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Welfare Implications  
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## Abstract

A benchmark result in the political economy of taxation is that majority voting over a linear income tax schedule will result in an inefficiently high tax rate whenever the median voter has a below average income. The present paper examines the role of tax avoidance for this welfare assessment. We find that the inefficiency in the voting equilibrium is the lower, the higher the average level of tax avoidance in the economy, or equivalently, the lower the median voter's amount of avoidance. The result holds for endogenous avoidance and labor choice and, under certain conditions, for an endogenous enforcement policy.

*JEL classification:* H26; D72; D6.

*Keywords:* Tax avoidance; welfare analysis; majority voting; median voter equilibrium.

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# 1 Introduction

Income tax avoidance looms large. For the U.S. the income tax gap is estimated at a total of \$ 345 billion – more than 15 percent of the actual tax liability (Slemrod, 2007). Lang et al. (1997) suggest that tax avoidance in Germany accounts for a loss of one third of income taxes paid. They further show that avoidance activities are quite heterogonously allocated among the population. As a result, the distribution of true incomes differs substantially from the distribution of taxed incomes (see also Johns and Slemrod, 2008). When it comes to redistributive taxation, conflicting interest not only emerge between the rich and the poor but also between those who avoid taxes and those who do not.

Despite the apparent economic significance, a large part of the political economy analysis of taxation neglects avoidance behavior. Only a few recent contributions consider the implications of tax evasion and avoidance on voting over taxes (Barbaro and Suedekum, 2009; Borck, 2009; Traxler, 2009). However, none of these papers studies the role of tax avoidance for the welfare assessment of the voting outcome. The present study aims to close this gap in the literature. Building on one of the cornerstones of the political economy of taxation – the result that, whenever the median voter has a below average income, majority voting over linear income tax schedules will result in an inefficiently high tax rate – we examine whether tax avoidance will aggravate or mitigate the inefficiency.

Our analysis proceeds as follows. First, we introduce a model of tax avoidance in the spirit of Slemrod (1994). Individuals decide on legal but costly activities that minimize their tax liability. For instance, taxpayers might shift income into untaxed fringe benefits, into preferentially-taxed capital gains, or into the future (e.g., via pension plans) (Slemrod and Yitzhaki, 2002). Taking labor supply and tax enforcement activities as exogenously given, section 2 studies majority voting over a linear income tax schedule with endogenous tax avoidance. We show that the median voter theorem is applicable and that the decisive voter is the taxpayer with the median taxed income rather than the median true income. This replicates similar results in Roine (2006), Borck (2009) and Traxler (2009).

We then compare the linear income tax scheme that wins majority voting with the welfare-optimal tax policy (section 3). One obtains the analogue to the well-known benchmark in the voting literature: whenever the median voter’s taxed income is below the average taxed income, the political process will result in an inefficiently high tax rate. The political inefficiency will be

the smaller, however, the higher the average level of tax avoidance is in the economy. The intuition behind this observation is quite simple: keeping the median voter's tax avoidance constant, a higher amount of avoidance reduces the social costs from increasing the tax rate. With more avoidance, the gap between the marginal costs of taxation considered by the planner and the decisive voter will become smaller. An increase in avoidance therefore brings the second-best tax rate closer to the tax rate selected by the voters. One can derive an equivalent statement for the pivotal taxpayer. The lower the median voter's amount of tax avoidance, the smaller is the political inefficiency. The less the pivotal taxpayer avoids, the higher are her marginal costs from increasing the tax rate. This induces an incentive to vote for 'too low taxes', which works into the opposite direction as the inclination to vote for 'too high taxes' that derives from a below average true income.

These findings have several implications. First, we note that a sufficiently high level of tax avoidance may turn a right-skewed income distribution into a left-skewed distribution of taxed incomes. This would imply that majority voting results in an inefficiently low tax rate. Second, the inefficiency in the voting equilibrium will be smaller under tax avoidance patterns where the rich and – especially for a more concave social welfare function – the poor engage more heavily in avoidance than the middle class. While the first observation is mainly of theoretical interest – the observed distribution of taxed income is typically skewed to the right in modern economies (Gottschalk and Smeeding, 1997) – the latter scenario finds ample empirical support (Cox, 1984; Fratantuono, 1986; Johns and Slemrod, 2008).

Section 4 studies several extensions of the basic analysis. We first demonstrate, that our results hold with an endogenous labor choice. Next we show that the analysis can be generalized from legal avoidance to the case of illegal tax evasion. Once we endogenize the level of tax enforcement, however, our findings only hold under certain assumptions on individuals' avoidance technology. The reason for this restriction is related to the result from Slemrod (1994), who shows that the optimal progressivity of the income tax depends on the level of enforcement. In our case, the second-best tax policy as well as the voting outcome depend on the extent of tax enforcement. In turn, the impact of tax avoidance on the welfare properties of the voting equilibrium relies on the endogenous enforcement policy.

Our analysis links the literature on tax avoidance with the classical political economic work on voting over taxation (Romer, 1975; Roberts, 1977; Meltzer and Richard, 1981). As noted above, there are only a few contributions studying similar problems. Borck (2009) considers tax evasion and voting over redistribution for risk-averse taxpayers. Roine (2006) studies majority voting on

taxes when agents can make a discrete avoidance decision. Traxler (2009) introduces a reduced-form model of tax evasion that generalizes the results from Roine (2006) and Borck (2009). The main lesson from these contributions is that tax evasion and avoidance drives a wedge between the ranking of true and taxed income. In turn, this can shift the position of the decisive voter away from the median income receiver which implies unusual patterns of redistribution (e.g., an ‘ends against the middle’ conflict). None of these papers, however, addresses the welfare implications of tax avoidance. While there exists a growing literature on the welfare consequences of evasion and avoidance and its role for the optimal income taxation – see Cremer and Gahvari (1994, 1996), Slemrod (1994) and the more recent work by Kopczuk (2001) and Chetty (2009) – the present paper has a different focus. Instead of providing a general welfare analysis of tax avoidance, we study its consequences for the welfare assessment of the political economy outcome. Our analysis thus focusses on the link between avoidance and the political inefficiency introduced by the voting process. Hence, the welfare analysis presented here is novel in the literature.

## 2 Majority voting and tax avoidance

The economy is represented by a continuum of taxpayers with unit mass. Each taxpayer has an exogenous income  $y$  which is distributed according to a cdf  $F(y)$ . (Section 4 discusses the case of endogenous labor supply.) Income is taxed at rate  $t$ , however, taxpayers can engage in costly activities that reduce the tax liability by the amount  $a$ . The non tax-deductible costs for avoiding taxes are given by  $K(a, e, y)$ . Next to  $a$  and  $y$ , these costs also depend on the government’s expenditures on tax enforcement  $e$ , which subsumes any costly activities that broaden the tax base. Avoidance costs are increasing and strictly convex in  $a$ ,  $K_a \geq 0$ ,  $K_{aa} > 0$ .  $K_{ay}$ , which reflects how marginal avoidance costs vary across income, may be locally positive or negative. In section 4, where we consider the endogenous choice of  $e$ , we will further assume that it is more costly to avoid taxes the higher the level of tax enforcement,  $K_e > 0$  and  $K_{ae} > 0$  for  $a > 0$ .

Preferences over consumption  $C$  are described by  $U(C)$ ,  $U' > 0 > U''$ . The taxpayer’s problem is

$$\max_{a, C} U(C) \quad \text{s.t.} \quad C = y + g - t(y - a) - K(a, e, y),$$

where  $g$  is a lump-sum transfer. Optimal avoidance  $a^*$  is characterized by the first-order condition<sup>1</sup>

$$K_a(a^*, e, y) = t. \quad (1)$$

The budget balancing transfer is given by tax revenues net of enforcement costs,

$$g(e, t) = t \int Z(y) dF - e = t \bar{Z} - e, \quad (2)$$

where  $Z(y) := y - a^*(y)$  captures the effectively taxed income of an agent with income  $y$ , avoidance  $a^*(y)$  and  $\bar{Z}$  denotes the average effective tax base in the economy.

Let us now turn to the voting process. An agent's most preferred tax rate is the solution to

$$\max_t U(C) \quad \text{s.t.} \quad C = y + g(e, t) - t(y - a^*) - K(a^*, e, y)$$

with  $g(e, t)$  as given by (2). Making use of the envelope theorem, we obtain the first-order condition

$$Z(y) = \frac{\partial g}{\partial t}. \quad (3)$$

The most preferred tax rate equalizes a taxpayer's marginal costs from a higher tax rate, given by  $Z(y)$ , with marginal benefits. Voters' preferences can be ranked according to their taxed income – the higher  $Z$ , the lower the preferred tax rate. The monotonicity of preferences in  $Z$  assures that the median voter theorem is applicable (see appendix), and the pivotal taxpayer is the one with the median level of  $Z(y)$ . Denoting the distribution function of  $Z = Z(y)$  by  $H(Z)$ , we arrive at

**Proposition 1** *The tax rate that wins majority voting is given by  $\hat{Z} = \partial g / \partial t$ , where  $\hat{Z}$  is the median level of taxed income in the economy,  $H(\hat{Z}) = 1/2$ .*

**Proof.** See appendix. ■

Proposition 1 characterizes the political equilibrium when tax avoidance is possible. The outcome is similar to the standard median voter result (Romer 1975; Roberts 1977; Meltzer and Richard 1981). The key difference is that the pivotal taxpayer is the agent with median taxed income  $\hat{Z}$  – which is not necessarily identical to the one with the median true income. As discussed in the literature, tax avoidance and tax evasion can drive a wedge between the ranking of true and

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<sup>1</sup>Corner solutions are excluded by assuming  $K_a(0, e, y) = 0$  and  $\lim_{a \rightarrow y} K_a(a, e, y) = \infty$ .

taxed income (Borck 2009; Roine 2006; Traxler 2009). As a results, this can shift the position of the decisive voter away from the median true income receiver. In our framework, the decisive voter may differ from the median income receiver if  $Z$  were non-monotonic in  $y$ , i.e., if taxed income were locally decreasing in income.<sup>2</sup> While this can give rise to unusual coalitions supporting an equilibrium (e.g. a coalition of rich and poor), the conditions for and the implications of such a non-monotonicity are closely discussed in Traxler (2009). Here we focus on assessing the welfare properties of the median voter equilibrium which hold independently of whether or not the median voter corresponds to the taxpayer with median true income.

### 3 Welfare Analysis

We compare this political outcome with the tax rate a planner would choose to maximize social welfare  $\int W[U(C(y, a^*(y)))]dF$ ,  $W' > 0 \geq W''$ . Taking into account taxpayers' avoidance behavior and the budget constraint, the planners' problem becomes

$$\max_t \int W[U(y + g(e, t) - tZ(y) - K(a^*(y), e, y))]dF \quad \text{s.t. (1) and (2).}$$

Making use of (1) and rearranging, we obtain the first-order condition

$$\int \psi(y) Z(y) dF = \frac{\partial g}{\partial t}, \quad (4)$$

$$\text{with } \psi(y) := \frac{W'[U(\cdot)]U'(\cdot)}{\bar{W}'\bar{U}'} \quad \text{and} \quad \bar{W}'\bar{U}' := \int W'[U(\cdot)]U'(\cdot) dF. \quad (5)$$

Denoting the left hand side of (4), the marginal social costs of increasing  $t$ , as  $\bar{Z}_\psi$ , the comparison with the majority voting outcome characterized in Proposition 1 yields the following result:<sup>3</sup>

**Proposition 2** *The median voter equilibrium is characterized by (a) an inefficiently high (b) an inefficiently low (c) the second-best tax rate iff (a)  $\hat{Z} < \bar{Z}_\psi$  (b)  $\hat{Z} > \bar{Z}_\psi$  (c)  $\hat{Z} = \bar{Z}_\psi$ , respectively.*

**Proof.** See appendix. ■

The proposition extends the standard result on the welfare properties of the median voter equilibrium to the case of tax avoidance. Consider first the case without avoidance and hence

<sup>2</sup>This would be the case if an income increase would be accompanied by a sufficiently strong increase in tax avoidance (driven by lower marginal avoidance costs,  $K_{ay} < 0$ ) such that the effectively taxed income  $Z$  would decline.

<sup>3</sup>We will call a tax *inefficiently* low [high], if it results in a lower [higher] tax rate as compared to the solution given by (4).



$Z(y) = y$ . For any income distribution where the median voter's income is below the average (welfare-weighted) income,  $\hat{y} < \bar{y}_\psi$ , the pivotal taxpayer faces marginal costs from taxation which are below the marginal social costs. The political equilibrium will be characterized by an inefficiently high tax rate. For the case with tax avoidance we get the same result as long as the decisive voter has a *taxed* income below the (welfare-weighted) average,  $\hat{Z} < \bar{Z}_\psi$  (case a). If the opposite holds true, i.e., if the decisive taxpayer has a taxed income  $\hat{Z} > \bar{Z}_\psi$  (case b), majority voting results in an inefficiently low tax rate. For  $\hat{Z} = \bar{Z}_\psi$  (case c), voting does not introduce any (further) inefficiency.

To analyze the role of tax avoidance for the welfare assessment of the voting equilibrium, it is useful to rewrite the condition for case (a) as

$$\bar{a}_\psi^* - a^*(\hat{y}) < \bar{y}_\psi - \hat{y}. \quad (6)$$

The left hand side of the condition captures the gap between the average (welfare-weighted) level of avoidance,  $\bar{a}_\psi^*$ , and the amount avoided by the pivotal taxpayer,  $a^*(\hat{y})$ . In the following, we will call this the 'avoidance gap'. The right hand side of (6) measures the gap between the average (welfare-weighted) income  $\bar{y}_\psi$  and a decisive voter's true income  $\hat{y}$ , the 'income gap'.<sup>4</sup> As long as the avoidance gap is smaller than the income gap, the political process will result in an inefficiently high tax rate.

To illustrate the intuition behind condition (6), consider an economy where the decisive taxpayer's true income coincides with the weighted mean,  $\hat{y} = \bar{y}_\psi$ . Without tax avoidance, no political inefficiency would arise from the voting process. However, if agents differ with respect to their avoidance behavior, this will drive a wedge between the social costs of increasing the tax rate and the costs considered by the pivotal taxpayer. Assume, for instance, that the median voter avoids less than the average,  $a^*(\hat{y}) < \bar{a}_\psi^*$ . She then faces marginal costs from increasing  $t$  which are above the marginal social costs. The left hand side of (6) would be positive and the condition would be violated – we would get  $\hat{Z} > \bar{Z}_\psi$  and therefore an inefficiently low tax rate. If the median voter would avoid more than the weighted average, condition (6) would be met and we obtain the opposite result.

Now turn to the scenario of a right-skewed income distribution with  $\hat{y} < \bar{y}_\psi$ , i.e., a case with a positive income gap. With tax avoidance varying along the income distribution ( $K_{ay} \neq 0$ ), the

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<sup>4</sup>As we do not rule out non-monotonicities in  $Z(y)$ , the income of the pivotal taxpayer does not necessarily equal the median income. Note further that  $Z(y)$  is non-injective if  $Z$  is non-monotonic. In this case, there could be several income levels  $\hat{y}_j$  and  $\hat{y}_k$ ,  $j \neq k$ , for which  $\hat{Z} = Z(\hat{y}_j) = Z(\hat{y}_k)$  holds. It is obvious, however, that (6) holds for any  $\hat{y}_k$ , as long as it holds for  $\hat{y}_j$ . Therefore we treat  $\hat{y}$  as if it always were unique.

left hand side of (6) will generally differ from zero. Whenever the decisive voter avoids less than the welfare-weighted average, the avoidance gap will be positive and tends to offset the political distortion that emerges for  $\hat{y} < \bar{y}_\psi$ . If the avoidance gap is larger than the income gap, condition (6) would be violated. Majority voting could then result in an inefficiently *low* tax rate – despite a distribution of true incomes with  $\hat{y} < \bar{y}_\psi$ . For the alternative scenario where the decisive voter avoids more than the average, the left hand side of (6) would be negative. The negative avoidance gap would further amplify the political inefficiency associated with the income gap. However, the empirical evidence discussed below suggests that this case is less plausible.

**Corollary 1** *The higher the average level of tax avoidance and the lower the median voter’s tax avoidance, (i) the lower will be the inefficiency introduced by majority voting for  $\hat{Z} < \bar{Z}_\psi$ , (ii) the higher will be the inefficiency introduced by majority voting for  $\hat{Z} > \bar{Z}_\psi$ .*

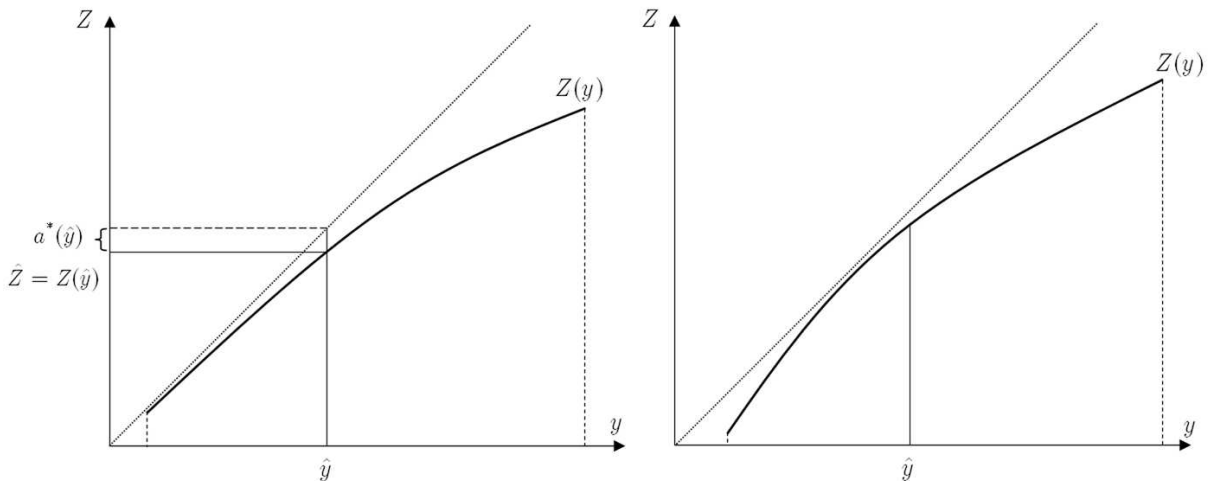
The intuition behind this observation is straightforward. Note first that the right hand side of (3) is identical to the right hand side of (4). The social planner and the voters thus consider the same marginal benefits from increasing the tax rate. All behavioral responses to taxation that shape the elasticity of the tax base – in particular, changes in tax avoidance (see (A.1) in the appendix) – are thus captured equally in the right hand side of (3) and (4). Hence, differences in the tax base elasticity do not impact the welfare assessment of the voting equilibrium. The inefficiency of the voting equilibrium, captured by  $|\hat{Z} - \bar{Z}_\psi|$ , only emerges from the difference in the marginal costs of increasing the tax rate considered by the pivotal taxpayer and the social planner, respectively. Note that the marginal social costs,  $\bar{Z}_\psi$ , are decreasing in avoidance  $\bar{a}_\psi^*$ . For case (i),  $\hat{Z} < \bar{Z}_\psi$ , where majority voting results in an inefficiently high tax rate, the political inefficiency is therefore the smaller, the higher the average (welfare-weighted) avoidance in the economy: the second-best tax rate will be closer to the tax that wins the elections. The opposite result applies when majority voting yields an inefficiently low tax rate: for case (ii), a higher level of average tax avoidance means that the political inefficiency is more pronounced.

Equivalent statements can be made for the avoidance behavior of the decisive voter. The less the pivotal taxpayer avoids, the higher are his marginal costs from a tax rate increase. This implies a stronger inclination to vote for ‘too low taxes’, which works into the opposite direction as the tendency to vote for ‘too high taxes’, that derives from a below weighted-average true income. In case (i), a decrease in the pivotal taxpayer’s avoidance will therefore mitigate the political inefficiency associated with majority voting.

**Redistributive Concerns** Corollary 1 holds independently of the curvature of the welfare function. However, redistributive concerns will of course affect the weight  $\psi(y)$  in (4) and therefore the level of  $\bar{y}_\psi$  and  $\bar{a}_\psi^*$ . It is straightforward to show that  $\psi(y)$  is strictly decreasing in income for  $K_y < 1 - t$ . Hence, the avoidance behavior of low income groups will get a larger weight than avoidance among the rich. With stronger social preferences for redistribution, the difference in weights will become more pronounced. Depending on the income–avoidance pattern this could either result in an increase or a decrease in  $\bar{a}_\psi^*$ . The point is best illustrated graphically.

Figure 1 plots the true income  $y$  (horizontal axis) against the taxed income  $Z(y)$  (vertical axis) for two different avoidance technologies. A vertical deviation from the 45 degree line captures the amount of avoidance for a given income level. In the example depicted in the left panel, avoidance is increasing in income such that avoidance is most prevalent among the top of the income distribution. In the second example, both the rich and the poor engage more actively in tax avoidance than the middle class taxpayer.<sup>5</sup>

Figure 1: Patterns of tax avoidance



Consider the special case of a linear social welfare function and say that the decisive voter avoids less than the (weighted) average in both examples, i.e.  $a^*(\hat{y}) < \bar{a}_\psi^*$ .<sup>6</sup> Neglecting redistributive concerns we thus have a positive avoidance gap. This does not necessarily imply, however, that

<sup>5</sup>The underlying avoidance technology in the first example satisfies  $K_{ay} \leq 0 \forall y$ . In the second example,  $K_{ay}$  is positive for low income levels and turns negative starting with an intermediate income. In both examples,  $Z(y)$  is monotonic in  $y$  such that the median income receiver corresponds to the agent with the median taxed income. See Traxler (2009) for a discussion of cases with non-monotonicities.

<sup>6</sup>We use the subscript  $\psi'$  to indicate the welfare weight avoidance level for a linear welfare function ( $W'' = 0$ ). In this case, the weighting term from (5) boils down to  $\psi'(y) = U'(C(y, a^*(y)))/\bar{U}'$ , which simply reflects the concavity of the utility function.

we get a positive avoidance gap for the case of a concave welfare function – in particular, for the scenario in the left panel. If the planner accounts for equity concerns, the amount of avoidance among the rich obtains a lower weight than the avoidance in the lower tail of the distribution. Thus, for the avoidance pattern in the left panel of figure 1, the avoidance gap will certainly be smaller when redistributive concerns are taken into account:  $\bar{a}_{\psi}^* < \bar{a}_{\psi'}^*$ . Hence, one might get  $\bar{a}_{\psi'}^* > a^*(\hat{y}) > \bar{a}_{\psi}^*$ , i.e., a positive avoidance gap for a linear but a negative avoidance gap for a concave welfare function. In contrast, for the scenario depicted in the right panel we might get a larger avoidance gap with redistributive concerns,  $\bar{a}_{\psi}^* > \bar{a}_{\psi'}^* > a^*(\hat{y})$ , if the welfare weights on low-income taxpayers' avoidance are sufficiently high.

The lessons to draw from these examples are clear-cut. A pattern of avoidance where taxpayers with intermediate incomes avoid less taxes than the poor and the rich, is more likely to result in a positive avoidance gap than a pattern with pronounced avoidance ‘in the middle’. Hence, a higher level of tax avoidance will be more effective in mitigating the political inefficiency obtained for  $\hat{Z} < \bar{Z}_{\psi}$  (case (i) of corollary 1), if the bulk of avoidance is concentrated among the ends of the income distribution. With a concave social welfare function, tax avoidance among low income groups is thereby particularly supportive to push this effect.

**Empirical Evidence** Given the importance of the avoidance-income pattern for the welfare properties of the political outcome, it is worth discussing empirical evidence on the distribution of tax avoidance. Little is known on the distribution of legal tax minimizing activities such as the usage of untaxed fringe benefits, tax-favored types of capital returns or the exploitation of tax loopholes (see section 5 in Slemrod and Yitzhaki, 2002). For other activities reducing the effective tax base, such as charity giving, it is hard to distinguish between intrinsically motivated and tax induced behavior. A common conjecture is that higher income receivers have access to more tax avoidance strategies. This view is supported by the evidence in Lang et al. (1997).

Slightly more is known about the distribution of illegal tax evasion.<sup>7</sup> It is argued that richer taxpayers also have better access to evasion technologies which are related to receiving unmatched income. Bloomquist (2003) reports, for instance, that middle-income taxpayers have the highest share – above 90% – of third party reported, matched income. Receiving unmatched income appears to be crucial, at least for tax evasion opportunities. Based on data from the IRS, the underreporting rate is estimated to be 54%, 8.5%, and 4.5% for income types subject to ‘little or no’, ‘some’, and

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<sup>7</sup>In the next section we discuss to which extent our results apply to the case of tax evasion.

‘substantial’ information reporting, respectively (Slemrod, 2007, p.30). It is thus not surprising that only 1% of wage and salaries but 57% of nonfarm proprietor income were not reported in 2001.

In a comprehensive analysis of micro data from the National Research Program, Johns and Slemrod (2008) show that misreporting of income (as a fraction of true income) is increasing in true income. This evidence supports a pattern as depicted in the left panel of figure 1. When refundable tax credits are taken into account, Johns and Slemrod document a U-shaped relationship between adjusted gross income and misreporting. Based on random audit data, Cox (1984) and Fratanduno (1986) also find a U-shaped relationship between income and evasion – with the smallest amount of evasion among taxpayers around the median income level. The latter findings lend support to the pattern on the right of figure 1.

## 4 Extensions

The analysis of the previous sections employed two strong assumptions. Individual incomes as well as the extent of tax enforcement were considered to be exogenously given. How robust are our results when we relax these assumptions? And to which extent do our results generalize to the case of illegal tax evasion rather than legal avoidance?

**4.1 Endogenous Labor Supply** The endogenous labor choice turns out to be irrelevant for our findings. Allowing for this additional behavioral response to taxation, one arrives at the same qualitative results as with a fixed income. The robustness of our findings is basically an implication of the fact that taxpayers’ behavior – which shapes the elasticity of the tax base – is captured in the right hand side of conditions (3) and (4). As discussed in the previous section, the expression is the same in both conditions. Thus, changes in the tax base elasticity that affect  $\partial g/\partial t$  do not alter the welfare assessment of the median voter equilibrium. This point is made explicitly in appendix C, which sketches the endogenous labor choice when taxpayers have heterogenous skill levels.

**4.2 Endogenous Enforcement** The assumption of an exogenously given tax enforcement is more crucial for our results. We therefore study an extension with an endogenous enforcement choice.

We focus on the case where  $e$  is set by a revenue maximizing authority.<sup>8</sup> The following timing of events is considered: First, the tax rate is determined by the political process or the social planner, second, the enforcement authority chooses the revenue maximizing level of enforcement and, finally, taxpayers decide on avoidance. With this timing, the enforcement authority sets  $e$  in order to maximize  $g(e, t)$  from (2), taking into account taxpayers' avoidance responses. The revenue maximizing policy,  $e^R$ , is implicitly defined by

$$-t \int_{y_l}^{y_h} \frac{\partial a^*(e^R, y)}{\partial e} dF = 1. \quad (7)$$

From (1) and  $K_{ae} > 0$  it follows that  $\partial a^*/\partial e < 0$ . Implicitly differentiating (7) and assuming  $\partial^2 a^*/\partial e^2 > 0$ , one obtains  $\partial e^R/\partial t > 0$ . The authority responds with an increase of enforcement to an increase in the tax rate. In this sense, the tax rate and tax enforcement are complementary.

Taking the authority's choice of  $e^R$  into account and substituting for (1), the most preferred tax rate for a taxpayer with income  $y$  is now given by

$$Z(y) + K_e(a^*(y), e^R, y) \frac{\partial e^R}{\partial t} = \frac{dg(t, e^R(t))}{dt}. \quad (8)$$

In addition to the first-order marginal costs from an increase in  $t$ , voters now face further costs that emerge from the endogenous increase in enforcement. With these additional costs of taxation, voters' preferences over  $t$  are no longer monotonic in  $Z(y)$ . The median voter theorem can nevertheless be applied if the left hand side of (8) is monotonic in  $y$ , i.e., if<sup>9</sup>

$$1 + \frac{\partial a^*}{\partial y} \left( K_{ae} \frac{\partial e^R}{\partial t} - 1 \right) + K_{ey} \frac{\partial e^R}{\partial t} > 0. \quad (9)$$

As discussed in appendix A, this condition assures that preferences over  $(g, t)$  are monotonic in income.

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<sup>8</sup>Qualitatively similar results are obtained for a welfare-maximizing choice of enforcement. However, the comparison with the result established above is more straightforward for a revenue maximizing policy. A further interesting extension would be to study voting over  $t$  and  $e$ . It turns out, however, that the problem has in general no Condorcet winner. A closer examination of the two dimensional voting problem (e.g., based on a structure-induced equilibrium approach; Shepsle, 1979) is beyond the scope of this paper and left for future research.

<sup>9</sup>Whenever  $K_{ay} \geq 0$ , then  $\partial a^*/\partial y \geq 0$ . The inequality will therefore hold under a mild (strict) constraint on  $K_{ey}$ , if the term in the round brackets of (9) is non-negative (negative). Whenever  $K_{ay} < 0$ , the inequality will be met under a mild (strict) constraint on  $K_{ey}$ , if the expression in the round brackets is negative (non-negative). Compare the discussion at the end of this subsection.

**Proposition 3** *Assume (9) is satisfied. With an endogenous, revenue maximizing choice of enforcement, the tax rate that wins majority voting is given by*

$$Z(\hat{y}) + K_e(a^*(\hat{y}), e^R, \hat{y}) \frac{\partial e^R}{\partial t} = \frac{dg(t, e^R(t))}{dt},$$

with  $F(\hat{y}) = 1/2$ .

**Proof.** See appendix. ■

In contrast to proposition 1, the new voting equilibrium requires monotonicity of preferences in true rather than taxed income. The pivotal taxpayer is thus always the one with median true income. We now compare this voting equilibrium with the welfare-maximizing tax policy. Following the same steps as above but accounting for the endogenous enforcement level,  $e^R(t)$ , the planner's first-order condition becomes

$$\int \psi(y) \left( Z(y) + K_e(a^*(y), e^R, y) \frac{\partial e^R}{\partial t} \right) dF = \frac{dg(t, e^R(t))}{dt}. \quad (10)$$

Denoting the condition's left hand side, the marginal social costs of increasing  $t$ , as  $\bar{z}_\psi$ , and the marginal costs faced by the median voter (the left hand side of (8) evaluated at  $\hat{y}$ ) as  $\hat{z}$ , we can state:

**Proposition 4** *With an endogenous, revenue maximizing choice of enforcement, the median voter equilibrium is characterized by (a) an inefficiently high (b) an inefficiently low (c) the second-best tax rate iff (a)  $\hat{z} < \bar{z}_\psi$  (b)  $\hat{z} > \bar{z}_\psi$  (c)  $\hat{z} = \bar{z}_\psi$ , respectively.*

**Proof.** The proof follows immediately from the proof of proposition 2. ■

The proposition is analogous to the one derived for exogenous enforcement expenditures. A welfare assessment of the political outcome requires to compare the marginal social costs with the median income receiver's costs of taxation, which now includes a term reflecting the endogenous adjustment in tax enforcement. Rearranging terms, we can write  $\hat{z} < \bar{z}_\psi$  as

$$\bar{a}_\psi^* - a^*(\hat{y}) - [\bar{\kappa}_\psi - \kappa(\hat{y})] \frac{\partial e^R}{\partial t} < \bar{y}_\psi - \hat{y}, \quad (11)$$

with  $\bar{\kappa}_\psi := \int \psi(y) K_e(a^*(y), e^R, y) dF$  and  $\kappa(\hat{y}) := K_e(a^*(\hat{y}), e^R, \hat{y})$ . As in (6), the condition contains the avoidance gap on the left and the income gap on the right hand side. The new term

on the left captures the difference between the marginal social and the median voter's marginal enforcement costs. This additional term, the 'cost gap', has a crucial impact on our analysis.

Recall that  $\partial e^R / \partial t > 0$  and note that the cost gap will be positive, if the social are above the median voter's marginal costs of raising  $e$ ,  $\bar{\kappa}_\psi > \kappa(\hat{y})$ . A positive cost gap means that the pivotal taxpayer considers lower second-order costs of raising  $t$  than the planner. This will work against any positive avoidance gap. The left hand side of (11), the sum of avoidance and cost gap, can nevertheless be positive but the conditions for this case are difficult to establish in general. In particular, the statement from corollary 1 does not immediately apply without further assumptions.

We have established earlier that the political inefficiency which emerges when the median voter has a taxed income below the welfare-weighted average ( $\hat{Z} < \bar{Z}_\psi$ ) is smaller, the less the median voter avoids and the higher the average avoidance level is. When tax enforcement is endogenous, this is not necessarily true. To see this, note that the cost gap as well as the avoidance gap are both decreasing in  $a^*(\hat{y})$  (recall that  $K_{ae} > 0$ ). The left hand side of (11) will be decreasing in the median voter's avoidance,  $a^*(\hat{y})$ , only if

$$K_{ae}(a^*(y), e^R, y) \frac{\partial e^R}{\partial t} < 1 \quad (12)$$

holds for  $y = \hat{y}$ . Thus, for a sufficiently small response of enforcement to taxes and for a sufficiently small increase of marginal avoidance costs in enforcement, a lower level of  $a^*(\hat{y})$  will still increase the left hand side of (11), thereby working against any positive income gap. When the condition holds for any  $y$ , this is sufficient to assure that the sum of avoidance and cost gap is also increasing in  $\bar{a}_\psi^*$ , the average weighted amount of avoidance.

**Corollary 2** *Assume that (9) and (12) are jointly satisfied. The higher the average level of tax avoidance and the lower the median voter's tax avoidance,*

- (i) *the lower will be the inefficiency introduced by majority voting for  $\hat{z} < \bar{z}_\psi$ ,*
- (ii) *the higher will be the inefficiency introduced by majority voting for  $\hat{z} > \bar{z}_\psi$ .*

Whenever the avoidance technology satisfies (9) and (12), we arrive at a qualitatively identical result as above. A higher level of average avoidance has two implications. It reduces the average tax base in the economy, thus lowering the marginal social costs of raising the tax rate. At the same time, the second-order costs from taxation from the endogenous response in tax enforcement will be higher. This latter effect tends to raise the marginal social costs. If (12) holds, the former



effect will dominate the latter. For case (i), a higher level of average avoidance thus moves the second-best tax rate closer to the median voter's most preferred tax rate. The opposite holds true for case (ii). In this case, more avoidance would push the second-best tax further away from the (inefficiently low) tax rate that wins majority voting. Similar as above, equivalent statements can be made for the pivotal taxpayer's amount of avoidance.

It is important to note that corollary 2 only holds under relatively restrictive conditions on the avoidance technology. This becomes obvious when (9) and (12) are combined to yield

$$\begin{aligned} 1 - \mu < K_{ae}(\cdot) \frac{\partial e^R}{\partial t} < 1 & \quad \text{for } \frac{\partial a^*(y)}{\partial y} > 0 \\ K_{ae}(\cdot) \frac{\partial e^R}{\partial t} < \min\{1, 1 - \mu\} & \quad \text{for } \frac{\partial a^*(y)}{\partial y} \leq 0 \end{aligned} \quad \text{with } \mu := \frac{1 + K_{ey}(\cdot) \frac{\partial e^R}{\partial t}}{\partial a^*(y) / \partial y}$$

If  $\partial a^*(y) / \partial y > 0$  (which requires  $K_{ay} < 0$ ), the numerator of  $\mu$  must be positive (i.e.,  $K_{ey} > -\frac{1}{\partial e^R / \partial t}$ ) to allow (9) and (12) to jointly hold. Otherwise, for  $\partial a^*(y) / \partial y \leq 0$  ( $K_{ay} \geq 0$ ), the condition can in principle hold for a positive or a negative  $\mu$ . If  $K_{ey} > -\frac{1}{\partial e^R / \partial t}$  and thus  $\mu < 0$ , condition (12) is already sufficient for (9) to hold. (Note that there exists a broad class of simple functions which jointly satisfy  $K_{ay} \geq 0$  and  $K_{ey} \geq 0$  (e.g.  $K(\cdot) = a^2 ey / 2$ .)

**4.3 Avoidance versus Evasion** Finally, let us examine whether the results from the previous section can also be interpreted in terms of illegal tax evasion rather than legal avoidance. Consider the following evasion costs  $\tilde{K}(\cdot) := p ast + k(a, y)$ , where  $p$  represents the chance of an audit,  $ast$  is the fine imposed on evading  $at$  taxes and  $k(\cdot)$  denotes transaction costs of concealing income.<sup>10</sup> Assuming risk neutrality, the taxpayer's problem becomes

$$\max_a C = y + g - t(y - a) - p ast - k(a, y)$$

and the optimal evasion  $a^*$  is given by

$$k_a(a^*, y) = t(1 - ps), \tag{13}$$

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<sup>10</sup>This function  $\tilde{K}(\cdot)$  can be derived from a framework where individual consumption is given by  $C_+ = (1 - t)y + at + g - k(\cdot)$  if evasion remains undetected and  $C_- = (1 - t)y - at(s - 1) + g - k(\cdot)$  in case of detection, where  $s > 1$  is the fine rate and we assume  $ps < 1$ .

where  $ps < 1$ . The condition has a similar structure as the one from (1). Making use of the envelope theorem, the taxpayer's most preferred tax rate is implicitly given by

$$Z'(y) = \frac{\partial g}{\partial t}, \quad (14)$$

with  $Z'(y) := y - a^*(y)(1 - ps)$ . The pivotal taxpayer is now the agent with median level of  $Z'(y)$ ,  $\hat{Z}'$ . The welfare properties of the voting equilibrium are characterized by the difference between  $\hat{Z}'$  and the welfare weighted average of  $Z'$ . One arrives at the following condition for an inefficiently high tax rate:

$$(1 - ps) (\bar{a}_\psi^* - a^*(\hat{y})) < \bar{y}_\psi - \hat{y}. \quad (15)$$

The intuition behind this condition is analogous to the one from (6). The fact that the left hand side of (15) captures the gap in concealed income net of expected fines rather than the avoidance gap alters the analysis only quantitatively.<sup>11</sup>

Admittedly, this result is derived in a strongly simplified model of tax evasion. If we would allow for risk aversion and consider a more general structure of fines, the comparison of avoidance and evasion becomes less clear. Typically, (i) one requires additional constraints to assure the applicability of the median voter theorem and, similar as in Section 4.2, (ii) one might obtain an additional term in (15) that reflects the differences in the marginal impact of the tax rate on the fine. However, the basic mechanism behind corollary 1 and 2 would nevertheless be at work.

## 5 Conclusion

This paper has studied the role of tax avoidance for the welfare assessment of majority voting over a linear income tax schedule. Taxpayers differ with respect to their true income as well as their endogenous level of avoidance. Hence, there are two layers of heterogeneity which can drive a wedge between the tax rate preferred by the median voter and the welfare-optimal policy. We found that, for a right-skewed distribution of true incomes, a higher level of tax avoidance mitigates the inefficiency in the voting equilibrium. The result is particularly relevant for the empirically plausible case where taxpayers on both ends of the income distribution engage more intensively

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<sup>11</sup>The revenues collected from auditing taxpayers would of course enter (2) and thus  $\partial g/\partial t$ . However, since this term equally appears on the right hand side of conditions (3) and (4), neither the distinction between tax evasion and tax avoidance nor the distinction between individual costs that generate revenues, *past* in our case, and purely wasteful costs,  $k(\cdot)$ , does affect the results from proposition 2 and corollary 1. See Chetty (2009) for a related discussion on these different types of cost.

in tax minimizing behavior than the middle class. Given the magnitude of tax avoidance, this argument seems to deserve more attention in the political economics of taxation.

Our framework may serve as a starting point for several fruitful extensions. One could include an occupational choice decision in the model, which would allow to endogenize heterogeneous avoidance costs. Such an extension would also provide a framework to study the extent to which tax authorities should concentrate their enforcement activities on different occupational and different income groups, respectively. With two layers of heterogeneity – heterogeneous incomes and heterogeneous tax avoidance – tax enforcement becomes crucial for horizontal and vertical equity considerations (Kopczuk, 2001). The analysis presented in this paper points to potential congruences and conflicts between redistributive targets and allocative costs of tax enforcement within a political economic framework.

From an empirical perspective, it would be interesting to compare the magnitude of the gap between the median and the mean income for the observed, taxed income as well as for the hypothetical case without any tax avoidance or evasion. While the obvious difficulties to measure tax minimizing behavior severely complicate this task, the data on the distribution of taxed and true income used by Johns and Slemrod (2008) seem to be a good starting point. Such an analysis would also allow to address the implications of evasion and avoidance for the optimal tax rate as recently pointed out in Chetty (2009).

# Appendix

## A. Second-order and single-crossing conditions

From (2) we obtain

$$\frac{dg(t, e^R(t))}{dt} = \bar{Z} - t \int \left( \frac{\partial a^*}{\partial t} + \frac{\partial a^*}{\partial e} \frac{\partial e^R}{\partial t} \right) dF - \frac{\partial e^R}{\partial t} \quad (\text{A.1})$$

and the second-order condition

$$\begin{aligned} \frac{d^2g(t, e^R(t))}{dt^2} &= -2 \int \left( \frac{\partial a^*}{\partial t} + \frac{\partial a^*}{\partial e} \frac{\partial e^R}{\partial t} \right) dF - t \int \left\{ \frac{\partial^2 a^*}{\partial t^2} + 2 \frac{\partial^2 a^*}{\partial t \partial e} \frac{\partial e^R}{\partial t} + \frac{\partial^2 a^*}{\partial e^2} \left( \frac{\partial e^R}{\partial t} \right)^2 \right. \\ &\quad \left. + \frac{\partial a^*}{\partial e} \frac{\partial^2 e^R}{\partial t^2} \right\} dF - \frac{\partial^2 e^R}{\partial t^2} < 0 \end{aligned} \quad (\text{A.2})$$

where  $\partial e^R / \partial t = \partial^2 e^R / \partial t^2 = 0$  for an exogenously fixed enforcement level (sections 2 and 3). In this case,  $\partial^2 a^* / \partial t^2 > 0$  is sufficient for  $g$  to be concave in  $t$ . For the extension with endogenous enforcement expenditures, (A.2) is assumed to hold.

The second-order condition to (3) is

$$S := \frac{\partial a^*}{\partial t} + \frac{\partial^2 g(e, t)}{\partial t^2} < 0. \quad (\text{A.3})$$

While the first term is positive (as  $K_{aa} > 0$ ), the second is strictly negative. Given that the latter expressions dominate, the condition holds and voters' preferences are single-peaked. But even if the second-order condition would be violated, the median voter theorem can nevertheless be applied, as the single-crossing condition always holds (Gans and Smart, 1996). To see this, we derive the marginal rate of substitution,

$$\left. \frac{dg}{dt} \right|_{U=\bar{U}} = - \frac{\partial U / \partial t}{\partial U / \partial g} = Z(y).$$

Hence, voters' preferences over the  $(g, t)$  space are monotonic in  $Z(y)$ .

The second-order condition to (4) is given by

$$\int \left[ W''(\cdot) (U'(\cdot))^2 F^2 + W'(\cdot) U''(\cdot) F^2 + W'(\cdot) U'(\cdot) S \right] dF < 0 \quad (\text{A.4})$$

where  $F := -Z + \partial g / \partial t$  and  $S$  is given by (A.3). The condition holds due to (A.3) and  $W'' \leq 0$ ,  $U'' < 0$ .

The second-order condition for the voting problem with endogenous enforcement is

$$\frac{\partial a^*}{\partial t} + \frac{\partial a^*}{\partial e} \frac{\partial e^R}{\partial t} - K_{ae} \frac{\partial a^*}{\partial t} \frac{\partial e^R}{\partial t} - \left( K_{ee} + K_{ae} \frac{\partial a^*}{\partial e} \right) \left( \frac{\partial e^R}{\partial t} \right)^2 - K_e \frac{\partial^2 e^R}{\partial t^2} + \frac{d^2 g(t, e^R(t))}{dt^2} < 0. \quad (\text{A.5})$$

While the first term is strictly positive, the second, third and the last term are strictly negative (due to (A.2)). The sign of the remaining two terms are ambiguous in general. With  $K_{ee}$  sufficiently large and  $e^R$  being convex in  $t$ , the voting problem under endogenous enforcement will be concave. Even if concavity would be violated, voters' preferences over the  $(g, t)$  space are monotonic in  $y$ , if and only if (9) holds. This follows immediately from

$$\left. \frac{dg}{dt} \right|_{U=\bar{U}} = - \frac{\partial U / \partial t}{\partial U / \partial g} = Z(y) + K_e(a^*(y), e^R, y) \frac{\partial e^R}{\partial t}. \quad (\text{A.6})$$

Finally, the concavity of  $W(\cdot)$  and  $U(\cdot)$  together with (A.5) assures that the second-order condition to (10) is satisfied.

## B. Proofs

**Proof of Proposition 1.** Let  $\hat{t}$  denote the tax rate preferred by the agent with taxed income  $\hat{Z}$ . Consider a vote between  $\hat{t}$  and any tax rate  $t'$  with  $t' < \hat{t}$ . The higher tax rate  $\hat{t}$  will be clearly preferred by all agents with  $Z \leq \hat{Z}$ . Hence, the fraction of the population that prefers  $t'$  over  $\hat{t}$  is smaller than  $H(\hat{Z}) = 1/2$ . From this follows that no tax rate lower than  $\hat{t}$  can defeat  $\hat{t}$  by an absolute majority. The same argument implies that no tax rate higher than  $\hat{t}$  can win a majority vote against  $\hat{t}$ . ■

**Proof of Proposition 2.** Given that  $\hat{Z}$  and  $\bar{Z}_\psi$  are strictly positive, there has to hold  $\partial g / \partial t > 0$  for the voting equilibrium as well as for the welfare-maximizing tax rate. With (A.2), Proposition 2 then follows from the comparison of (3) with (4), with the first condition being evaluated at  $Z(y) = \hat{Z}$ . ■

**Proof of Proposition 3.** If (9) is satisfied, it follows from (A.6) that single crossing holds and voters' preferences are monotonic in  $y$ . Following the arguments applied in the Proof of Proposition 1 one immediately arrives at Proposition 3. ■

### C. Endogenous Income

Let us briefly consider the case of an endogenous income. An exogenously given skill (wage)  $w$  is distributed according to a cdf  $\Phi(w)$  and income is given by  $y = wL$ , where  $L$  denotes the labor supply. We follow Slemrod (1994), assuming  $K(a, e, w)$ . Preferences over consumption  $C$  and labor  $L$  are described by  $U(C, L)$  and the taxpayer's new problem is

$$\max_{a, C, L} U(C, L) \quad \text{s.t.} \quad C = wL + g - t(wL - a) - K(a, e, w)$$

Optimal avoidance  $a^*$  and labor supply  $L^*$  is characterized by the first-order conditions

$$t = K_a(a^*, e, w), \tag{A.7}$$

$$U_C(\cdot) w(1 - t) + U_L(\cdot) = 0 \tag{A.8}$$

(we focus on interior solutions). The budget balancing lump-sum transfer  $g$  becomes

$$g(e, t) = t \int Z(w) d\Phi - e,$$

where  $Z(w) = wL^*(w) - a^*(w)$  captures the effectively taxed income of an agent with skill  $w$ . The taxpayers' voting problem is

$$\max_t U(C, L) \quad \text{s.t.} \quad C = wL^*(w) + g(e, t) - t(wL^*(w) - a^*(w)) - K(a^*(w), e, w),$$

and the first-order condition is

$$U_C(\cdot) \left( -Z(w) + \frac{\partial g}{\partial t} \right) = 0, \tag{A.9}$$

where we have substituted for (A.7) and (A.8). Quantitatively, a difference to the model presented in the main text is that  $\partial g/\partial t$  now includes a term reflecting the labor elasticity which was absent before. Qualitatively, however, we get the same result as in the main text. From the analysis of the model with exogenous income it follows that voters' preferences are monotonic in  $Z(w)$ . The median voter theorem is applicable and the voting equilibrium is characterized analogously to the one from Proposition 1. It is straightforward to show that the welfare analysis equally extends to the case of endogenous labor supply.

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