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Voting over Taxes: The Case of Tax Evasion*

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Abstract

This paper studies majority voting on taxes when tax evasion is possible. We characterize the voting equilibrium where the agent with median *taxed* income is pivotal. Since the ranking of true incomes does not necessarily correspond to the ranking of taxed incomes, the decisive voter can differ from the median income receiver. In this case, we find unconventional patterns of redistribution, e.g. from the middle class to the poor and the rich. Furthermore, we show that majority voting can lead to an inefficiently *low* level of taxation – despite a right-skewed income distribution. Hence, the classical over-provision result might turn around, once tax evasion is taken into account.

JEL classification: H26; D72; D6.

Keywords: Majority Voting; Tax Evasion; Welfare Analysis; Redistribution.

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1 Introduction

You've got to be careful about this rhetoric, we're only going to tax the rich. ... The rich in America happen to be the small business owners. ... Just remember, when you're talking about, oh, we're just going to run up the taxes on a certain number of people – first of all, real rich people figure out how to dodge taxes. And the small business owners end up paying a lot of the burden of this taxation.

George W. Bush, 9th Aug. 2004.[1]

One of the corner stones of the political-economic literature is the analysis of voting over tax schedules. The seminal contributions by Romer (1975), Roberts (1977) and Meltzer and Richard (1981) study majority voting on tax rates, where the median income receiver determines the political outcome. As long as the income distribution is skewed to the right, such that the pivotal agent's income falls short of the average income, the median voter equilibrium is characterized by an inefficiently high level of taxation.[2] This paper studies whether these results still hold if taxpayers can cheat on their taxes. While the empirical importance of tax evasion is well-documented,[3] there is no comprehensive analysis of income tax evasion within the classical median voter framework. Our approach attempts to close this gap in the literature.

Allowing taxpayers to conceal a part of their income from taxation alters the standard results in several interesting ways. First of all, individual preferences over alternative tax rates are no longer determined by their *true*, but rather by their *taxed* income. Second, the ranking of agents according to *true* income does not necessarily correspond to the ranking of *taxed* incomes. This implies that voters' preferences for taxation are not necessarily monotonic in their true income. If e.g. taxpayers from the top of the income distribution can more easily conceal income than individuals with intermediate income levels – as suggested in the quote by George W. Bush – the taxed income of the '*real rich*' might be lower than the taxed income of the middle class respectively the '*small business owners*'. If this is the case, high income groups ceteris paribus prefer higher taxes than voters from the middle class. An untypical coalition of poor and rich would emerge, with both groups voting for higher taxes. Consequently, the tax system would redistribute from the middle class to the poor *and* to the rich.[4] The non-monotonicity of preferences over taxes in true income furthermore implies that the pivotal taxpayer – the agent with the median *taxed* income – does not necessarily correspond to the voter with the median income.

Taking into account tax evasion, has also a strong impact on the welfare properties of the median voter equilibrium. The underlying reason is that in our framework there are two lay-

[1]See http://www.whitehouse.gov/news/releases/2004/08/20040809-3.html

[2]For an overview of this literature see e.g. Persson and Tabellini (2000).

[3]In the US, for example, the IRS estimated the 'tax gap' – the difference between actual and hypothetical tax revenues without evasion – to amount to a total of approximately $350 billion in the year 2001 (Sawicky, 2005). Frey and Feld (2002) assess the income tax gap for Switzerland at more than 17%.

[4]A similar example of an 'ends against the middle'-conflict is discussed in Epple and Romano (1996).

ers of heterogeneity among agents which drive a wedge between the social planer's and the decisive voter's incentives. One is the 'income gap' – the well-studied difference between the mean and the median voter's income. If the pivotal taxpayer has an income below the average, he considers costs of taxation which are too low from the planner's perspectives. Hence, the tax rate in the voting equilibrium will be inefficiently high. In the presence of tax evasion, however, we need to compare the average *taxed* income with the *taxed* income of the decisive voter in order to determine the welfare characteristics of the political equilibrium. That is, next to the income gap, we also have to consider differences in the level of evasion – the 'evasion gap'. If the decisive voter conceals *less* than the average, his taxed income will ceteris paribus rise (as compared to the mean taxed income). This, in turn, provides the pivotal taxpayer with an incentive to vote for an inefficiently *low* level of taxation. Apparently, this incentive works against the standard effect from the income gap. If the median voter's taxed income is above the average, the evasion gap dominates. In that case, majority voting leads to an inefficiently *low* level of taxation, once tax evasion is taken into account. Interestingly, this can occur even if the distribution of true income is skewed to the right.

Our approach combines the literature on income tax evasion (see e.g. Andreoni et al., 1998) and the political-economic literature on voting over taxation (Persson and Tabellini, 2000). Thereby, we deviate from the standard model of income tax evasion (Allingham and Sandmo, 1972; Yitzhaki, 1974), where risk-averse taxpayers trade off the costs of detection against the tax savings in case they get away with the evasion. Instead, we consider risk-neutral agents who face convex costs of concealing income. In this vein, our approach is similar to models of firm evasion (e.g. Cremer and Gahvari, 1993; Stöwhase and Traxler, 2005). We study the case where the opportunities – respectively the costs – to conceal income vary with income. This captures the fact that different income groups derive their earnings from different sources – capital or labour income, respectively income from self-employed or employed labour – which determine their chances to dodge taxes (see e.g. Roth et al., 1989). Within this framework we study tax evasion and majority voting over a proportional income tax, which is used to finance a public good.

There are only a few other contributions on majority voting in a similar context.[5] Borck (2003) analyzes voting over redistribution with tax evasion. Evasion is modeled along the lines of Allingham and Sandmo (1972) and tax revenues are used to finance a lump-sum transfer. Roine (2006) studies a model of majority voting on taxes in the presence of legal tax avoidance. Agents make a discrete choice, either to invest a fixed amount and explore a given avoidance opportunity or to declare all their income. Roine (2003) generalizes the approach, considering the case of continuous tax avoidance and endogenous labour supply. Similar as is our paper, these contributions show that tax evasion respectively avoidance typically drives a wedge between the ranking of pre-tax and taxed income. In turn, this will shifting the position of the decisive voter away from the median income receiver, which triggers similar patterns of redis-

[5]In a slightly different approach, Barbaro and Südekum (2006) study voting over tax exemptions. Similar as in our analysis, they find that the decisive voter does not necessarily correspond to the median income receiver.

tribution as in our analysis. In the models of Borck (2003) and Roine (2003, 2006), however, voters' preferences regarding taxation satisfy neither single peakedness nor single crossing. As the median voter theorem is in general not applicable and a voting equilibrium may not exist, the authors use numerical examples to discuss the properties of different equilibria. In addition, non of the papers addresses the welfare implications of tax evasion respectively avoidance. Hence, the welfare analysis in the present paper is novel in the literature.

The remaining paper is structured as follows. In section 2 we set up the basic model and analyze the agents' evasion behavior. Section 3 studies the taxpayers' voting incentives. We characterize the voting equilibrium and discuss possible patterns of redistribution associated with different types of equilibria. In section 4 we study the welfare properties of the political equilibrium. A brief discussion of our main findings concludes the paper.

2 Basic Model

An agent i receives an exogenous pre-tax income y_i, $0 < y_i < \infty$, which is subject to a linear income tax at rate τ, $0 < \tau < 1$. The taxpayer chooses to conceal a share $e_i \in [0, 1]$ of his income. Hiding income from authorities entails (non tax-deductible) costs of $c(y_i, e_i)$, related to the individual's evasion efforts. These costs also depend on the income level, as different income groups – which may derive their incomes from different sources (e.g. capital or labour, self-employed or employed labour) – face different opportunities to dodge taxes. Throughout our analysis we assume that $c(.,.)$ is continuously differentiable with $c_e(y_i, e_i) \geq 0$, $c_e(y_i, 0) = 0$, $c_e(y_i, 1) = \infty$ and $c_{ee}(y_i, e_i) > 0$.[6] With a fixed probability p an evader gets detected and has to pay full taxes plus a penalty proportional to the taxes evaded (Yitzhaki, 1974).[7] If the taxpayer gets away with the evasion, only the declared income is taxed.

Note that our set up, employing individual evasion costs,[8] can be interpreted as a reduced form model of the case where the detection probability depends on the share of income concealed as well as on the income level. While this alternative approach would not alter the main results of the study, the analysis would become quite tediously.

The expected after-tax income is then given by

$$EY(y_i, e_i) = (1 - p)(y_i(1 - \tau) + \tau e_i y_i) + p(y_i(1 - \tau) - \tau e_i y_i(s - 1)) - c(y_i, e_i)$$

which simplifies to

$$EY(y_i, e_i) = y_i(1 - \tau + e_i \tau(1 - ps)) - c(y_i, e_i), \tag{1}$$

where $s > 1$ denotes the penalty rate. Expected fines are assumed to be such that $ps < 1$. Hence, evading income yields a positive return. Note, that for the special case $p = 0$ our approach can

[6] We use $c_e(y_i, e_i)$ and $c_{ee}(y_i, e_i)$ for $\frac{\partial c(.,.)}{\partial e}$ and $\frac{\partial^2 c(.,.)}{\partial e^2}$, respectively. Equivalently, $c_{ey}(y_i, e_i)$ denotes $\frac{\partial c(.,.)}{\partial e \partial y}$.

[7] Our results also hold for the case originally studied by Allingham and Sandmo (1972), where the penalty is proportional to the concealed income rather than taxes evaded.

[8] For other models of individual tax evasion which consider individual evasion costs see e.g. Slemrod (2001), Chang and Lai (2004).

be interpreted as a model of legal tax avoidance, similar to Roine (2006). As we consider a continuous evasion respectively avoidance decision, however, our framework is more general.

The preferences of risk neutral agents are characterized by an additively separable utility function defined over expected income $EY(.,.)$ and a public good g,

$$U(y_i, e_i, g) = EY(y_i, e_i) + V(g), \tag{2}$$

with $V(.)$ being continuously increasing and strictly concave. Taxpayers choose e_i so as to maximize (2). The first order condition to this problem,

$$y_i \tau (1 - ps) = c_e(y_i, e_i), \tag{3}$$

characterizes e_i^*, the optimal share of income concealed, for a given set of policy variables and an income y_i.[9] Using the implicit function theorem on (3) one can easily derive

$$\frac{\partial e_i^*}{\partial p} < 0, \qquad \frac{\partial e_i^*}{\partial s} < 0, \qquad \frac{\partial e_i^*}{\partial \tau} > 0.$$

While stricter tax enforcement – an increase in the detection probability and/or the penalty rate – will reduce evasion, a rise in the tax rate will trigger more evasion. Note, that this last result is at odds with the classical model of income tax evasion. For the case of risk-averse taxpayers and a penalty structure as considered above (i.e. proportional to taxes evaded), non-increasing absolute risk aversion is sufficient to show that evasion *de*creases with higher tax rates (Yitzhaki, 1974). As we consider risk neutral agents who face convex costs of concealing income, we get the more intuitive result that evasion increases as taxes rise.[10]

From (3) we get

$$\frac{\partial e_i^*}{\partial y_i} = \frac{\tau (1 - ps) - c_{ey}(y_i, e_i^*)}{c_{ee}(y_i, e_i^*)}. \tag{4}$$

Although marginal benefits of evasion are (linearly) increasing in income, the sign of $\partial e / \partial y$ is ambiguous and depends on the cross derivative of the cost function – i.e. on how the marginal costs of concealing change with the income level. If the inequality

$$c_{ey}(y_i, e_i^*) \geq \tau (1 - ps) \tag{5}$$

holds, the share of concealed income e_i^* is non-increasing in income. In this case, the marginal costs to dodge taxes are strongly increasing in income, such that richer taxpayers would declare a larger share of their true income than poorer agents.[11] However, if the marginal costs of concealing are declining or not too strongly increasing in income, condition (5) would be

[9] We focus on interior solutions by assuming $c_e(y_i, 0) = 0$ and $c_e(y_i, 1) = \infty$. The second order condition is fulfilled since $c_{ee}(y_i, e_i) > 0$.

[10] Following a similar modelling approach, the same result is derived in the literature on tax evasion of firms (see e.g. Cremer and Gahvari, 1993; Stöwhase and Traxler, 2005).

[11] For the special case where (5) holds with equality – which would be the case if e.g. $c(y_i, e_i)$ were linear in y_i – the share of income concealed e_i^* would be the same for all income levels.

violated. In this case, the share of income concealed would increase as income rises: Richer taxpayers would conceal a larger share of their income as compared to poorer agents. In the following we will consider both possible cases.

Finally, we specify the public sector of the economy. We consider a continuum of individuals with incomes distributed according to a continuously differentiable cumulative distribution function $F(y)$ with $y \in [y^l, y^h]$, $0 < y^l < y^h < \infty$. In the following $\bar{y}$ denotes the mean and y^m the median of the income distribution. Revenues from taxes and fines are used to finance the public good. With a marginal rate of transformation of unity we get

$$g = \tau \int_{y^l}^{y^h} y\left(1 - e^*\left(y\right)\left(1 - ps\right)\right) dF(y), \tag{6}$$

where $e^*\left(y\right)$ denotes the solution to (3) as a function of income. Let us define

$$x(y_i) \equiv y_i\left(1 - e^*\left(y_i\right)\left(1 - ps\right)\right), \tag{7}$$

the – in expectation terms[12] – taxed income of a taxpayer with true income y_i. Substituting for $x(y_i)$ we can express (6) as

$$g(\tau) = \tau \int_{y^l}^{y^h} x(y) dF(y) \equiv \tau\,\bar{x}, \tag{8}$$

where $\bar{x}$ denotes the mean taxed income.

3 Voting with Tax Evasion

Let us now turn to the endogenous choice of the tax rate within this framework. We first study the political equilibrium under majority voting. In the next section we analyze the tax policy chosen by a welfare maximizing planner. The following timing of events is considered: First, the tax rate is determined (by voters respectively the planner). Second, taxpayers choose their optimal level of evasion and finally the revenues collected from taxation and auditing determine the public good level as studied above. Throughout this analysis the detection probability as well as the penalty rate are taken as exogenously fixed.[13]

3.1 Voting Equilibrium

The most preferred tax rate of an agent with income y_i is given by the solution to

$$\max_{\tau}\ EY(y_i, e_i^*) + V(g(\tau)),$$

[12]Note that $x(y_i)$ consists of the declare income, $y_i(1 - e_i^*)$, as well as of the 'base' for the expected fine, $ps\, y_i e_i^*$.

[13]As p is kept constant, we normalize the public costs of providing a certain auditing level to zero. Note further, that our analysis neglects the case where the government can not credibly commit to an auditing policy.

with e_i^* and $g(\tau)$ from (3) and (8), respectively. Making use of (3), we get the following first order condition:

$$V' \frac{\partial g}{\partial \tau} = x(y_i), \tag{9}$$

with $\partial g/\partial \tau$ derived in the appendix. There we also show that for sufficiently large $V'(.)$ the second order condition for this problem holds for all $y_i \in [y^l, y^h]$. Hence, condition (9) determines the most preferred tax rate of an agent where the marginal benefits equal her marginal costs from taxation. While the former are equal for all taxpayers, the latter depend on $x(y_i)$, the taxed income of an individual with true income y_i. From (9) immediately follows that the preferred tax rate is decreasing in x: The higher the taxed income, the more a taxpayer contributes to the public good and the lower is the desired tax rate. Ranking taxpayers according to their *taxed* income then yields the (reversed) ranking of voters' preferences for taxation. As preferences are single-peaked, the median voter theorem is applicable (Black, 1948). The decisive voter is then characterized by the median level of $x(y_i)$. This result is summarized in

Proposition 1 *Let the cumulative distribution of $x = x(y)$ be given by $H(x)$. The political equilibrium is characterized by*

$$V' \frac{\partial g}{\partial \tau} = \hat{x}$$

with $H(\hat{x}) = \frac{1}{2}$.

Proof. See Appendix. ■

The majority voting outcome characterized in Proposition 1 is analogous to the classical result (Romer, 1975; Roberts, 1977; Meltzer and Richard, 1981). In the absence of tax evasion, preferences for taxation can be ranked according to the *true* income of taxpayers and the median income voter is pivotal. In our framework, however, agents are heterogenous along the *true* income as well as the level of evasion – which boils down to a distribution of *taxed* incomes. The political equilibrium is then determined by the taxpayer with median taxed income $\hat{x}$.

3.2 Position of the Median Voter

We now have to ask whether the decisive voter still correspond to the taxpayer with median true income. In order to address this question, we have to check if $x(y)$ is monotonic in y. From (7) we can easily derive

$$\frac{\partial x(y_i)}{\partial y_i} = (1 - e_i^* (1 - ps)) - y_i \frac{\partial e_i^*}{\partial y_i} (1 - ps). \tag{10}$$

The first term on the right hand side of (10) is positive and depicts the increase in declared respectively taxed income associated with a rise in y_i. The second term captures the change in the evasion behavior due to an increase in true income. Since this second effect might be negative, the sign of $\partial x/\partial y$ is ambiguous and crucially depends on $\partial e^*/\partial y$ from (4), which itself is determined by the sign of c_{ey}.[14] We can distinguish between three different cases:

[14]Compare condition (5) and the discussion in section 2.

1. If $\partial e^*/\partial y \leq 0$ holds (for all income levels), the share of income concealed e_i^* decreases and taxable income $x(y_i)$ monotonically increases in incomes. In this case, preferences for taxation are monotonic in true income and the median voter corresponds to the taxpayer with the median income.

2. If $\partial e^*/\partial y$ is positive but the first term in (10) dominates the second for all income levels, we still get $\partial x/\partial y > 0$. Preferences for taxation are monotonic in the true income and the decisive voter is the median income receiver.

3. With $\partial e^*/\partial y$ being positive, however, there might exist income levels where the second term in (10) dominates the first. In this case, agents would increase the share of income concealed such that the higher level of evasion outbalances the income increase. Consequently, taxed income is (locally) decreasing in true income. Voters' preferences for taxation are no longer monotonic in income. As a consequence, the median voter might differ from the median income receiver.

Case	Condition on c_{ey}	Properties	
1.	$\forall y \in [y^l, y^h] : c_{ey} \geq \tau(1-ps)$	$\frac{\partial e^*}{\partial y} \leq 0$	$\frac{\partial x}{\partial y} > 0$
2.	$\forall y \in [y^l, y^h] : \tau(1-ps) - \psi(y) \leq c_{ey} < \tau(1-ps)$	$\frac{\partial e^*}{\partial y} > 0$	$\forall y \in [y^l, y^h] : \frac{\partial x}{\partial y} \geq 0$
3.	$\exists y \in [y^l, y^h] : c_{ey} < \tau(1-ps) - \psi(y)$	$\frac{\partial e^*}{\partial y} > 0$	$\exists y \in [y^l, y^h] : \frac{\partial x}{\partial y} < 0$

Table 1

One can distinguish between these cases according to the value of c_{ey}, which determines the size and sign of $\partial e/\partial y$. In Table 1 we used (4) in (10) to derive thresholds for the three possible scenarios, where $\psi(y)$ is defined as

$$\psi(y) \equiv \frac{1 - e^*(y)(1-ps)}{y(1-ps)} c_{ee}.$$

If the marginal costs of concealing are strongly increasing in income such that (5) holds, we are in case 1. If (5) is violated, we are either in case 2 or case 3. If c_{ey} does not fall too short of the threshold $\tau\,(1-ps)$, the condition for case 2 might hold for all income levels. The smaller is c_{ey}, the more likely we arrive at case 3. Note, however, that it is not at all necessary for c_{ey} to be negative, to get the third case.[15] Even if the marginal costs of evasion are increasing in income, i.e. $c_{ey} > 0$, the ranking of taxed income can differ from the ranking of true income.

These findings lead us to the following proposition:

Proposition 2 1. *If $c_{ey} \geq \tau(1-ps) - \psi(y)$ holds for all income levels $y \in [y^l, y^h]$ we get $\frac{\partial x(y)}{\partial y} \geq 0$ for all agents. Voters' preferences for taxation are monotonic in income and the median income receiver is pivotal, $\hat{x} = x(y^m)$.*

[15]Let us further remark that $\psi(y)$ tends to decreases in y. The numerator of $\psi(y)$ decreases in y as in this range of c_{ey} we have $\partial e/\partial y > 0$. In addition, the denominator increases with y. Given that these are the dominant effects, i.e. if c_{eey} is not too strongly positive, we get $\partial \psi/\partial y < 0$. Hence, for a given level of c_{ey}, the third case is particularly likely to hold for high income levels.

2. *If there exits an income $y \in [y^l, y^h]$ such that $c_{ey} < \tau(1-ps) - \psi(y)$, we locally get $\frac{\partial x(y)}{\partial y} < 0$. Voters' preferences for taxation are non-monotonic in y. The decisive voter will be different from the median income receiver, $\hat{x} \neq x(y^m)$,*

2.a *if $\exists y \in (y^m, y^h]$ with $x(y) < x(y^m)$ and $\nexists y \in [y^l, y^m)$ with $x(y) > x(y^m)$.*
In this case we get $\hat{x} < x(y^m)$.

2.b *if $\nexists y \in (y^m, y^h]$ with $x(y) < x(y^m)$ and $\exists y \in [y^l, y^m)$ with $x(y) > x(y^m)$.*
In this case we get $\hat{x} > x(y^m)$.

2.c *if $\exists y \in (y^m, y^h]$ with $x(y) < x(y^m)$ and $\exists y \in [y^l, y^m)$ with $x(y) > x(y^m)$.*
In this case we either get $\hat{x} < x(y^m)$, $\hat{x} > x(y^m)$ or $\hat{x} = x(y^m)$.

2.d *Otherwise, if $\nexists y \in (y^m, y^h]$ with $x(y) < x(y^m)$ and $\nexists y \in [y^l, y^m)$ with $x(y) > x(y^m)$, the median income receiver is pivotal, $\hat{x} = x(y^m)$.*

Proof. See Appendix. ■

While Proposition 2.1 subsumes scenarios 1 and 2 from Table 1, Proposition 2.2 specifies evasion costs which correspond to the third scenario. For this last case, the pattern of tax evasion is such that taxed income – and thereby the ranking of preferences – is non-monotonic in pre-tax income. The subcases 2.a – 2.c identify conditions under which this non-monotonicity drives a wedge between the position of the median voter and the agent with the median income. This occurs, if e.g. some taxpayers with above median-income strongly conceal income such that their taxed income falls short of the median income receiver's taxed income. In this case 2.a, the decisive voter has a lower taxed income than the agent with median income. Hence, the tax rate (as well as the public good level) in the voting equilibrium will be too high from the perspective of the median income receiver. The opposite holds true for case 2.b: if some taxpayers from the lower half of the income distribution have a higher taxed income than the agent with median income, the decisive voter has a higher taxed income and therefore prefers a lower level of taxation as compared to the taxpayer with the median income. In case 2.c, where at the same time some agents from the upper half of the income distribution have a lower and some voters from the lower half have a higher taxed income than the median income receiver, the tax policy in the political equilibrium will (typically) be different from the policy preferred by the median income agent. Without any further restrictions, however, one cannot determine the direction of this deviation. Finally, in the case characterized in part 2.d of the proposition, the non-monotonicity of preferences does not alter the position of the median income receiver as the decisive voter. Hence, the political equilibrium will be equivalent to the one which emerges in the case specified in Proposition 2.1.

What can we say about the empirical plausibility of the case specified in Proposition 2.2, i.e. that c_{ey} is sufficiently small. Let us assume for the moment, that the marginal costs of concealing are mainly determined by the source of the (exogenous) income. Furthermore, consider the case, where the share of income derived from capital – as compared to labour – or self-employed – as compared to employed labour – is increasing in pre-tax income. Given that income from capital respectively self-employment are easier to conceal, low or even negative values for c_{ey} appear highly plausible. Hence, a non-monotonicity of taxed income as specified in Proposition 2.2 seems to be of empirical relevance.[16] Anecdotal evidence which supports this view is discussed by Bergström and Gidehag (2003). They report that "*more than half of the hairdressing employers in Sweden have a taxed income that is less than half of what a full-time employed hairdresser earns per annum ... .*" While there could be various reasons for this observation, the authors argue that the key explanation are the greater evasion opportunities among employers as compared to employees.

3.3 Tax Evasion and Redistribution

The non-monotonicity of preferences in income has also strong implications for the pattern of redistribution within our framework. To illustrate this point, let us discuss some examples. Figure 1 and 2 show the true income y (horizontal axis) plotted against the taxed income $x(y)$ (vertical axis) for two possible evasion cost functions resulting in different shapes of $x(y)$. Without tax evasion, taxed income would equal true income. A vertical deviation from the 45 degree line then captures the amount of income concealed from taxation (in expectation terms) at a give income level y.

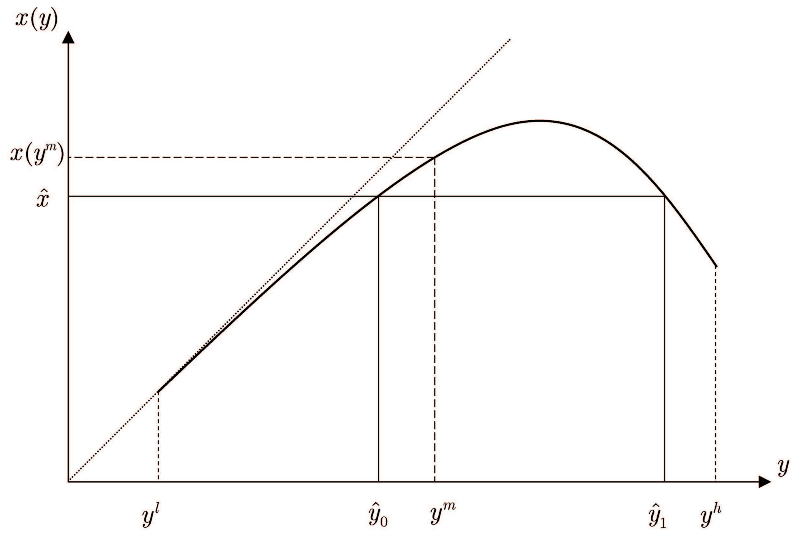

Figure 1: Voting Equilibrium and Patterns of Redistribution, Example 1

The first figure describes the case suggested by George W. Bush in the quote from above: '*real rich people figure out how to dodge taxes*' – they conceal a huge part of their income. The voting equilibrium is then supported by an unusual coalition of rich and poor, taxpayers with $y \in [y^l, \hat{y}_0]$ respectively $y \in [\hat{y}_1, y^h]$. In equilibrium '*the small business owners end up paying a lot of the burden of this taxation*' – there is redistribution from the middle class, agents with $y \in [\hat{y}_0, \hat{y}_1]$

[16]Models of risk averse taxpayers typically assume a decreasing absolute risk aversion, which also implies that the share of income concealed increases as income rises. Compare e.g. Andreoni et al. (1998, p.838), Borck (2003).

who have a taxed income above $\hat{x}$, to the poor *and* the rich, who both have a taxed income $x(y) < \hat{x}$.

A similar example, which also corresponds to the group of scenarios specified in Proposition 2.2.a, is given in Figure 2. Here, the coalition supporting the equilibrium tax rate is formed by the poor with $y \in [y^l, \hat{y}_0]$ and the 'upper-middle-class' with $y \in [\hat{y}_1, \hat{y}_2]$. These two groups benefit from redistribution to the disadvantage of the rich, taxpayers with $y \in [\hat{y}_2, y^h]$, as well as the 'lower-middle-class' with $y \in [\hat{y}_0, \hat{y}_1]$. While this examples shows the typical redistribution from the top to the bottom of the income distribution, we also observe an unusual direction of redistribution among the middle class – i.e. from the lower to the upper part of this group with intermediate income levels. To put it into the terms of the observation from Bergström and Gidehag (2003) (see above): There is redistribution 'from the Swedish hairdressers to their employers'. The reason here is again that locally an income increase leads to an over-proportional increase in evasion such that the ranking of the taxed income among the middle class gets reversed.

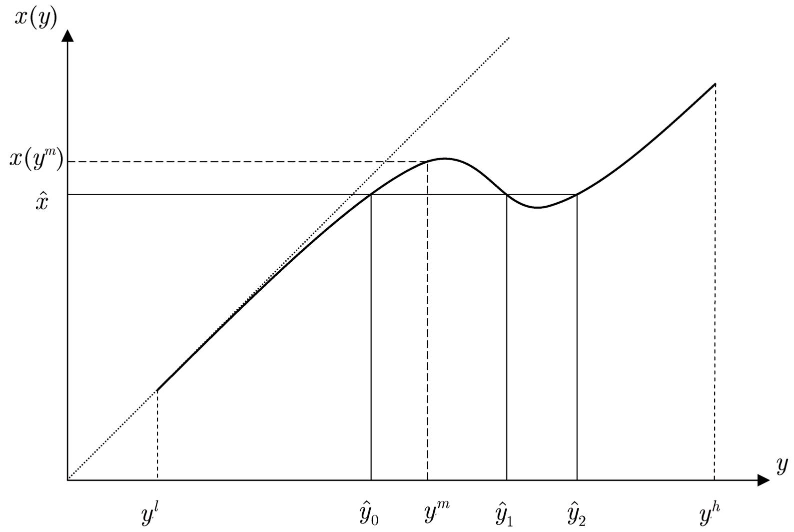

Figure 2: Voting Equilibrium and Patterns of Redistribution, Example 2

The emergence of such unusual patterns of redistribution in the context of tax evasion (respectively tax avoidance) is not new in the literature.[17] Both Borck (2003) and Roine (2003, 2006) find scenarios similar to the one described in Figure 1. Borck (2003) considers a society consisting of three agents, who can either evade nothing at all or everything. A similar approach is provided by Roine (2006), who studies (legal) tax avoidance. His taxpayers can either invest a fixed amount to reduce their tax base by a fixed share or they declare their full income. While the median voter theorem is typically not applicable in these frameworks, both authors discuss numerical examples of equilibria, where the tax system distributes from the middle class to the poor and the rich taxpayer. Similar cases are derived in Roine (2003), studying a contin-

[17] An interesting example of an 'ends against the middle'-conflicts is also discussed in Epple and Romano (1996).

uous tax avoidance decision together with endogenous labour supply. In comparison to our approach, however, these contributions excludes many interesting patterns of redistribution. In particular, these models can only capture a non-monotonicity of taxed income at the top of the income distribution. Hence, cases like the one depicted in Figure 2, where taxed income is reversed among the middle class, are neglected in their studies. The same holds for scenarios characterized by part 2.b and 2.c of Proposition 2.

4 Welfare Analysis

In order to discuss the welfare properties of the voting equilibrium, we first derive the welfare maximizing policy within our framework. The social planner maximizes aggregate utility, taking into account taxpayers' responses in their evasion behavior to changes in the tax rate. Using $e^*(y)$ and (8) in (2), the planners' problem becomes

$$\max_{\tau} \int_{y^l}^{y^h} EY(y, e^*(y))dF(y) + V(g(\tau)).$$

The Samuelson condition to this problem is given by

$$V' \frac{\partial g}{\partial \tau} = \bar{x}, \tag{11}$$

where we made use of (3) and (7).[18] Condition (11) characterizes the welfare maximizing tax rate and the budget constraint from (8) determines the corresponding public good level. In the welfare maximizing equilibrium, the mean marginal costs from taxation, given by $\bar{x}$, are equal to the (total) marginal benefits from a increase in the public good provision. Using this solution as a benchmark, we can derive the welfare properties of the voting equilibrium from Proposition 1.[19]

Proposition 3 *The political equilibrium is characterized by* $(\mathbf{a})$ *an inefficiently high,* $(\mathbf{b})$ *an inefficiently low,* $(\mathbf{c})$ *a welfare maximizing level of taxation and public good provision iff* $(\mathbf{a})$ $\hat{x} < \bar{x}$, $(\mathbf{b})$ $\hat{x} > \bar{x}$, *respectively* $(\mathbf{c})$ $\hat{x} = \bar{x}$.

Proof. See Appendix. ■

Proposition 3 is equivalent to the welfare result typically derived in the majority voting literature: Neglecting tax evasion and considering an income distribution which is skewed to the right, the pivotal taxpayer has an income below the average – he faces lower marginal costs of taxation than the mean costs considered by the social planner. Hence, the political equilibrium will be characterized by too high taxes and an inefficiently high level of public good provision (Romer, 1975; Roberts, 1977; Meltzer and Richard, 1981). The political equilibrium in our

[18] The second order condition is derived in the appendix.

[19] Note that the policy characterized by (11) is not first best. In the following we call a policy 'inefficient', if it results in a lower level of welfare as compared to the benchmark from (11).

framework has the same properties, as long as the decisive voter has a *taxed* income below the mean, $\hat{x} < \bar{x}$ (case a). If the opposite holds true, i.e. if the decisive taxpayer has a taxed income $\hat{x} > \bar{x}$ (case b), majority voting results in inefficiently low levels of taxation and public good provision. For the special case where $\hat{x} = \bar{x}$ (case c), voting introduces no distortion as the pivotal taxpayer chooses the same tax rate as the social planer.

For which pattern of evasion respectively for which income distribution does majority voting now result in an over-, under-, or an efficient provision of public goods? One straightforward example where we get an over-provision of public goods (case a), is an income distribution $F(y)$ with $y^m < \bar{y}$ together with a constant share of evasion, $e^*(y) = e^* \; \forall y$.[20] It is obvious, that in this case there must hold $\hat{x} < \bar{x}$. Using (7) we can write $\hat{x} < \bar{x}$ as

$$\hat{y}_j \left(1 - e^*(\hat{y}_j)\left(1 - ps\right)\right) < \int y \left(1 - e^*\left(y\right)\left(1 - ps\right)\right) dF(y), \tag{12}$$

with $\hat{y}_j$ being the income of the pivotal taxpayer, $\hat{x} = x(\hat{y}_j)$.[21] If e^* is independent of y, tax evasion reduces the marginal costs of taxation for all agents by the same proportion. Technically this means that condition (12) boils down to $\hat{y}_j < \bar{y}$. Since we assume $\partial e^*/\partial y = 0$, preferences are monotonic in income (compare Proposition 2.1) and the pivotal taxpayer has median income: $\hat{x} = x(y^m)$ and $\hat{y}_j = y^m$. With a constant share of income concealed, majority voting therefore results in an inefficiently high level of taxation as long as the distribution of true incomes fulfills $y^m < \bar{y}$.

If we turn to the more general case where e^* varies with income, this result might turn around – *despite* a distribution of true income with $y^m < \bar{y}$. The pattern of evasion can be such that the decisive voter faces marginal cost of taxation which are *above* the mean costs (case c in Proposition 3), where we would get an *under*-provision of public goods. To address this point in more detail, we express $\hat{x} \geq \bar{x}$ as

$$\left(\int ye^*\left(y\right) dF(y) - \hat{y}_j e^*(\hat{y}_j)\right)\left(1 - ps\right) \geq \bar{y} - \hat{y}_j. \tag{13}$$

While the right hand side of condition (13) depicts the gap between the mean income and a decisive voter's true income $\hat{y}_j$,[22] the left hand side captures the gap between the mean level of income concealed and the (expected) amount concealed by a pivotal taxpayer j. If this agent j conceals *less* income than the average, the left hand side is positive. If this 'evasion gap' is bigger than the 'income gap' such that condition (13) holds, majority voting would result in an inefficiently *low* level of taxes and public goods.

[20]This would be the case if e.g. $c(y_i, e_i)$ were linear in income. (Compare footnote 11.)

[21]Note, that $x(y)$ from (7) is non-injective if x is non-monotonic in y. Hence, there might exist different levels of true income $\hat{y}_j$ and $\hat{y}_{k \neq j}$ for which $\hat{x} = x(\hat{y}_j) = x(\hat{y}_k)$ holds. (Compare Figure 1 and 2 from above.) If $e^*(y) = e^* \; \forall y$, however, it follows from (10) that $x(y)$ is injective and there is one unique income level $\hat{y}_j$ where $\hat{x} = x(\hat{y}_j)$ holds.

[22]Note, that the income of the pivotal taxpayer is not necessarily equal to the median income (compare Proposition 2). Moreover, there might be several income levels $\hat{y}_j$ and $\hat{y}_{k \neq j}$ for which $\hat{x} = x(\hat{y}_j) = x(\hat{y}_k)$ holds (compare footnote 21). It is obvious, however, that if (13) holds for $\hat{y}_j$ it also has to hold for all other $\hat{y}_{k \neq j}$.

Consider for example a uniform distribution of true incomes. Without tax evasion, majority voting would not introduce any distortion, as median and mean income coincide. If, however, agents differ with respect to the share of income concealed, the heterogeneity in tax evasion will drive a wedge between the decisive voter's and the mean marginal costs of taxation. Given that the median voter conceals less income than the average, he ceteris paribus faces marginal costs of taxation which are above the social costs considered by the planner. In terms of (13), the left hand side would be positive. If the taxed income is monotonic in true income as characterized in Proposition 2.1, the pivotal taxpayer has median income, $\hat{y}_j = y^m$. Since for a uniform distribution there holds $y^m = \bar{y}$, the right hand side of (13) equals zero. Hence, condition (13) holds and we get an under-provision of public goods.

The intuition for this result is that the planner takes into account the mean taxed income $\bar{x}$ and thereby also the mean level of income concealed. If the pivotal taxpayer conceals less than the average, this will provide him with an incentive to vote for a level of taxation which is inefficiently low. As long as this is the only wedge between the median voter's and the planner's incentives – i.e. if there is no income gap – it determines the welfare properties of the voting equilibrium. In the case of an income distribution which is skewed to the right, the incentive to vote for a 'too low' tax – stemming from a below-average level of evasion (evasion gap) – would work into the opposite direction as the incentives to vote for 'too high' taxes – related to a below-average income (income gap). If the former incentive dominates the latter, condition (13) is fulfilled and the voting equilibrium is characterized by an under-provision of public goods. For the special case where condition (13) holds with equality, the two distortions – the one related to the income gap and the other to the evasion gap – exactly offset each other. The pivotal agent has mean taxed income $\hat{x} = \bar{x}$ and the majority voting outcome would also be welfare maximizing (compare case c in Proposition 3).[23]

Finally, we shall link the welfare discussion with the analysis from the previous section. As we know from Proposition 3, a necessary condition for an under-provision of public goods is a distribution of taxed incomes $H(x)$ which fulfills $\hat{x} > \bar{x}$. Given that the distribution of true income $F(y)$ is skewed to the right, condition (13) is more likely to hold if we are in the case characterized by Proposition 2.2: If the taxed income is non-monotonic in true income – in particular, if the taxed income decreases for the very rich (as in Figure 1) – tax evasion can transform a right-skewed distribution $F(y)$ into a distribution $H(x)$ which satisfies (13).[24] Interestingly, however, one can easily find examples of an under-provision of public goods (despite a right-skewed $F(y)$), where the taxed income is monotonically increasing (compare Proposition 2.1) but sufficiently concave. This is typically the case if $\partial e^*/\partial y > 0$ (compare Table 1 from above), i.e. if the share of income concealed increases with higher incomes.[25] The intuition behind this point is straightforward: If '*only the little people pay taxes*', as convicted tax

[23]The decisive voter could also conceal *more* than the average taxpayer. In this case, the left hand side of (13) would be negative and the incentive from tax evasion would only amplify the political distortion associated with a below-average income of the pivotal agent.

[24]In Appendix A.3 we provide an example for this case.

[25]A numerical example which illustrates this case is discussed in Appendix A.3. In order to address this point more formally, we would have to make some assumptions on the evasion cost function $c(y, e)$.

evader Leona Helmsley put it, – i.e. if tax compliance is high among the poor and the middle class but the rich heavily engage in tax evasion – this will widen the evasion gap and thereby work in favor of an under-provision result. Hence, if the rich are indeed more prone to evade taxes than the rest of the society, the over-provision of public goods under majority voting associated with a right-skewed income distribution might turn into an under-provision, once tax evasion is taken into account.

5 Conclusion

This paper introduced tax evasion into a simple model of majority voting on taxes. Allowing taxpayers to conceal income, has strong implications for the political-economic analysis: First of all, individual preferences over tax rates are determined by their *taxed* rather than their true pre-tax income. Given that the opportunities to dodge taxes vary between different income groups, some taxpayers are more inclined to evade taxes than others. As a consequence, the ranking of agents according to true income does not necessarily correspond to the ranking of taxed incomes. Hence, voters' preferences over tax rates may be non-monotonic in their pre-tax income. If this is the case, the decisive voter can differ from the median income receiver. This also implies the existence of voting equilibria based e.g. upon a coalition of poor and rich, with both groups voting for higher taxes than the middle class. More generally, we observe redistribution from taxpayers with lower to individuals with (relatively) higher pre-tax incomes, if the latter conceal sufficiently more taxes than the former. Therefore, the distributional conflict emerges not only along income lines but also between those who comply with tax laws and those who cheat on taxes. Given the empirical relevance of tax evasion, tax compliance represents an important dimension of redistribution, which so far received only little attention in the political-economic literature on redistributive taxation (Borck, 2003; Roine, 2003, 2006).

In addition to distributive consequences, tax evasion has also a strong impact on the welfare properties of the voting equilibrium. As in our framework agents differ with respect to their income as well as their level of evasion, there are now two layers of heterogeneity which drive a wedge between the social planer's and the voters' incentives. Only considering the income heterogeneity – i.e. neglecting tax evasion – majority voting results in an inefficiently high level of taxation and public good provision, as long as the pivotal taxpayer has a pre-tax income below the average. In order to determine the welfare proprieties of the voting equilibrium in the case of tax evasion, however, one has to compare the decisive voter's *taxed* income with the average *taxed* income. That is, next to the 'income gap', we also have to consider the difference in the level of evasion – the 'evasion gap'. If the decisive voter conceals *less* than the average, this will ceteris paribus raise his taxed income (as compared to the mean taxed income). In turn, this provides the pivotal taxpayer with an incentive to vote for an inefficiently *low* level of taxation. Hence, the incentive from a below average level of tax evasion works against the standard effect from a below average income. If the median voter's taxed income is above the average, the evasion gap dominates. In this case, majority voting would leads to an inefficiently *low* level of taxation. Interestingly, this can occur even if the distribution of true income is skewed to the right.

How relevant are our findings from an empirical point of view? Despite a widespread belief that the '*real rich people figure out how to dodge taxes*' and hence '*only the little people pay taxes*', the lack of data on income specific levels of tax evasion severely limits the proper empirical assessment of these conjectures.[26] Nevertheless, there are several considerations why tax evasion may indeed be higher among the rich: Standard theory, for example, emphasizes the fact that decreasing absolute risk aversion triggers higher levels of evasion among the rich (see e.g. Cowell, 1990). In addition, evasion opportunities systematically differ between different income groups. As richer taxpayers typically derive large shares of their incomes from sources with relatively easy evasion opportunities (e.g. capital incomes, self-employed earnings), they have more chances to cheat on taxes than those who mainly derive wage incomes (see e.g. Roth et al., 1989, p. 137). Precisely this latter argument triggers the discussed implications for redistribution and welfare in our model.

With respect to the welfare analysis we should add that the observed income distributions – the distribution of declared respectively taxed incomes – is skewed to the right in most modern economies.[27] One could argue that this fact renders the case of an inefficiently low level of taxation in the voting equilibrium a mere theoretical possibility. In practice, however, tax rates are hardly determined by one-dimensional majority election (not to mention non-linear tax schedules). Moreover, recent evidence also highlights the importance of non-selfish motives for individual voting behavior (e.g. Tyran and Sausgruber, 2006). Hence, it might be misleading to take the observed income distributions as clear-cut evidence for an inefficiently high level of taxation in a majority voting equilibrium. In any case, we are convinced that the incentive related to the evasion gap – which tends to work in favor of an inefficiently *low* level of taxation – provides an important argument, so far neglected in the welfare discussion. If the evasion gap does not dominate, it at least mitigates the distortion associated with a right-skewed income distribution in the context of majority voting.

[26] The few existing empirical studies on the relationship between tax evasion and income do not provide a clear picture: Some contributions find that evasion tends to increase with higher incomes (e.g. Clotfelter, 1983), others do not find any significant results (e.g. Feinstein, 1991). Compare also Andreoni et al. (1998, pp.838) and the references therein.

[27] See e.g. Gottschalk and Smeeding (1997).

Appendix

A1. Second Order Conditions

From (8) we can easily derive

$$\frac{\partial g}{\partial \tau} = \bar{x} - \tau \left(1 - ps\right) \int y \frac{\partial e(y)^*}{\partial \tau} dF(y). \tag{A.1}$$

As both V' and $x(.)$ are strictly positive, it follows from (9) respectively (11), that for the voting equilibrium as well as for the welfare maximizing policy there holds $\partial g / \partial \tau > 0$. Hence, the tax policy is on the upward-sloping side of the Laffer-curve.

The second order condition to (9) is given by

$$V'' \left(\frac{\partial g}{\partial \tau}\right)^2 - \left(1 - ps\right) \left[2V' \int y \frac{\partial e^*(y)}{\partial \tau} dF(y) - y_i \frac{\partial e_i^*}{\partial \tau}\right] \leq 0, \tag{A.2}$$

where we have substituted for

$$\frac{\partial^2 g}{\partial \tau^2} = -2 \left(1 - ps\right) \int y \frac{\partial e(y)^*}{\partial \tau} dF(y) < 0. \tag{A.3}$$

While the first term in (A.2) is strictly negative, the second term is negative if the expression in the squared brackets is positive. We assume that the marginal utility of the public good V' is high enough, such that this sufficient condition holds for all $y_i \in [y^l, y^h]$.

The second order condition to the Samuelson condition from (11) is given by

$$V'' \left(\frac{\partial g}{\partial \tau}\right)^2 - \left(1 - ps\right) \left(2V' - 1\right) \int y \frac{\partial e(y)^*}{\partial \tau} dF(y) \leq 0, \tag{A.4}$$

where we have substituted for (A.3). As the first term in (A.4) is strictly negative, it is sufficient for (A.4) to be fulfilled that $2V'(g) > 1$. This is assumed to hold.

A2. Proofs

Proof of Proposition 1. Let us denote the tax rate preferred by the agent with a taxed income $\hat{x}$ as $\hat{\tau}$. Consider a vote between $\hat{\tau}$ and a tax rate $\tau' < \hat{\tau}$. The higher tax rate will be clearly preferred by all agents with $x \leq \hat{x}$. Hence, the fraction of the population that prefers τ' over $\hat{\tau}$ is less than $H(\hat{x}) = \frac{1}{2}$. From this follows that no tax rate lower than $\hat{\tau}$ can defeat $\hat{\tau}$ by an absolute majority. From the same argument follows that no tax rater higher than $\hat{\tau}$ can win a majority vote against $\hat{\tau}$. Hence, the taxpayer with $\hat{x}$ is pivotal. ■

Proof of Proposition 2. **1.** Substituting (4) in (10) and using $c_{ey} \geq \tau(1 - ps) - \psi(y)\ \forall y \in [y^l, y^h]$, it follows that $\frac{\partial x(y)}{\partial y} \geq 0$ for all income levels. Hence, the ranking of taxpayers according to their true income y corresponds to the ranking according to the taxed income x. From this and Proposition 1 immediately follows that the median income receiver is also pivotal.

2. Following the steps from above, the existence of a true income $y' \in [y^l, y^h]$ for which $c_{ey} < \tau(1-ps) - \psi(y')$ implies that $\frac{\partial x(y')}{\partial y} < 0$ holds for y'. Therefore, the ranking of taxpayers according to their true income y does no longer correspond to the ranking according to the taxed income x.

2.a Consider the case where $\exists y \in (y^m, y^h]$ with $x(y) < x(y^m)$ and $\nexists y \in [y^l, y^m)$ with $x(y) > x(y^m)$. The median income receiver can not be pivotal as there is a majority – formed by all agents with $y \in [y^l, y^m]$ as well as those agents with $y \in (y^m, y^h] : x(y) \leq x(y^m)$ – with a taxed income lower than (or equal to) the median income receiver's taxed income. Formally, $H(x(y^m)) > \frac{1}{2}$. From this follows that the decisive voter must have a taxed income $\hat{x} < x(y^m)$.

2.b Consider now the case where $\nexists y \in (y^m, y^h]$ with $x(y) < x(y^m)$ and $\exists y \in [y^l, y^m)$ with $x(y) > x(y^m)$. Again, the median income receiver can not be pivotal. All agents with $y \in [y^m, y^h]$ as well as those agents with $y \in [y^l, y^m)$ who have $x(y) \geq x(y^m)$ form a majority, who have a higher (or equal) taxed income than the median income receiver. We get $H(x(y^m)) < \frac{1}{2}$ and the political equilibrium must be characterized by a taxpayer with $\hat{x} > x(y^m)$.

2.c If $\exists y \in (y^m, y^h]$ with $x(y) < x(y^m)$ and $\exists y \in [y^l, y^m)$ with $x(y) > x(y^m)$ it is ambiguous whether $H(x(y^m))$ is bigger or small than $\frac{1}{2}$. Consequently we can get either the case from 2.a or 2.b above. For the special case where $H(x(y^m)) = \frac{1}{2}$ we can also get $\hat{y} = y^m$.

2.d If $\nexists y \in (y^m, y^h]$ with $x(y) \leq x(y^m)$ and $\nexists y \in [y^l, y^m)$ with $x(y) \geq x(y^m)$, the non-monotonicity of $x(y)$ does not alter the position of the median income receiver as the agent with the median taxed income. We get $H(x(y^m)) = \frac{1}{2}$ and therefore $\hat{y} = y^m$. ■

Proof of Proposition 3. As V', $\hat{x}$ and $\bar{x}$ are strictly positive, there has to hold $\partial g / \partial \tau > 0$. Since $V'' < 0$, Proposition 3 then follows from the comparison of (11) with (9), evaluated at $x(y) = \hat{x}$. ■

A3. Income Distributions, Evasion and Welfare

Example 1. Let us first consider an example, where $x(y)$ is monotonic in income as specified in Proposition 2.1. We use the following specifications: The evasion cost function is given by

$$c(e, y) = e^2 \left(y^{1/20} - y \frac{1}{30} \right) \tag{A.5}$$

and the policy parameters are set at $p = 0.05$, $s = 8$ and $\tau = 0.35$. Assuming that $y \in [\frac{1}{1000}, 6]$, one can easily show that $\frac{\partial x(y)}{y} > 0$ as well as $\frac{\partial x^2(y)}{y^2} < 0$ holds for this specifications: while there is little tax evasion for lower and medium income levels – $e^*(y)$ varies between 0.01 and 0.27 for $y \leq 3$ – the very rich evade huge parts of their income – $e^*(y)$ peaks at 0.58 for $y = 6$.

Let income be distributed according to the following step-function

$$F(y) = \alpha \frac{\min\left(y - y^l; y^s - y^l\right)}{y^s - y^l} + (1-\alpha) \frac{\max\left(y - y^s; 0\right)}{\left(y^h - y^s\right)}, \tag{A.6}$$

with $y^l = \frac{1}{1000}$, $y^s = 1$, $y^h = 6$ and $\alpha = 0.3$. Note, that for this parameter values there holds $y^m < \bar{y}$, i.e. the median income is below the average income.

With this specifications, we can now compute $x(y)$ respectively $\bar{x}$. From Proposition 2.1 we know, that in this example the median income receiver is also pivotal. Hence, $x(y^m) = \hat{x}$. A comparison of the decisive voter's taxed income and the average income then shows, that $\hat{x} > \bar{x}$. The voting equilibrium in this example is characterized by an under-provision of public goods, despite an income distribution with $y^m < \bar{y}$ and a monotonically increasing taxed income $x(y)$.

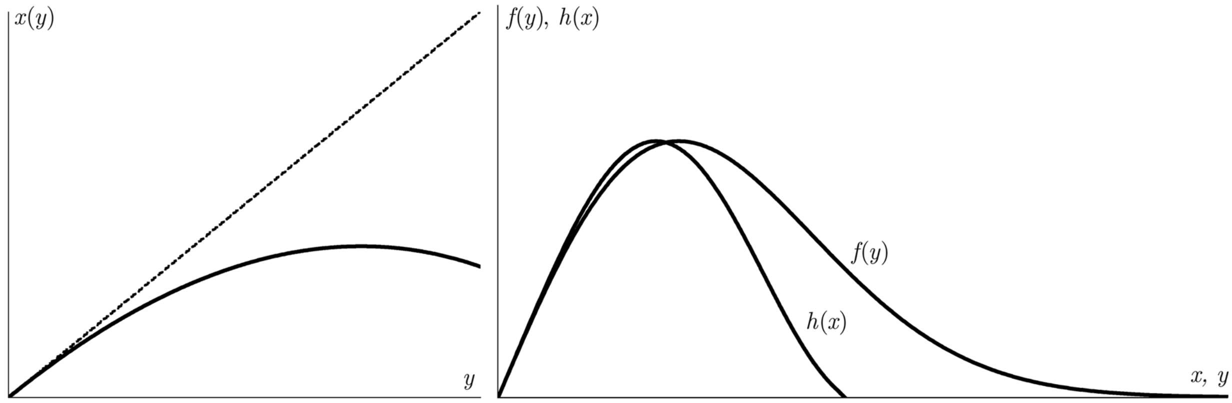

Figure 3: Distribution of True and Taxed Income

Example 2. Let us consider now an example where tax evasion follows the pattern specified in Proposition 2.2. We use the same evasion costs as in (A.5). The policy parameters are set at $p = 0.05$, $s = 5$ and $\tau = 0.35$. The left panel shows the resulting pattern of taxed income. As compared to the example from above, the punishment rate is now lower. Therefore, evasion is now more widespread. Moreover, $x(y)$ is now decreasing for the very rich as in Figure 1 (compare Proposition 2.2).

The income distribution is now given by a Weibull-distribution ($\mu = 0$, $\alpha = 2$, $\beta = 1.75$ with a truncation at $y^h = 6$). On the right panel of Figure 3 we plotted the density function $f(y)$ corresponding to our Weibull-distribution. The density function $h(x)$ stems from the distribution of taxed incomes $H(x)$ in this example. While there holds $y^m < \bar{y}$, the pattern of evasion underlying the shape of $x(y)$ transforms the income distribution into a distribution of taxed incomes, which is approximately symmetric. The numerical example shows that indeed $\hat{x} > \bar{x}$ holds. Hence, majority voting again results in an under-provision of public goods.

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