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The political economics of redistribution, inequality and tax avoidance

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Abstract A central result in the political economy of taxation is that the degree of redistribution is positively linked to income inequality. However, empirical evidence supporting such a relationship turns out to be mixed. This paper shows how the different empirical reactions can be rationalized within a simple model of tax avoidance and costly tax enforcement. By focusing on structure-induced equilibrium in which taxpayers vote over the size of the income tax *and* the level of tax enforcement, we show that more inequality may well reduce the extent of redistribution, depending on two opposing effects: the standard political effect and a negative tax base effect working through increases in the average level of tax avoidance and the share of enforcement expenditures in total tax revenue.

Keywords Tax avoidance · Voting · Redistribution

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1 Introduction

The early theoretical literature on the political economy of taxation has established a positive relationship between income inequality and the extent of income redistribution (Romer 1975; Roberts 1977; Meltzer and Richard 1981). However, subsequent empirical

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evidence regarding this link remains inconclusive: whereas Meltzer and Richard (1983) find evidence in favor of a negative relation between the mean to median income ratio and redistribution, the findings of more recent studies point to the opposite conclusion (Rodriguez 1999; Kenworthy and McCall 2008; Georgiadis and Manning 2012).[1] According to these studies, a rise in income skewness is often accompanied by a cut-back in the welfare state. The aim of this paper is to rationalize these opposing findings within a simple model of tax avoidance and costly tax enforcement.

Both legal tax avoidance and the costs of taxation are economically significant. According to Roine (2006), the size of tax avoidance amounts to approximately 2 % of GDP in the United Stats and between 2 and 4 % in Denmark and Sweden. Similarly, for Germany, the revenue loss equals one-third of all income taxes actually paid, corresponding to about 7 % of GDP (Lang et al. 1997).[2] Regarding the costs of taxation, Evans (2003) notes that taxpayers' compliance costs are typically somewhere between 2 and 10 % of total revenue while administrative costs are around 1 % of total revenue.[3] Besides the economic significance, the relevance of tax avoidance for the political problem has recently been emphasized by Roine (2006) and Traxler (2012).[4] Specifically, when it comes to redistributive taxation, tax avoidance activities may not only give rise to atypical coalitions supporting higher taxes ('ends against the middle') but also will affect the welfare properties of the voting outcome. However, none of these papers explicitly addresses the relation between inequality and redistribution in the context of tax avoidance. Furthermore, the costs of taxation and enforcement have mostly been neglected in these models.[5] To close these gaps in the literature is the aim of the present paper.

We consider a simple model in which individuals may reduce their tax liabilities by engaging in costly and riskless tax avoidance activities. Examples of such activities are (i) lowering cash compensations in favor of larger fringe benefits, stock options or future pensions, (ii) reorganizations of business structures in order to shift profits from the individual to the corporate tax base, (iii) shifting of ordinary income into tax-favored capital gains but also (iv) outright tax evasion, e.g., by transferring income to off-shore accounts (Slemrod and Yitzhaki 2002; Piketty et al. 2014).[6]

[1] See Borck (2007) for a survey and further references and Strulik (2007) for a critical review of cross-sectional studies that find both supporting and contradicting evidence regarding a positive relationship between income inequality and redistribution.

[2] See also Slemrod (2007), who estimates that the US income tax gap in 2001 amounts to a total of $345 billion, which equals more than 15 % of the estimated actual tax liability.

[3] Similarly, Sandford et al. (1989) and OECD (2013) highlight the economic significance of these costs relative to other public costs.

[4] See also Borck (2004), Borck (2009) and Traxler (2009b) for models with illegal tax evasion instead of legal avoidance.

[5] See Traxler (2012) for an exception. His analysis, however, focuses on the welfare implications when there is sequential majority voting over enforcement and taxes, and does not explicitly consider the relationship between income inequality and redistribution. By contrast, as will be further explained below, our paper focuses on structure-induced equilibrium rather than sequential majority voting. In Sect. 4.5, however, we also study the case where enforcement is set by the government, which in turn brings the analysis closer to the one in Traxler (2012).

[6] It is important to note that our results are not limited to the case of tax avoidance. Rather, as shown in Online Appendix A, they readily carry over to the case of tax evasion. Hence, our model can as well be interpreted as a reduced form analysis of risky evasion activities (Cowell 1990). More precisely, Cowell (1990) shows how the standard portfolio selection approach to tax evasion can be reconciled with the one adopted in the present paper, in which a so-called cost-of-concealment function is specified a priori. However, neither Cowell (1990) nor the aforementioned papers about tax evasion explicitly consider the relationship between income inequality and redistribution in the politico-economic context, which is the aim of the present paper.

The particular contribution of the present model is twofold. First, we explicitly account for the costs of tax enforcement.[7] Second, and in contrast to most of the existing literature, we study majority voting over a linear income tax schedule *and* the level of tax enforcement when avoidance is endogenous. Hence, the voting space is two-dimensional implying that the existence of a Condorcet winner of the majority voting game is not guaranteed. To deal with this characteristic of the game, we make use of the concept of structure-induced equilibrium (Shepsle 1979).

The model introduces a novel mechanism based on complementarities between policy instruments which may help explain the opposing empirical findings on the relationship between income inequality and redistribution. Specifically, we show that for a given level of tax enforcement, the degree of income redistribution increases with inequality in line with the predictions of the standard model. This is the well-known direct or 'political effect'. However, endogenizing the level of tax enforcement introduces an additional effect in the form of changes in the tax base which tend to reduce redistribution. This 'tax base effect' affects the political outcome through two separate channels: First, if an increase in income inequality implies a higher preferred tax rate by the poorer median voter, the tax base will shrink as average tax avoidance increases. Second, the share of enforcement expenditures in total tax revenue rises as low income taxpayers vote for a higher level of tax enforcement to increase the effectiveness of the new tax rate. However, since tax enforcement is costly, net tax revenues, and so the possible amount of governmental transfers financed by a given level of taxation will decline. The (standard) political effect and the tax base effect are thus working in opposite directions. Consequently, the model predicts that an increase in income inequality implies less redistribution if, and only if, the tax base effect dominates the political effect.

Recent empirical evidence documents a negative relationship between income inequality and the tax base, suggesting that the magnitude of the tax base effect is indeed economically relevant: Aizenman and Jinjarak (2012), for example, find that an increase in the Gini coefficient of inequality by 1 (in a scale of 0−100), is associated with a lower tax base of 2 % of GDP. Similarly, using a panel of 17 OECD countries between 1975 and 2005, Milasi (2013) reports evidence of a negative relationship between the concentration of income at the top and budget revenues.[8] Furthermore, Besley and Persson (2014) document a strong negative correlation between the size of the informal sector and income taxation, and argue that a high degree of informality makes broad-based taxation of income extremely hard because of a large response of taxable income to tax rates and the implied loss of tax revenue when raising taxes.[9]

[7] Enforcement expenditures encompass any administrative costs that broaden the tax base (Traxler 2012). However, they may also be interpreted as reflecting real enforcement costs, such as auditing expenditures, when considering tax evasion activities. Clearly, the specific kind of any avoidance/evasion activity determines how costly it is for the government to enforce taxation. For example, costs can be extremely high when enforcement requires international cooperation (in case of international income shifting or off-shore tax evasion) or if lobbyism and political constraints prevent the government from effectively closing tax loopholes (such as the exemption for fringe benefits) and reforming the tax system.

[8] According to theory, however, outcomes should be affected by changes in the median to mean income ratio. More precisely, the Meltzer–Richard hypothesis states that, whenever the median voter's income is less than the mean income, the decisive median voter will support redistributive income taxation. Hence, a more uneven income distribution (i.e., a higher mean-to-median income ratio) is associated with higher taxes. Yet, different measures of income inequality tend to be correlated over time. Corcoran and Evans (2010), e.g., show that, in the United States, both the mean to median income ratio and the Gini coefficient increased quite uniformly over time from 1970 to 2000. See also Cowell (2009) for an extensive treatment of alternative approaches to measuring income inequality.

[9] See also the large literature on the taxable income elasticity surveyed by Saez et al. (2012), which typically finds large behavioral responses to tax changes by top income earners.

Our work relates to simple majority voting models that are widely used to capture political feedback effects, see, e.g., Alesina and Rodrik (1994) and Persson and Tabellini (1994), who argue that inequality depresses growth because anticipated redistributive taxation reduces the incentive to accumulate capital. Owing to the mixed empirical evidence on the Meltzer–Richard hypothesis, however, some studies have advocated the use of more sophisticated models of redistribution based on the behavior of politicians or special interest groups (Gouveia and Masia 1998). By contrast, the results of this paper suggest that the predictions of simple majority voting models remain valid, despite the inconclusive empirical evidence summarized above. Similar conclusions have been reached recently by Bredemeier (2014) and Freitas (2012). However, the explanations of these papers differ from ours: while Bredemeier (2014) proposes a standard majority-voting model with imperfect information,[10] Freitas (2012) studies the tax mix between direct and indirect taxes when individuals may evade taxation by supplying labor to an informal sector.[11] The present paper provides a complementary explanation based on behavioral responses and politico-economic consequences of tax avoidance and enforcement.

Our work also relates to the literature analyzing the effects of tax avoidance on income redistribution and the efficiency properties of majority voting outcomes over a linear income tax schedule (see Roine 2006; Traxler 2012). Our contribution relative to these papers lies in extending the majoritarian voting game to a bidimensional issue space such that individuals do not vote only over the tax schedule, but also over the level of tax enforcement. Hence, the focus of this paper is on structure-induced equilibria which have, for example, been studied by Conde-Ruiz and Galasso (2003, 2005), Bethencourt and Galasso (2008) and Nuscheler and Roeder (2013) in the context of inter- and intragenerational redistributive programs such as social security, early retirement or public health. Our model complements these papers by modeling the role of tax avoidance and enforcement and its determinants in politico-economic equilibrium. In particular, our analysis explicitly accounts for the costs of taxation and tax enforcement, an issue that has mostly been neglected in theoretical analysis.

The remainder of the paper is structured as follows. Section 2 describes the basic model. Section 3 sets up the voting game and Sect. 4 solves for the politico-economic equilibrium and analyzes its properties. Furthermore, Sect. 4 presents an example with specific functional forms to illustrate our main finding and provides an extension showing that our main results readily carry over to a framework in which enforcement is set by a revenue-maximizing government. Section 5 concludes. All proofs can be found in the Online Appendix.

2 The economy

Consider an economy that is populated by a mass-1 continuum of taxpayers with utility $U(c)$, $U' > 0 > U''$, where c denotes consumption. Each taxpayer has an exogenous income, y, distributed on the support $[\underline{y}, \overline{y}] \in \Re_+$ according to a cumulative density function (cdf) $F(y)$ with mean $\widetilde{y}$.

[10] Specifically, if an agent's preferred income tax rate depends on the *perception* of average rather than actual productivity, changes in income affect the income distribution by shifting voting power owing to income misperceptions in the voting game.

[11] Her findings, which are based on numerical simulations, point to a non-monotonic relationship between inequality and redistribution. See also Lee and Roemer (1999).

The government redistributes income equally among the total population through a constant income transfer which is financed by a linear personal income tax τ. However, taxpayers can reduce their tax liability by engaging in riskless but costly activities.[12]

The government knows the existence of those activities and uses a portion of the taxes collected to deter tax avoidance by financing a certain level of tax enforcement, e, which includes all costly activities that reduce the opportunities to avoid taxes and thus broaden the tax base. Thus, the (non-tax-deductible) costs of avoiding taxes, denoted by $K(a, e, y)$, depend on the amount of avoided taxes a, on individual income y and on the government's level of tax enforcement e. Following Traxler (2012), avoidance costs are increasing and strictly convex in a and e, that is, $K_a > 0$, $K_{aa} > 0$, $K_e > 0$, $K_{ee} > 0$ and $K_{ae} > 0$ for $a > 0$.[13] A taxpayer's budget constraint is given by

$$c = y - \tau(y - a) - K(a, e, y) + g, \tag{1}$$

where g denotes a lump-sum transfer.

Optimal avoidance, a^*, is characterized by

$$a^* : \quad \tau = K_a(a^*, e, y). \tag{2}$$

It is straightforward to show that the optimal level of avoidance is increasing in the tax rate, $da^*/d\tau > 0$, and decreasing in the enforcement level, $da^*/de < 0$.

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

$$g = \tau \int (y - a^*) dF - \phi(e) = \tau \bar{Z} - \phi(e), \tag{3}$$

where $\phi(e)$ denotes the amount of public revenues that the government needs to provide a tax compliance level e, $Z(y) = y - a^*(y)$ denotes the effectively taxed income of an agent with income y and avoidance $a(y)$ and; $\bar{Z}$ denotes the average effective tax base in the economy. Following Sandmo (1981) and Cremer and Gahvari (1994), we assume that $\phi' > 0$ and $\phi'' \geq 0$.[14]

Taxpayers' preference relations over taxes and enforcement expenditures are characterized by their indirect utility function:

$$V(\tau, e, g) = U(y - \tau(y - a^*) - K(a^*, e, y) + g). \tag{4}$$

3 The voting game

The personal income tax rate τ and the level of tax enforcement e are decided by the agents through a political system of majoritarian voting.[15] Individual preferences over the two issues are represented by the indirect utility function at Eq. (4). Notice that every agent has zero mass, and thus no individual vote could change the outcome of the election. Hence,

[12] See Online Appendix A for an extension to the case of tax evasion. There it is shown that the qualitative results hold equally in this case.

[13] Note further that K_{ay} may be positive or negative. Slemrod (2001), e.g., assumes that higher income makes avoidance less costly and therefore more attractive at the margin, i.e., $K_{ay} < 0$, which is consistent with empirical evidence in Lang et al. (1997).

[14] The assumption that the government incurs convex costs in order to ensure a certain level of tax compliance is in line with the literature on optimal taxation; see also Slemrod and Yitzhaki (1987).

[15] The description of the voting game follows Bethencourt and Galasso (2008).

we assume that individuals vote sincerely. The important characteristic of this majoritarian voting game is that the issue space is bidimensional, (τ, e), and thus an equilibrium may fail to exist. To deal with this feature, we analyze structure-induced equilibria, following Shepsle (1979), which reduces the game to a static issue-by-issue voting game.

To characterize the equilibria of this voting game, we apply the results in Shepsle (1979) to obtain sufficient conditions for a (structure-induced) equilibrium to exist. In particular, if preferences are single-peaked along every dimension of the issue space, a sufficient condition for (τ^*, e^*) to be an equilibrium of the voting game is that τ^* represents the outcome of a majority voting over τ, when the other dimension is fixed at its level e^*, and vice versa. However, even if preferences are not single peaked in each dimension, the existence of a structure-induced equilibrium is guaranteed if preferences satisfy the single-crossing property in each dimension (Donder et al. 2012). Such a voting equilibrium can be characterized by the following conditions:[16]

(i) There are two specialized committees having separate jurisdictions over tax rates and tax law enforcement. The first committee is in charge of setting the income tax τ while the second one sets the level of enforcement e.
(ii) Proposals can be amended only along the dimension that falls in the jurisdiction of each committee at a time (Jurisdictional Germaneness rule).
(iii) Each committee is constituted by the whole electorate.

Intuitively, these conditions ensure that the preferences of the electorate are perfectly represented by the government, that policy decisions are made by (perfectly representative) committees, and that each committee proposes the size of one specific policy instrument for a given level of the other (e.g., a certain level of τ for a given e and vice versa). Given the preferences of the median voter over each dimension, proposals can be viewed as the best responses (or reaction functions) of each committee. The structure-induced equilibrium is given by the intersection of these best response functions. Hence, the extensive form generating a structure-induced equilibrium can be considered as a situation in which votes over both policy instruments are cast simultaneously but separately over each dimension. In this sense, institutional restrictions on the way individuals or committees make proposals induce the stability of equilibria in multidimensional policy spaces (see also Shepsle and Weingast 1981).

4 Politico-economic equilibria

In this section, individual votes over each dimension of the issue space, τ and e, are examined issue-by-issue. Voters cast a ballot over τ, for a given level of e, and vice versa. For each dimension τ and e, we study if preferences are single-peaked or satisfy the single-crossing property. If preferences are single-peaked, we order votes of individuals on each dimension τ and e to identify the median vote, which, by Shepsle's (1979) theorem, represents the structure-induced equilibrium outcome of the voting game. If preferences are not single-peaked but satisfy the single-crossing property on the same policy space along each dimension, τ and e, Donder et al. (2012) have shown that any structure-induced equilibrium coincides with a component-wise ideal point of the median type.

[16] See Galasso (2008) and Nuscheler and Roeder (2013) for similar characterizations.

4.1 Voting on the tax rate and the enforcement level

Consider first voting over the personal income tax rate. For a given level of enforcement, e, a taxpayer with income y would choose her most preferred income tax rate $\tau(e)$ by maximizing her indirect utility (see Eq. (4)) with respect to τ. The next lemma characterizes the outcome of this vote.

Lemma 1 The most preferred tax rate by any type-y individual is

$$\tau(e): \quad Z(y) = \partial g/\partial \tau, \tag{5}$$

where $\partial g/\partial \tau = \bar{Z} - \tau \int \frac{\partial a^*}{\partial \tau} dF$.

The most preferred tax rate, $\tau(e)$, equalizes a taxpayer's marginal costs from an increase in the tax rate, $Z(y)$, with the marginal benefits from a higher lump-sum transfer. In Online Appendix B we show that if the function $Z(y)$ is monotonic in y, voters' preferences on τ can be ranked according to their taxed income and so, preferences on dimension-e satisfy the single crossing property.

It is now straightforward, for a given level of tax enforcement, to order every agent's vote over the tax rate and to identify the median voter's type. The median voter is the type-$y_{m\tau}$ taxpayer who divides the electorate in halves, namely the taxpayer with median taxed income. For a given level of enforcement, e, we identify her most preferred tax rate as $\tau_{m\tau}(e)$.

The above findings characterize the political equilibrium with endogenous tax avoidance and exogenous enforcement, which has received a lot of attention in the recent literature; see, e.g., Roine (2006) and Traxler (2012). The main insight relative to the standard median voter model is that the true median income receiver and the pivotal taxpayer may not necessarily coincide if tax avoidance is possible. This, in turn, may give rise to atypical coalitions supporting higher tax rates. In the following, however, we are interested in the effect of an increase in income inequality on the political equilibrium when both avoidance and enforcement are endogenous. Therefore, as will become clear below, we focus on the case in which the median voter equals the (true) median income receiver.

The level of tax enforcement chosen by a type-y taxpayer, given a personal income tax rate, $e(\tau)$, is characterized by the following lemma:

Lemma 2 The most preferred enforcement level by any type-y individual is

$$e(\tau): \quad K_e(a^*, e, y) = \partial g/\partial e, \tag{6}$$

where $\partial g/\partial e = -\tau \int \frac{\partial a^*}{\partial e} dF - \partial \phi/\partial e$.

The most preferred enforcement level, $e(\tau)$, equalizes a taxpayer's marginal costs from an increase in the level of enforcement, $K_e(a^*, e, y)$, with the marginal benefits from higher revenues, which translate into a larger lump-sum transfer. Similarly to the case of voting over taxes, if the function $K_e(a^*, e, y)$ is monotonic in y, voters' preferences on e can be ranked according to their taxed income and, so, preferences on dimension-e are single-crossing. We can then order the votes on the enforcement level according to the voters' types. The median voter is the low-income type-y_{me}, who divides the electorate in halves. For a given tax rate τ, we identify her most preferred level of tax enforcement as $e_{me}(\tau)$.

In the following, we focus on the case where both $Z(y)$ and $K_e(a^*, e, y)$ are monotonically increasing in y, as in Traxler (2012).[17] The latter condition is satisfied if

$$K_{ey} + K_{ae}\frac{\partial a^*}{\partial y} \geq 0, \tag{7}$$

which in turn requires that K_{ey} is not too negative and, as $K_{ae} > 0$, that avoidance is increasing in true income, i.e., $\partial a^*/\partial y > 0$. The latter assumption will hold if the costs of avoiding taxes are decreasing in true income, i.e., $K_{ay} < 0$, which is consistent with the analysis in Slemrod (2001) and the empirical evidence in Lang et al. (1997). Then, the median type is the same in both dimensions and corresponds to the median true income receiver, i.e., $y_{me} = y_{m\tau} = y_m$ and thus $\tau_{m\tau}(e) = \tau_m(e)$ and $e_{me}(\tau) = e_m(\tau)$.

Moreover, applying the implicit function theorem to Eqs. (5) and (6), we obtain the following comparative static results[18]

$$\frac{d\tau(e)}{dy} = \frac{1 - \frac{\partial a^*}{\partial y}}{\frac{\partial a^*}{\partial \tau} - \int (2\frac{\partial a^*}{\partial \tau} + \tau\frac{\partial^2 g}{\partial^2 \tau})dF} < 0 \tag{8}$$

$$\frac{de(\tau)}{dy} = \frac{K_{ey} + K_{ae}\frac{\partial a^*}{\partial y}}{K_{ee} + K_{ae}\frac{\partial a^*}{\partial e} - \frac{\partial^2 g}{\partial^2 e}} < 0. \tag{9}$$

Equation (8) resembles the well-known result of the standard median voter model (Romer 1975; Roberts 1977; Meltzer and Richard 1981), stating that individuals with higher income will prefer lower tax rates. Similarly, Eq. (9) shows that individuals with higher incomes will additionally prefer less tax law enforcement as marginal costs of enforcement are increasing with income.

Finally, by implicitly differentiating Eqs. (5) and (6), we obtain the following expressions for $d\tau/de > 0$ and $de/d\tau > 0$:

$$\frac{d\tau(e)}{de} = \frac{1}{SOC^\tau}\left(-\frac{\partial a^*}{\partial e} - \frac{\partial^2 g}{\partial e \partial \tau}\right) = \frac{1}{SOC^\tau}\left[-\frac{\partial a^*}{\partial e} + \int\left(\frac{\partial a^*}{\partial e} + \tau\frac{\partial^2 a^*}{\partial \tau \partial e}\right)dF\right] \tag{10}$$

and

$$\frac{de(\tau)}{d\tau} = \frac{1}{SOC^e}\left(K_{ae}\frac{\partial a^*}{\partial \tau} - \frac{\partial^2 g}{\partial \tau \partial e}\right) = \frac{1}{SOC^e}\left[K_{ae}\frac{\partial a^*}{\partial \tau} + \int\left(\frac{\partial a^*}{\partial e} + \tau\frac{\partial^2 a^*}{\partial \tau \partial e}\right)dF\right], \tag{11}$$

where SOC^τ and SOC^e are the second-order conditions (SOC) w.r.t. τ and e (see Online Appendix B). We know that $\partial a^*/\partial e < 0$, $\partial a^*/\partial \tau > 0$ and $K_{ae} > 0$. Hence, the first term in the squared brackets is positive in both equations whereas the second term under the integral will be negative, given that the first-order effect dominates. Consequently, the signs of both equations turn out to be ambiguous in general. However, the analysis of several simple examples for $K(.)$ suggests that the negative first-order effect dominates the

[17] It is straightforward to show that our qualitative results carry over to the case where $Z(y)$ is monotonically increasing and $K_e(a^*, e, y)$ is monotonically decreasing in y. The difference, however, is that richer individuals would then prefer a higher level of tax enforcement as marginal costs of enforcement are decreasing with income. As a result, we are left with an additional offsetting (rather than reinforcing) effect if income inequality increases; see the discussion after proposition 2.

[18] Note that the denominator in both expressions equals the second-order conditions for τ and e, which we assume to hold in the following. See Online Appendix B.

other terms in the squared bracket (cf. Traxler (2012, p. 8) and see also the example in Sect. 4.3). For this case, we get $d\tau(e)/de > 0$ and $de(\tau)/d\tau > 0$. Hence, there exist complementarities between both policy instruments. A higher enforcement level makes taxation more attractive as it increases the size of the individual transfer g. By the same argument, a higher tax rate increases the level of enforcement.

4.2 Characterization of politico-economic equilibria

Since preferences satisfy the single-crossing property on the same policy space in each dimension τ and e, we can now characterize the structure-induced equilibrium.

Proposition 1 Assume that both $Z(y)$ and $K_e(a^*, e, y)$ are monotonically increasing in y. Then, there exists a unique structure-induced equilibrium (τ^*, e^*), such that $\tau^* = \tau_m(e^*)$ and $e^* = e_m(\tau^*)$.

The above proposition characterizes a majority voting equilibrium, wherein the taxpayer with the actual median income is pivotal in each dimension τ and e. The monotonicity assumptions on $Z(y)$ and $K_e(a^*, e, y)$ guarantee the existence of a unique Condorcet winner in each dimension, which in turn coincides with the unique structure-induced equilibrium (Donder et al. 2012). Given that such an equilibrium will always exist, we now proceed to analyze how the type of the median voter affects both the tax rate and the law enforcement level.

Totally differentiating Eq. (5) and (6) and evaluating the resulting expressions in equilibrium gives:

$$d\tau^*\left(-\frac{\partial \hat{a}^*}{\partial \tau}-\frac{\partial^2 g}{\partial^2 \tau}\right)+dy_m\left(1-\frac{\partial \hat{a}^*}{\partial y_m}-\frac{\partial^2 g}{\partial \tau \partial y_m}\right)+de^*\left(-\frac{\partial \hat{a}^*}{\partial e}-\frac{\partial^2 g}{\partial \tau \partial e}\right)=0 \tag{12}$$

$$de^*\left(\hat{K}_{ee}+\hat{K}_{ae}\frac{\partial \hat{a}^*}{\partial e}-\frac{\partial^2 g}{\partial^2 e}\right)+dy_m\left(\hat{K}_{ae}\frac{\partial \hat{a}^*}{\partial y_m}+\hat{K}_{ey_m}-\frac{\partial^2 g}{\partial e \partial y_m}\right)+d\tau^*\left(\hat{K}_{ae}\frac{\partial \hat{a}^*}{\partial e}-\frac{\partial^2 g}{\partial e \partial \tau}\right)=0, \tag{13}$$

where y_m denotes the income of the median voter and a hat indicates that the respective term is evaluated at the median voter's values of avoidance and true income (i.e., $\hat{K}_{ae}$, $\hat{K}_{ey_m}$, $\hat{K}_{ee}$ and $\hat{a}^*$). Solving the equation system (12), (13) for $\frac{d\tau^*}{dy_m}$ and $\frac{de^*}{dy_m}$ and simplifying terms by using (8), (9), and the corresponding expressions for $d\tau(e)/de$ and $de(\tau)/d\tau$ (10) and (11), these equations can be rewritten as follows:

$$\frac{d\tau^*}{dy_m}=\frac{\frac{d\tau}{dy_m}+\frac{d\tau}{de}\frac{de}{dy_m}}{1-\epsilon_\tau \epsilon_e} \tag{14}$$

$$\frac{de^*}{dy_m}=\frac{\frac{de}{dy_m}+\frac{de}{d\tau}\frac{d\tau}{dy_m}}{1-\epsilon_\tau \epsilon_e}, \tag{15}$$

where $\epsilon_\tau = \frac{d\tau}{de}\frac{e}{\tau}$ denotes the elasticity of the preferred tax rate with respect to the level of enforcement and $\epsilon_e = \frac{de}{d\tau}\frac{\tau}{e}$ the elasticity of the preferred level of enforcement with respect to the tax rate. Note that if $\epsilon_\tau \epsilon_e = 1$ or, equivalently, if the product of the slope of both functions $\frac{d\tau}{de}$ and $\frac{de}{d\tau}$ in (e, τ)-space is equal to one, either no interior equilibrium or a continuum of equilibria will exist. In this case, small changes in exogenous variables (e.g., the income distribution or the technology of tax enforcement) may exhibit relatively

extreme political outcomes, i.e., preferred levels of taxation and enforcement.[19] In the following, however, we focus on the more realistic case in which an *interior* political equilibrium exists.

Under the assumption that first-order effects dominate,[20] we obtain

Proposition 2 For a structure-induced equilibrium, (τ^*, e^*), of the voting game, an increase in income inequality (a reduction in the median voter's income) generates a new equilibrium, (τ^{**}, e^{**}), with two possible results:

$$(i) \quad \tau^{**} < \tau^* \wedge e^{**} < e^* \Leftrightarrow \epsilon_\tau \epsilon_e > 1 \tag{16}$$

$$(ii) \quad \tau^{**} > \tau^* \wedge e^{**} > e^* \Leftrightarrow \epsilon_\tau \epsilon_e < 1. \tag{17}$$

An increase in income inequality (a decline in y_m), affects the politically chosen tax rate through three different channels. First, the new median voter at τ-dimension decides to vote for a higher tax rate, i.e., $\frac{d\tau}{dy_m} > 0$. This is the standard political channel. Second, the poorer median voter at e-dimension chooses a higher level of tax enforcement, which in turn implies a higher tax rate, i.e., $\frac{d\tau}{de}\frac{de}{dy_m} > 0$, and thus reinforces the standard effect. Finally, a (potentially) offsetting effect arises from complementarities between both policy instruments. Following Lee and Roemer (1999), we label this 'the tax base effect', which affects the political outcome through two separate channels.[21] First, the higher level of taxation preferred by the new median voter at τ-dimension implies more tax avoidance and, thus, a smaller tax base. Second, as law enforcement is costly, the more vigorous efforts preferred by the new median voter along the e-dimension reduces net tax revenues and thus the amount of individuals' transfer.[22] As a result, these indirect effects are running counter to the direct effects and the net effect on the tax rate and tax enforcement generally is ambiguous.

The overall effect can be analyzed in terms of two elasticities: The elasticity of the most preferred tax rate with respect to the level of enforcement, ϵ_τ, and the elasticity of the most preferred enforcement level with respect to the tax rate, ϵ_e. Given that this product is

[19] Note that such extreme outcomes are very common in the politico economic literature on tax avoidance/evasion, see Roine (2006), Traxler (2009b) or Borck (2009). The intuition behind the non-existence of an interior equilibrium in the present model is that voters will prefer $\tau = e = 0$ if enforcement is very expensive and ineffective so that the costs of enforcement and increasing avoidance activities exceed additional tax revenues from higher taxes (in this case the required τ for supporting a desired level of e, would be higher than the τ that the median voter would choose, this is, $\bar{\tau}(e) > \tau(e)$ for all e and where $\bar{\tau}(e)$ is the inverse function of $e(\tau)$). By contrast, if enforcement is very cheap and effective in generating tax revenues and tax avoidance is thus low, voters will prefer $\tau = 1$ and the corresponding maximum level of enforcement (in this case $\bar{\tau}(e) < \tau(e)$ for all e).

[20] The latter assumption implies that $\frac{d\tau(e)}{de} > 0$ and $\frac{de(\tau)}{d\tau} > 0$.

[21] More precisely, Lee and Roemer (1999) consider a model in which the existence of incomplete credit markets implies that, in equilibrium, poorer households may prefer lower tax rates if they do not invest into private education and are thus unable to benefit from complementarities arising in the joint provision of public and private investments in education. Similarly, Freitas (2012) emphasizes the importance of the tax mix between direct and indirect taxes when there is an informal sector and individuals may evade taxation by supplying labor to this sector.

[22] Similarly, an increase in income inequality affects the politically chosen level of tax enforcement as follows: A poorer median voter prefers a higher level of enforcement, i.e., $de/dy_m > 0$, and a higher tax rate, which in turn makes enforcement more attractive, i.e., $\frac{de}{d\tau}\frac{d\tau}{dy_m} > 0$. These positive effects have to be balanced with the potentially offsetting tax base effect in order to determine the overall effect of rising inequality on the level of tax enforcement.

sufficiently large, then indirect effects outweigh the standard political effect, implying a lower tax rate. But what determines the sizes of these elasticities? From Eq. (10) and (11), it is clear that behavioral responses of tax avoidance to changes in tax enforcement and the tax rate play a decisive role in shaping ϵ_τ and ϵ_e. For example, if an increase in enforcement leads to a sharp reduction in the level of tax avoidance, i.e., if $|\partial a^*/\partial e|$ is large, ϵ_τ also will be large. The reason is that more enforcement increases the effectiveness of taxation in generating tax revenues. Similarly, ϵ_e will be large if $|\partial a^*/\partial e|$ is large and if $\partial a^*/\partial \tau$ is small. Then, a higher tax rate makes larger enforcement expenditures more attractive as the gain in terms of larger tax revenues exceeds the corresponding loss from more active tax avoidance.

Proposition 2 highlights a novel mechanism based on complementarities between policy instruments that works against the standard political channel and which may, in turn, imply a negative relationship between income inequality and the tax rate. The importance of such complementarities for the design of optimal tax systems has been emphasized by Slemrod and Kopczuk (2002). They argue that an administrative instrument is optimally set if its cost and the benefit of reducing distortions resulting from other tax instruments are balanced.[23] Similarly, the present analysis emphasizes the importance of such complementariness for the political economy outcome.

How do the predictions of our model relate to existing empirical evidence? In recent work, Aizenman and Jinjarak (2012) study the relationship between increasing income inequality and the tax base using data from 50 countries in 2007, in 2009 and in 2011. They find that an increase in the Gini coefficient of inequality by 1 (in a scale of 0–100), is associated with a lower tax base of 2 % of GDP. Similarly, Milasi (2013) uses a panel of 17 OECD countries between 1975 and 2005 to investigate the association between concentration of income at the top and budget deficits. His results provide evidence in favor of a positive relationship between the top 1 percent income share and budget deficits that is driven mainly by a strong negative effect of tax rates on tax revenues.[24] These findings generally support the existence of a tax base effect which turns out to be important for our results.

Further complementary evidence comes from the large behavioral responses among high income earners which have been emphasized in the literature on taxable income and behavioral elasticities, see, e.g., Kopczuk (2005) and Saez et al. (2012).[25] More precisely, the finding that behavioral responses (i.e., $\partial a^*/\partial \tau$) are larger for richer than for poorer individuals suggests that ϵ_e tends to be smaller in developed countries than in developing ones.[26] Furthermore, the size of ϵ_τ may be linked to the introduction of third-party reporting, which has been emphasized to be a key aspect of modern tax collection in developed countries (see, e.g., Kleven et al. (2011)). In those countries information processing is relatively complete and thus tax authorities are able to collect large amounts of tax revenue at relatively low costs (Kleven et al. 2009). In terms of our model, the introduction of third-party reporting (or, more generally, improvements in the efficiency and the organization of the tax system) implies a small elasticity of the preferred tax rate with respect to enforcement, ϵ_τ, as tax avoidance and

[23] See also Yitzhaki (1979) and Wilson (1989) for similar arguments.

[24] There is also a recent literature studying the impact of income inequality on the level of public debt, see, e.g., Azzimonti et al. (2014) and references therein. These studies find that governments choose higher levels of public debt when inequality increases.

[25] See also Besley and Persson (2014) who find a strong negative relationship between the size of the informal sector and the level of income taxation and argue that this is due to a large elasticity of taxable income which in turn implies a significant loss of tax revenue when raising taxes.

[26] This view is also supported by recent evidence in Kleven and Waseem (2013) who find that the majority of the population in Pakistan is relatively unresponsive to tax incentives.

evasion opportunities are reduced substantially and thus behavioral responses (i.e., $|\partial a^*/\partial e|$) have been found to be small. Hence, according to our model, we should on average observe a positive relationship between income inequality and the level of taxation in developed countries (or in those countries with an effective tax system), whereas the opposite relationship holds for developing countries in which the tax base effect is sufficiently dramatic (and elasticities ϵ_τ and ϵ_e are sufficiently large). In fact, it is well documented that a large informal sector (with many avoidance/evasion opportunities) on average coincides with more income inequality and lower GDPs and social spending (Mello and Tiongson 2006; Freitas 2012; Porta and Shleifer 2014).

Finally, a strong negative correlation exists between top tax rates and an increase in the top income share in a panel of OECD countries since 1960 (Piketty et al. 2014). While it might be tempting to argue that an increase in top income share (as a proxy for income inequality in general) lowers (top) tax rates, such conclusions have to be drawn with caution since any change in the tax system may also affect the income distribution. In fact, the empirical literature to date has not yet established causality in a satisfactory way (Atkinson et al. 2011). Hence, more empirical work is needed in order to properly address issues of causality and also to explicitly address the interrelations between tax enforcement strategies and political outcomes.[27]

4.3 An example with specific functional forms

In order to further illustrate the main result of proposition 2, we impose some structure on the model by assuming the following functional forms:

$$K(a,e,y) = \kappa\left(\frac{a^{1+\gamma}e^{1+\delta}}{y^{\gamma}}\right) \tag{18}$$

with $\kappa > 0$, $\gamma > 0$, $\delta > 0$ and[28]

$$\phi(e) = \frac{e^{1+\eta}}{1+\eta}. \tag{19}$$

Then, the optimal level of tax avoidance a^* is characterized by

$$a^* = \left(\frac{\tau}{\kappa(1+\gamma)e^{1+\delta}}\right)^{1/\gamma} y \tag{20}$$

and the budget-balancing transfer is given by tax revenues net of enforcement costs

[27] See, e.g., Casaburi and Troiano (2013) for a first attempt in this direction.

[28] Note that this specification assumes that a higher income makes avoidance less costly and therefore more attractive at the margin, i.e., $K_{ay} < 0$. The example could be extended, however, to allow for a specification implying $K_{ay} > 0$. This would not affect the qualitative results. Note further that we assume the cost function to be convex in e, so that every dollar spent on tax enforcement must be more productive than the one before. This would, e.g., be the case if tax enforcement is characterized by some administrative fixed costs. However, enforcement spillovers may also account for this pattern. The importance of such spillovers has, e.g., recently been emphasized by Rinke and Traxler (2011) and Galbiati and Zanella (2012).

$$g = \tau\widetilde{y}\left(1 - \left(\frac{\tau}{\kappa(1+\gamma)e^{1+\delta}}\right)^{1/\gamma}\right) - \frac{e^{1+\eta}}{1+\eta}. \tag{21}$$

A taxpayer's most preferred income tax rate and enforcement level are obtained from (1) and (2):

$$\tau(e) = \max\left\{0, \kappa(1+\gamma)e^{1+\delta}\left(\frac{\widetilde{y}-y}{\left(\frac{1+\gamma}{\gamma}\right)\widetilde{y}-y}\right)^{\gamma}\right\} \tag{22}$$

and

$$e(\tau) = \left[\left(\frac{1+\delta}{1+\gamma}\right)\left(\frac{\tau^{1+\gamma}}{\kappa(1+\gamma)}\right)^{1/\gamma}\left(\left(\frac{1+\gamma}{\gamma}\right)\widetilde{y}-y\right)\right]^{\frac{\gamma}{1+\gamma(1+\eta)+\delta}}. \tag{23}$$

The median voter is the low-income type-y_m, who divides the electorate in halves. As the number of votes for both variables is monotonic in income,[29] the median voter's type is the same in both dimensions. Consequently, proposition 1 can be restated as follows:

There exists a structure-induced equilibrium, (τ^*, e^*)*, of the voting game, such that:*

$$(A) \quad (\tau^* = 0, e^* = 0) \text{ if } y_m > \tilde{y}; \tag{24}$$

$$(B) \quad \left(\tau^* = \left(\left(m_1 m_2^{\frac{1}{\gamma}}\right)^{(1+\delta)} m_2^{1+\eta}\right)^{\frac{1}{\eta-\delta}}, e^* = \left(m_1 m_2^{\frac{1+\gamma}{\gamma}}\right)^{\frac{1}{\eta-\delta}}\right) \text{ if } y_m < \widetilde{y} \tag{25}$$

with

$$m_1 = \left(\frac{1+\delta}{1+\gamma}\right)\left(\frac{1}{\kappa(1+\gamma)}\right)^{1/\gamma}\left(\left(\frac{1+\gamma}{\gamma}\right)\widetilde{y}-y_m\right) \tag{26}$$

$$m_2 = \kappa(1+\gamma)\left(\frac{\widetilde{y}-y_m}{\left(\frac{1+\gamma}{\gamma}\right)\widetilde{y}-y_m}\right)^{\gamma}. \tag{27}$$

No redistributive program will exist if the median voter is a high-income taxpayer (case A). In this case, the level of tax enforcement will be zero as the median voter is not willing to support the system. If, however, a poorer median voter appears, then a redistributive program with a positive level of enforcement will emerge (case B).[30] In the following, we concentrate on the latter, empirically relevant case.

Proposition 2 can now be restated as follows:

For a structure-induced equilibrium, (τ^*, e^*)*, of the voting game, an increase in income inequality (a reduction in the median voter's income) generates a new equilibrium,* (τ^{**}, e^{**})*, with two possible results:*

[29] It is straightforward to show that the monotonicity conditions (the assumptions of proposition 1) are satisfied so that a unique equilibrium does exist.

[30] Note that the existence of an interior equilibrium further requires $\delta \neq \eta$ which we assume to hold throughout the remaining analysis.

$$(i) \quad \tau^{**} < \tau^{*} \wedge e^{**} < e^{*} \Leftrightarrow \ \delta > \eta \tag{28}$$

$$(ii) \quad \tau^{**} > \tau^{*} \wedge e^{**} > e^{*} \Leftrightarrow \ \delta < \eta. \tag{29}$$

With the specific functional forms, results will depend on the technology of producing tax enforcement, η, and the efficiency of tax enforcement in controlling tax avoidance, δ. Moreover, the elasticities ϵ_τ and ϵ_e are given by

$$\varepsilon_\tau = \ 1 + \delta \tag{30}$$

$$\varepsilon_e = \frac{1+\gamma}{1+\delta+\gamma(1+\eta)} \tag{31}$$

Hence, the lower is η, the larger is the elasticity of tax enforcement with respect to the administrative costs of maintaining a certain level of e, which in turn implies a larger elasticity of the preferred tax enforcement with respect to the tax rate, ϵ_e. Similarly, the higher is δ, the larger (in absolute terms) is the elasticity of tax avoidance activities with respect to the level of tax enforcement and thus the elasticity of the preferred tax rate with respect to the level of enforcement, ϵ_τ. Hence a small η and a large δ imply large indirect effects, this is, a large $\epsilon_\tau \epsilon_e$ and so, a substantial reduction in the tax base.[31]

As we have argued in the previous section, the existence of an efficient and well-organized tax system suggests a low level of δ as tax avoidance/evasion opportunities are very limited and thus behavioral reactions have been found to be small. This, in turn, is reflected in a relatively low elasticity of the preferred tax rate with respect to the enforcement level, ϵ_τ. Moreover, η will be large as it is very costly to further improve enforcement when starting from an initially high level, which, in turn, implies a low elasticity of the preferred enforcement with respect to the tax rate, ϵ_e.

Figure 1 provides a graphical illustration of our results. For both cases (i) and (ii) we first plot the initial reaction functions on each political dimension, $\tau(e)$ and $e(\tau)$ (Eqs. (22), (23), respectively). These reaction functions, in turn, determine the initial equilibrium, (τ^*, e^*). Furthermore, we calculate $\overline{\tau}(e)$, the inverse of reaction function $e(\tau)$, which is

$$\overline{\tau}(e) = \left[\frac{1}{m_1}\right]^{\frac{\gamma}{1+\gamma}} e^{\frac{1+\gamma(1+\eta)+\delta}{1+\gamma}}.$$

[31] The tax base effect can further be illustrated as follows: In fact, it is easy to prove that the net effect on the aggregate level of tax avoidance resulting from an increase in income inequality turns out to be positive. Let $\tilde{a}$ be the aggregate amount of tax avoidance,

$$\tilde{a} = \left(\frac{\tau}{\kappa(1+\gamma)e^{1+\delta}}\right)^{1/\gamma} \tilde{y}. \tag{32}$$

In equilibrium, we have

$$\widetilde{a}^{*} = \left(\frac{m_2}{\kappa(1+\gamma)}\right)^{1/\gamma} \widetilde{y} = \left(\frac{\widetilde{y} - y_m}{\left(\frac{1+\gamma}{\gamma}\right)\widetilde{y} - y_m}\right) \widetilde{y}$$

with

$$\frac{\partial \widetilde{a}^{*}}{\partial y_m} < 0.$$

Thus, the positive effect of the tax rate on the aggregate level of tax avoidance outweighs the negative effect through an increase in the level of tax enforcement.

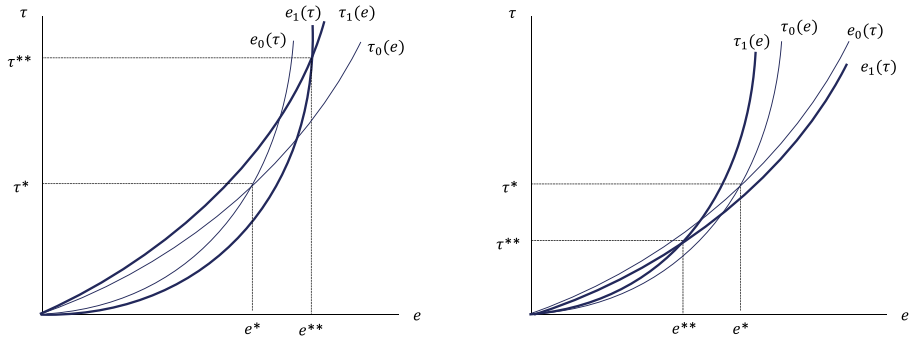

Fig. 1 The effect of an increase in inequality; Cases (i) (*right*) and (ii) (*left*)

To illustrate the existence of the two cases, we then determine the ratio of the two reaction functions:

$$\frac{\tau(e)}{\overline{\tau}(e)} = \frac{m_2 e^{1+\delta}}{\left[\frac{1}{m_1}\right]^{\frac{\gamma}{1+\gamma}} e^{\frac{1+\gamma(1+\eta)+\delta}{1+\gamma}}} = m_2 m_1^{\frac{\gamma}{1+\gamma}} e^{\frac{\gamma(\delta-\eta)}{1+\gamma}},$$

where

$$\frac{\partial\left(\frac{\tau(e)}{\overline{\tau}(e)}\right)}{\partial e} = m_2 m_1^{\frac{\gamma}{1+\gamma}} e^{\frac{\gamma(\delta-\eta)}{1+\gamma}-1} \frac{\gamma(\delta-\eta)}{1+\gamma}.$$

Therefore, we observe that this ratio is increasing or decreasing depending on the relative size of δ and η:

$$\frac{\partial\left(\frac{\tau(e)}{\overline{\tau}(e)}\right)}{\partial e} > 0 \Leftrightarrow \delta > \eta \Leftrightarrow \tau(e) > \overline{\tau}(e)\,\forall e > e^* \quad \frac{\partial\left(\frac{\tau(e)}{\overline{\tau}(e)}\right)}{\partial e} < 0 \Leftrightarrow \delta < \eta \Leftrightarrow \tau(e) < \overline{\tau}(e)\,\forall e > e^*.$$

Once we have defined the two types of initial equilibria, it is easy to analyze the consequences of an increase in inequality (a decrease in y_m). In both cases, the reaction function $\tau(e)$ moves to the left while the reaction function $\overline{\tau}(e)$ moves to the right. These movements are the direct effects. However, in the left panel of Fig. 1, we observe that the resulting new equilibrium (τ^{**}, e^{**}) implies higher levels of both tax rate and tax enforcement, case (ii), whereas in the right panel of Fig. 1 we observe the opposite case (i).

4.4 A numerical example: the ERTA

As has been emphasized by Bredemeier (2014), the first Reagan tax cut is a major anomaly for the Meltzer–Richard hypothesis. Shortly after the Reagan administration was elected in 1980, personal income taxes were reduced substantially in the Economic Recovery Tax Act (ERTA) of 1981, even though the mean-to-median ratio of the US pre-tax income distribution had been rising steadily in the preceding years (see, e.g., Esteban et al. 2007).

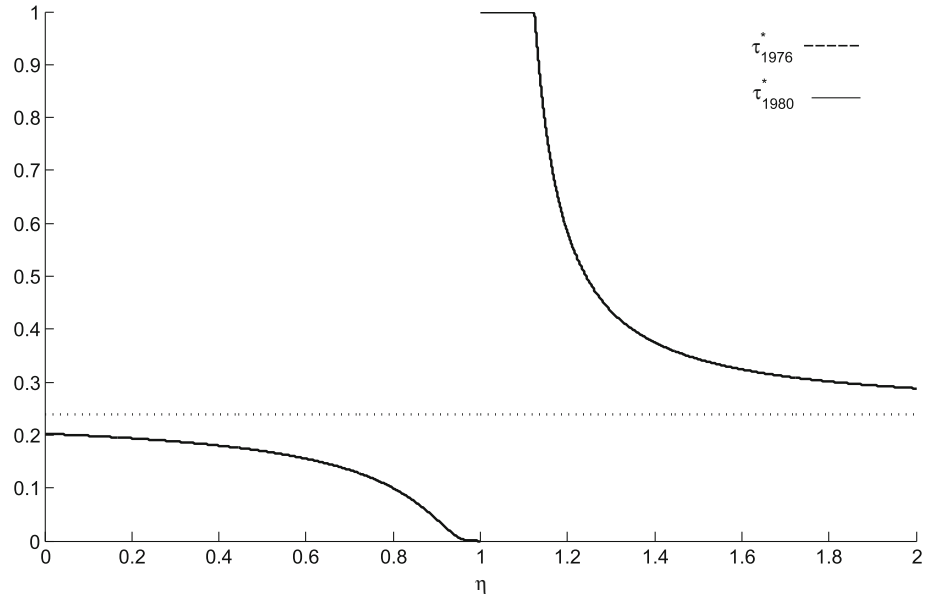

Fig. 2 Predicted levels of taxation in 1976 and 1980 for varying η

In the following, we illustrate the comparative static result of proposition 2 by applying our model to the US economy. In 1976, the year before the election of the Carter administration, which we take to be the starting point of our analysis, the percentage of total tax revenue over GDP was 24.0 % (see OECD at stats.oecd.org). Moreover, using US Census data,[32] we match the average and median income in the model with the 1976 gross mean and median household income (in 2013 dollars). The mean income, $\tilde{y}$, is equal to $\$55,548$ while the median income, y_m, equals $\$47,224$. We choose not to impose any functional form on the income distribution $F(\cdot)$. In order to pin down the parameters related to the avoidance cost function, however, we further assume that the average share of underreported income equals 1.80 %, which corresponds to the gross US individual income tax gap (as a percentage of GDP) in 1976.[33] Finally, after normalizing $\delta = 1$, the above figures are matched by the following parameter values: $\gamma = 0.1223$ and $\kappa = 0.35 * \exp(-16.355/(1+\eta))$. Note that we have two target values, τ and $a^*/\tilde{y}$, and three parameters, which leaves us with one degree of freedom. Moreover, as the average share of underreported income $a^*/\tilde{y}$ does not depend on η, we can uniquely determine γ.

This set of parameter values allows us roughly to reproduce some key figures of the US tax system in 1976 just before the election of the Carter administration. We can now analyze the effect of a change in the mean-to-median ratio in the years preceding the election of Reagan in 1980 on the politically chosen tax rate and the share of underreported income (for a given level of η). Specifically, using US census data for 1980 and accordingly changing the mean and median income to $\$56,693$ and $\$47,668$, respectively, Fig. 2

[32] Available at census.gov/hhes/www/income/data/historical/index.html.

[33] See data from the IRS at www.irs.gov/uac/Tax-Stats-2. Data on GDP are taken from the Worldbank; see data.worldbank.org/.

illustrates the model's predicted tax rates in 1976 (τ^*_{1976}, dotted line) and 1980 (τ^*_{1980}, continuous line) for varying levels of η.

Clearly, if $\eta < \delta = 1$, the model predicts a decrease in the tax rate relative to the level in 1976. More specifically, considering, for example, $\eta = 0.01$, the model predicts a reduction in the tax rate by 3.77 percentage points and an increase in the average share of underreported income to 1.91 %. The share of enforcement expenditures over mean income declines from 6.35 to 5.68 %. These predictions are broadly in line with observed movements of the respective variables: An empirical estimate of the impact of the ERTA on tax revenues is given by Tempalski (2006), who reports a decline in tax revenues over GDP by about 3 % of GDP. Moreover, the gross individual income tax gap (as a percentage of GDP) was equal to 1.93 % in 1981.

Finally, even though no direct evidence on tax law enforcement expenditures is available, Bagchi (2013, Figs. 3–4) finds significant reductions in both the share of the IRS budget devoted to detecting tax fraud and the number of IRS employees devoted to criminal investigation in the years after Reagan came into office. Furthermore, according to Bagchi (2013), the percentage of the IRS budget as a share of total federal expenses was 0.40 % in the period preceding the ERTA (1978–1980), whereas it was 0.37 % during the ERTA period (1981–1985); it then rose to an average level of 0.43 % during the period 1986–1990 following the Tax Reform Act of 1986. Hence, if we consider the size of the IRS budget as a proxy for tax enforcement, these numbers suggest a decrease during the ERTA period. An alternative proxy for enforcement expenditures might be a measure of the fiscal costs of tax collection. More precisely, the IRS estimates that the average cost of collecting $100 was $0.49 during 1976–1980 (the Carter administration), while it fell to 0.45 during the ERTA period 1981–1985, and increased to 0.51 in response to the Tax Reform Act of 1986 (TRA), during 1986–1990. Similarly, these figures support a decline in tax enforcement during the ERTA period.[34]

As we have argued in Sect. 4.2, a high δ (relative to η) is consistent with a tax system being characterized by many avoidance/evasion opportunities and thus large behavioral responses resulting from changes in the level of taxation. However, subsequent simplifications of the US tax code and a broader tax base (e.g., through the Tax Reform Act of 1986), should imply changes in the parameters δ and η in such a way that behavioral responses moderated over time; see Kopczuk (2005). In this sense, our numerical example is also consistent with the more recent tax increases in the mid 1990s and in 2013. More precisely, the Omnibus Budget Reconciliation Act (OBRA) of 1993, for example, seems to be in line with the findings of Meltzer–Richard as personal income taxes were increased shortly after the Clinton administration came into office in early 1993, while the mean-to-median ratio of the US pre-tax income distribution has been rising steadily since the 1960s (Esteban et al. 2007).

Summarizing, even though our model slightly over-predicts the size of the first Reagan tax cut, the given example illustrates that tax avoidance opportunities and accompanying changes in tax enforcement may well contribute to explaining the real-world reductions in income taxation in response to the empirical developments in the US income distribution in the late 1970s. Existing explanations of a stronger public demand for tax cuts, however, focus on institutional frameworks and changes therein, the personal approval of President Reagan as compared to his predecessors, the prospect of upward mobility or imperfect information about one's own position along the income distribution; see Bredemeier (2014) for a thorough discussion of the different mechanisms. Our model complements

[34] Data on the costs of tax collection are taken from the IRS, available at www.irs.gov/uac/Tax-Stats-2.

these explanations by emphasizing behavioral consequences related to tax avoidance behavior in response to changes in the income distribution.

4.5 The choice of enforcement by bureaucrats

So far we have assumed that individuals vote over taxes *and* the level of tax law enforcement. However, while campaigning about income taxation can frequently be observed, one may argue that tax enforcement is a less salient political issue. In the following, we therefore show that our main findings are robust against assuming that enforcement is instead set by a revenue-maximizing bureaucrat (a Niskanen-type bureaucrat). Specifically, following Borck (2004) and Traxler (2009a), we consider the following timing of events: Individuals first vote on the tax rate and subsequently the bureaucrat determines the level of enforcement.[35] Finally, individuals decide on how much income taxes to avoid.[36]

The level of enforcement $e(\tau)$, chosen by a revenue maximizing bureaucrat, is given by

$$\widehat{e} : \arg\max_{e} \; g; \; \widehat{e} = \left[\left(\frac{1+\delta}{1+\gamma} \right) \left(\frac{\tau^{1+\gamma}}{\kappa(1+\gamma)} \right)^{1/\gamma} \left(\frac{1+\gamma}{\gamma} \right) \widetilde{y} \right]^{\frac{\gamma}{1+\gamma(1+\eta)+\delta}}. \tag{33}$$

Individuals are forward looking and anticipate the bureaucrat's choice. Hence, the voters' problem is to maximize indirect utility [Eq. (4)] with respect to τ subject to Eq. (33). In Online Appendix B it is shown that the (interior) equilibrium levels of taxation and enforcement are given by

$$\tau^* = \left(\frac{1+\delta+\gamma(1+\eta)}{(1+\gamma)(1+\eta)} \frac{\tilde{y}-y_m}{\frac{m_3^{1+\eta}}{1+\eta} + \left(1+\frac{y_m}{1+\gamma}\right)\left(\frac{1}{\kappa(1+\gamma)m_3^{1+\delta}}\right)^{1/\gamma}} \right)^{\frac{1+\delta+\gamma(1+\eta)}{\eta-\delta}} \tag{34}$$

$$e^* = m_3 (\tau^*)^{\frac{1+\gamma}{1+\gamma(1+\eta)+\delta}} \tag{35}$$

with

$$m_3 = \left[\left(\frac{1+\delta}{1+\gamma} \right) \left(\frac{1}{\kappa(1+\gamma)} \right)^{1/\gamma} \left(\frac{1+\gamma}{\gamma} \right) \widetilde{y} \right]^{\frac{\gamma}{1+\gamma(1+\eta)+\delta}}. \tag{36}$$

From the above equations it is straightforward to see that

$$\frac{\partial \tau^*}{\partial y_m} \gtrless 0 \quad \Leftrightarrow \quad \delta \gtrless \eta \quad \text{and} \quad \frac{\partial e^*}{\partial y_m} \gtrless 0 \quad \Leftrightarrow \quad \delta \gtrless \eta, \tag{37}$$

which are equivalent to the conditions stated in Eqs. (28) and (29). In contrast to the basic model of the previous subsection, however, the median voter internalizes the fact that the bureaucrat tends to expand the level of enforcement in response to a tax rate increase.[37]

[35] It can be shown that the qualitative results remain unchanged if the timing of events is reversed.

[36] Note that Borck (2004) and Traxler (2009a) do not explicitly address the relationship between tax avoidance and income inequality within this framework. Note further that Traxler (2009a) characterizes the voting equilibrium with general functional forms. In order to illustrate that our main result carries over to such a framework, however, we stick to the simple functional forms of the preceding subsection.

[37] From Eq. 33 is straightforward to see that $\frac{\partial \widehat{e}}{\partial \tau} > 0$.

Thus, the intuition of the results in Eq. (37) is the following: An increase in inequality (a reduction in y_m) incentivizes the new median voter to vote for a higher tax rate (the standard political effect). However, taking into account the bureaucrat's reaction, more vigorous tax enforcement requires more public resources, thereby reducing the amount of transfers that could be financed with the same income tax rate. This negative tax base effect lowers the incentive of the poorer median voter to support higher tax rates which, in turn, reduces the level of tax enforcement. Consequently, the results are similar to the baseline model with the tax base effect and the direct effect working in opposite directions.

5 Conclusions

A central result of the political economy of taxation is the existence of a positive link between the mean-to-median income ratio and the extent of income redistribution. However, empirical evidence on this relationship remains inconclusive. In many instances, observed changes in the mean-to-median income ratio are accompanied by less redistribution.

This paper has proposed a simple model of tax avoidance and costly enforcement to explain these different empirical findings. We have shown that increases in income inequality can lead to less redistribution. The key channel for this non-standard result is a tax base effect that counteracts the standard mean-to-median income effect. If taxpayers do not only vote over the size of the tax rate but also over the level of tax enforcement, higher taxes increase the average level of tax avoidance in the economy. This, in turn, reduces the tax base and therefore the amount of redistribution that could be financed by a given level of taxation. Due to this tax base effect, an increase in income inequality can imply a lower level of income redistribution, in contrast to the predictions of the standard model (the Meltzer–Richard hypothesis).

The present framework could be used to study the welfare consequences of the political outcome. Traxler (2012), e.g., has shown that sequential majority voting may result in inefficiently high or low levels of taxation and enforcement. It would be interesting to see how such a result extends to the equilibrium concept studied in the present paper. Moreover, our analysis could be extended to account for additional behavioral responses as, e.g., labor-leisure decisions. Though we conjecture that our main results carry over to this alternative framework, we leave a more thorough analysis of these extensions for future research.

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