# Paternalism against Veblen: Optimal Taxation and Non-Respected Preferences for Social Comparisons[**]

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**Abstract**

This paper compares optimal nonlinear income tax policies of welfarist and paternalist governments, where the latter does not respect individual preferences regarding relative consumption. Consistent with previous findings, relative consumption concerns under welfarism typically imply higher marginal income tax rates. Remarkably, the optimal marginal tax rules are very similar in the paternalist case. For example, if relative consumption concerns are based on mean value comparisons and all consumers are equally positional, then the first-best tax rules are identical between the governments. Extensive numerical simulations supplement the theoretical results, and make it possible to compare also tax levels and overall redistribution.

Keywords: Paternalism; nonlinear taxation; redistribution; status; positional goods

JEL Classification: D62, H21, H23

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Ever since the writings of Adam Smith in the 18th century, it has been well-known in economics that people care about status and social comparisons and that relative consumption matters to most people.[1] Tax and other policy implications of such comparisons have more recently been explored from different points of departure in a number of studies, including Boskin and Sheshinski (1978), Oswald (1983), Tuomala (1990), Persson (1995), Corneo and Jeanne (1997), Ljungqvist and Uhlig (2000), Dupor and Liu (2003), Abel (2005), Frank (2008), Aronsson and Johansson-Stenman (2008, 2010, 2015), and Kanbur and Tuomala (2013). A typical finding in this literature is that the externalities generated by relative consumption concerns motivate considerably higher marginal tax rates than in the conventional model of optimal taxation without social comparisons. However, as is always the case, the theoretical results depend on the underlying assumptions. A common assumption in all of these studies is that the tax policy is decided by a welfarist government, i.e., a government that fully respects all aspects of consumer preferences, including concerns about relative consumption.

While the welfarist assumption in normative economic analysis is standard, and often seen as uncontroversial, one may argue that this assumption is less obvious when it comes to social comparisons. Indeed, several authors, including Sen (1979), Harsanyi (1982), and Goodin (1986), argue that the government should not respect anti-social preferences. Harsanyi (1982, p. 56) specifically mentions envy as an example of anti-social preferences and states that such preferences "must altogether be excluded from our social-utility function." Goodin (1986) similarly discusses how to "launder" private preferences in order to make them suitable as arguments in the governmental objective function. Since positional concerns imply that an individual's utility depends negatively on other people's consumption, one can interpret such concerns in terms of envy. Following Harsanyi and Goodin, one could then argue that the government should not respect such preferences and hence not include the effects

[1] This argument also finds support in recent research on happiness and questionnaire-based experiments showing that relative consumption is an important determinant of individual well-being (e.g., Easterlin 1995, 2001; Johansson-Stenman et al. 2002; Blanchflower and Oswald 2004; Ferrer-i-Carbonell 2005; Solnick and Hemenway 2005; Carlsson et al. 2007; Clark and Senik 2010), while Card et al. (2012) found a causal effect of peer salary on individual well-being based on a natural experiment.

of relative consumption in the social objective function.[2] Yet other authors, such as Blackorby et al. (2005), have explicitly argued against the view of Harsanyi and Goodin and instead proposed that the government should respect preferences that may be perceived as anti-social. Finally, in a comprehensive survey paper on optimal income taxation, Piketty and Saez (2013) are generally positive to include relative concerns in the optimal taxation framework, but seem to hesitate regarding what the government should really maximize:

> Whether such externalities should be factored in the social welfare function is a deep and difficult question. Surely, hurting somebody with higher taxes for the sole satisfaction of envy seems morally wrong. Hence, social welfare weights should not be allowed to be negative for anybody no matter how strong the envy effects. At the same, it seems to us that relative income concerns are a much more powerful and realistic way to justify social welfare weights decreasing with income than standard utilitarianism with concave utility of consumption. (p. 453)

As researchers on normative policy issues, we do not see it as our main role to judge which social objectives are appropriate and which are not. Rather, we believe it is important to analyze the implications of different normative or ethical points of departure that governments may have, regardless of whether we share these values or not. Therefore, in the present paper we do not take a stand on the appropriateness of different assumptions regarding the social objective. Instead, we simply analyze the policy implications of a paternalist approach, where the welfare effects of relative consumption are removed from the social objective function, and compare them with those of the conventional welfarist approach.

As our fundamental workhorse, we will utilize the discrete self-selection approach to the Mirrleesian optimal nonlinear income tax model with two productivity types developed by Stern (1982) and Stiglitz (1982), where information asymmetries typically prevent the government from implementing a first-best resource allocation. This approach is extended to accommodate consumer preferences for relative consumption and provides a useful analytical framework—based on a reasonably simple structure—for understanding the policy incentives associated with correction

[2] According to Frank (2005), this is also one likely reason many economists have been reluctant to base policy analyses on models where the consumers are positional. Yet, as also argued by Frank, positional concerns need not necessarily reflect anti-social preferences. Instead they might reflect instrumental reasons such as the need for families to keep up with community spending to be able to live in areas where their children may attend schools of reasonable quality.

and redistribution. Since much earlier literature on the self-selection approach to optimal taxation is based on the two-type model, it allows for straightforward comparisons with earlier studies. In addition, a first-best tax policy follows naturally from the special case where the self-selection constraint does not bind, which simplifies the presentation considerably.

Our study parallels much earlier research on the self-selection approach to optimal taxation by characterizing Pareto-efficient marginal tax policies. It also distinguishes between a welfarist policy based on the individuals' own preferences and a policy based on the "laundered preferences" imposed on them by a paternalist government. An important strength of this approach is that the policy rules for marginal income taxation derived below apply for any such Pareto-efficient allocation and, thus, also for any underlying Paretian social welfare function based on the individuals' true and laundered preferences, respectively. Since our primary aim is to compare the corrective motive for taxation faced by welfarist and paternalist governments, and how the self-selection constraint modifies this motive for corrective taxation in a second-best setting, the focus on policy rules for marginal tax policy is natural. However, we also provide a functional form example allowing for some comparison between levels of marginal income tax rates as well.

One may perhaps conjecture that the induced higher marginal income taxes due to social comparisons based on the welfarist approach will vanish if the analysis is instead based on a paternalist approach where preferences for social comparisons are not respected. It turns out, however, that such a conjecture is importantly wrong. In fact, a paternalist government may respond in a way similar, or even identical, to a welfarist government, although for a different reason. The intuition is that the externality imposed by each individual on other people (which is of importance to the welfarist government) coincides with the individual's own behavioral failure as perceived by the paternalist government. Moreover, these insights are straightforward to generalize to a case with more than two productivity types. Consequently, it seems that relative consumption concerns are generally important for the policy outcome, irrespective of whether the government aims at correcting for positional externalities or tries to make the consumers behave as if they were not concerned with their relative consumption.

This major finding is also confirmed based on numerical simulations with a utilitarian social welfare function, together with specific functional forms of the utility functions and different reference consumption levels. In these simulations, we are able to compare the two governments in terms of how the optimal marginal and average tax rates, as well as optimal labor supply and overall redistribution, vary with the *degree of positionality*, i.e., the extent to which people's utility gain from increased consumption is driven by the preference for relative consumption. Although these simulation results, not surprisingly, show large heterogeneity, e.g., related to the assumptions underlying the social comparisons, we can conclude that relative consumption concerns will in general substantially affect the optimal income tax policy, not only for the welfarist but also for the paternalist government.

The outline of the paper is as follows. Section I presents related literature and the contribution of the present paper in relation to this literature. Section II presents a benchmark model where each individual compares his/her consumption with the average consumption in the overall economy. The implications for first-best and second-best taxation are analyzed in Sections III and IV, respectively. Section V concerns the tax policy implications of two alternative comparison forms: within-type and upward comparisons, respectively. Section VI presents the results of extensive numerical simulations, while Section VII provides a summary and a discussion. Proofs are presented in the Appendix.

## I. Relation to the Literature

As indicated in the introduction, a number of earlier studies have examined the tax policy implications of relative consumption concerns based on welfarist objectives.[3] First-best policy rules to correct for the associated externalities—often referred to as positional externalities—have been derived in a variety of contexts; see, e.g., Layard (1980), Persson (1995), Ljungqvist and Uhlig (2000), and Dupor and Liu (2003). The most important early contributions to the study of optimal *second-best* taxation under

[3] For a long time in the 20th century, there was little discussion on normative implications of relative consumption concerns, yet there were of course exceptions. Moreover, such issues were often taken more seriously by classical economists. For example, Mill (1848) argued that consumer choice quite often "is not incurred for the sake of the pleasure afforded by the things on which the money is spent, but from regard to opinion, and an idea that certain expenses are expected from them, as an appendage of station." He concluded that: "I cannot but think that expenditure of this sort is a most desirable subject of taxation" (Principles of Political Economy, Book 5, Chapter 6).

relative consumption concerns are Boskin and Sheshinski (1978), Oswald (1983), and Tuomala (1990), all of which examined tax policy problems where externality correction and redistribution are carried out simultaneously. Whereas Boskin and Sheshinski focused on a model with a linear negative income tax, the studies by Oswald and Tuomala are based on Mirrleesian models of optimal nonlinear taxation.

Aronsson and Johansson-Stenman (2008) were the first to analyze this problem by using the Stern (1982) and Stiglitz (1982) two-type version of the Mirrleesian model. Their approach allows for more precise results and clearer intuition as to why the self-selection constraint modifies the incentive to correct for positional externalities. In addition, they expressed the policy rules for efficient marginal taxation in terms of degrees of positionality, i.e., the extent to which increased consumption contributes to higher utility through increased relative, rather than absolute, consumption. This simplifies the presentation, and makes it possible to interpret the theoretical results in light of available empirical estimates of such degrees, e.g., based on questionnaire-experimental research.[4] The present paper generalizes the model in Aronsson and Johansson-Stenman (2008) to allow for a paternalist government. Our contribution is to systematically compare the marginal tax policy implemented by welfarist and paternalist governments in economies where the consumers are concerned about their relative consumption.[5]

There are a few previous studies on paternalist approaches to optimal taxation in such economies. Dodds (2012) and Kanbur and Tuomala (2010)[6] compare the optimal marginal income tax policy of welfarist and paternalist governments in the context of numerical models. A linear income tax is considered in the former paper, whereas the latter deals with optimal nonlinear income taxation. The numerical results show that relative consumption concerns among consumers may motivate much higher marginal tax rates than in the absence of such concerns, even if the consumer preference for relative consumption does not affect the policy objective (provided that the

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[4] See, e.g., Johansson-Stenman et al. (2002), Alpizar et al. (2005), and Carlsson et al. (2007).

[5] Other proposed reasons for deviating from welfarism include the presence of merit goods (Sandmo 1983), alleviation of poverty (Kanbur et al. 1994), self-control problems (Gruber and Köszegi 2001), and biased risk perceptions (Johansson-Stenman 2008). Yet, and not surprisingly, there is no scientific consensus in any of these cases regarding the appropriateness of paternalism.

[6] This is the working paper version, which was subsequently published as Kanbur and Tuomala (2013). However, in the journal version the section based on a paternalist government was dropped.

government recognizes the associated behavioral effects). Eckerstorfer and Wendner (2013) instead examine the optimal structure of commodity taxation in a theoretical model and allow the consumption externality caused by relative consumption comparisons to be non-atmospheric (such that individuals differ in their marginal contribution to this externality) and asymmetric (meaning that people use different reference points). They show that both a welfarist and a paternalist government may implement its first-best resource allocation through personalized commodity taxation, and that the principle of targeting does not generally apply if the (welfarist or paternalist) government is restricted to using uniform commodity taxes.

The paper closest to ours is Micheletto (2011), who analyzes optimal income taxation in a second-best setting where he also considers the case of paternalism. He uses a quite specific model, where each productivity type compares his/her consumption with that of the adjacent type with higher productivity (meaning that the highest productivity type is not concerned about relative consumption). We will return to his results below. Our study is more general and differs from his in several important ways. First, we consider a broader spectrum of possibilities by analyzing the tax policy implications of (i) the mean value comparison (which is the conventional assumption in earlier comparable studies based on the welfarist approach), (ii) within-type comparisons, and (iii) upward comparisons.[7] Second, we consider the incentives underlying both first-best and second-best taxation, meaning that we are able to compare our results with a fairly large body of literature on tax policy and relative consumption based on welfarist models. Third, we present the optimal marginal tax policy in terms of degrees of positionality, which makes it possible to interpret the results in light of such estimates from the empirical literature on social comparisons.

[7] The empirical evidence here is scarce. Some evidence suggests that people compare their own consumption with that of similar others (e.g., Runciman 1966; McBride 2001; Clark and Senik 2010), which in our setting may justify comparisons within productivity groups, while other evidence is more in accordance with upward comparisons (e.g., Bowles and Park 2005). We also interpret Veblen (1899) in terms of upward comparisons, as he argued that people in other social classes are influenced by the behavior of, and try to emulate, the wealthy leisure class.

## II. A Two-Type Economy with Relative Consumption and Nonlinear Taxation

Consider an economy with two types of consumers, a low-productivity type (type 1) and a high-productivity type (type 2), where productivity is measured by the before-tax wage rate. There are $n^1$ individuals of the low-productivity type and $n^2$ individuals of the high-productivity type; $N = n^1 + n^2$ denotes total population. Output in this economy is produced by a linear technology such that the before-tax wage rates are fixed.[8]

### A. *Consumer Behavior and Preferences for Relative Consumption*

Each consumer derives utility from his/her absolute consumption and use of leisure, respectively, as well as from his/her consumption relative to that of referent others. The utility function faced by a consumer of productivity type $i$ ($i$=1,2) is given by

(1) $$U^i = u^i(x^i, z^i, \Delta^i),$$

where $x^i$ denotes consumption, $z^i$ leisure, and $\Delta^i$ the individual's relative consumption. For technical convenience, the relative consumption is defined as the difference between the individual's own consumption and a measure of reference consumption, $x^r$, such that $\Delta^i = x^i - x^r$ (as in, e.g., Akerlof 1997; Corneo and Jeanne 1997; Ljungqvist and Uhlig 2000; Bowles and Park 2005; and Carlsson et al. 2007).[9] To begin with, we consider the conventional mean value comparison, where the reference consumption is given by the average consumption in the economy as a whole, i.e.,[10]

[8] This assumption simplifies the calculations; it is of no significance for how relative consumption concerns affect the optimal tax policy.

[9] An obvious alternative would be to assume that the individual's relative consumption is determined by the ratio between the individual's own consumption and the relevant reference measure (e.g., as in Boskin and Sheshinski 1978; Layard 1980; Abel 2005; and Wendner and Goulder 2008). It is not important for the qualitative results which option is chosen.

[10] Earlier studies on optimal income taxation and relative consumption typically assume that individuals compare their own consumption with the average consumption in the economy as a whole. Exceptions include Aronsson and Johansson-Stenman (2010), who also analyze the policy implications

$$x^r = \bar{x} \equiv \frac{n^1 x^1 + n^2 x^2}{N}.$$

We assume that the function $u^i(\cdot)$ is increasing in its arguments and strictly quasi-concave. Note also that equation (1) allows for differences in preferences between types. Alternative comparison forms and measures of reference consumption will be addressed in Section V.

We show below that the strengths of the relative consumption concerns are important determinants of the optimal tax policy, irrespective of whether the government has a paternalist or welfarist objective. Based on Johansson-Stenman et al. (2002), the strength of the consumer preference for relative consumption will be measured by "the degree of positionality," which is interpretable as the fraction of an individual's overall utility gain from an additional dollar spent on consumption that is due to increased relative consumption. This means that if the degree of positionality equals zero, then only absolute consumption matters, as in the conventional model, whereas a value equal to one means that only relative consumption matters on the margin. An alternative interpretation is that the degree of positionality reflects the welfare cost to the individual, measured per unit of consumption, of an increase in the level of reference consumption. For an individual of productivity type *i*, the degree of positionality is given by

$$(2) \qquad \alpha^i = \frac{u^i_\Delta}{u^i_x + u^i_\Delta}.$$

Throughout the paper, subscripts attached to the utility function denote partial derivatives such that $u^i_x = \partial u^i / \partial x^i$ and $u^i_\Delta = \partial u^i / \partial \Delta^i$. The assumptions made earlier imply that $\alpha^i \in (0,1)$, whereas $\alpha^i$ would be equal to zero in the absence of any preference for relative consumption. The average degree of positionality measured over all consumers in this economy can then be written as

$$(3) \qquad \bar{\alpha} \equiv \frac{n^1 \alpha^1 + n^2 \alpha^2}{N}.$$

The average degree of positionality gives an indication of how important relative consumption concerns are on average in the economy as a whole. With mean-value comparisons, it is also a measure of the marginal positional externality per unit of

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of within-generation and upward comparisons, respectively, faced by a welfarist policy maker, and Micheletto (2011), who considers a variant of upward comparisons.

consumption (since all individuals contribute to this externality to the same extent under such comparisons). Empirical estimates of the average degree of positionality suggest that relative consumption is an important determinant of individual well-being; Wendner and Goulder (2008) argue that this number is typically found in the interval 0.2–0.4, whereas Alpizar et al. (2005) and Carlsson et al. (2007) find that the average degree of positionality (measured for income) is around 0.5. Some estimates from happiness studies suggest even higher values. These numbers are clearly consistent with Frank's (2005) argument that positional externalities cause large welfare losses.

The individual budget constraint can be written as

$$w^i l^i - T(w^i l^i) - x^i = 0 , \tag{4}$$

where $w^i$ denotes the before-tax wage rate and $l^i$ the hours of work, measured by a time endowment less the time spent on leisure. The function $T(\cdot)$ represents the income tax. We assume that each consumer is small relative to the economy as a whole and behaves as an atomistic agent by treating $w^i$ and $x^r$ as exogenous. The first-order condition for work hours can then be written as

$$\left(u_x^i + u_\Delta^i\right) w^i (1 - T'(w^i l^i)) - u_z^i = 0 . \tag{5}$$

In equation (5), $T'(\cdot)$ is the marginal income tax rate.

## B. *Constraints Facing the Government*

The government is assumed to be able to observe income (the product of the before-tax wage rate and the hours of work), whereas individual productivity (and consequently the hours of work) is private information. Similar to a great deal of other literature on optimal taxation, we assume to begin with that the government wants to redistribute income from high-productivity to low-productivity individuals, which is referred to as the normal case by Stiglitz (1982).[11] By making the conventional assumption that the high-productivity type has flatter indifference curves in the gross

[11] We can also think of this assumption as the case where the government in a first-best optimum redistributes income from the high-productivity type to the low-productivity one, rather than the other way around; cf. Stiglitz (1982).

income–consumption space than the low-productivity type,[12] the following self-selection constraint is imposed to prevent high-productivity individuals from becoming mimickers:[13]

(6) $$U^2 = u^2(x^2, z^2, \Delta^2) \geq u^2(x^1, 1-\phi l^1, \Delta^1) = \hat{U}^2 .$$

The weak inequality (6) constrains the redistribution policy: It implies that this policy must not be such that a high-productivity individual will prefer the allocation intended for the low-productivity type (which the high-productivity individual can reach by reducing his/her hours of work and selecting the income–consumption point intended for the low-productivity type). $\hat{U}^2$ denotes the utility of a high-productivity mimicker and $\phi = w^1 / w^2 < 1$ the relative wage rate. Therefore, $\phi l^1$ represents the labor supply chosen by the mimicker and $1-\phi l^1 = \hat{z}^2$ is interpretable as the leisure used by the mimicker (with the time-endowment normalized to unity). At the end of Section IV below, we examine the consequences of replacing equation (6) with a self-selection constraint imposed on the low-productivity type, based on the assumption that high-productivity individuals are net recipients from the redistribution system.

By using $\sum_i n^i T(w^i l^i) = 0$ together with the private budget constraints given in equation (4), we can write the public budget constraint as

(7) $$\sum_i n^i w^i l^i = \sum_i n^i x^i .$$

The public decision problem is to design a Pareto-efficient tax policy satisfying the self-selection and budget constraints given in equation (6) and (7), respectively. We follow convention in writing the public decision problem as a direct decision problem, where consumption and work hours serve as direct decision variables. We can then infer the marginal income tax rates implicit in the socially optimal resource allocation simply by comparing the first-order conditions of the public decision problem with the private first-order conditions for work hours.

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[12] Note that we refer to *individual* indifference curves here, where utility-effects of relative consumption are thus taken into account by the individuals.

[13] As pointed out by Boadway and Keen (1993) in the context of a model with productivity type-specific utility functions (as in our framework), this assumption rules out the possibility that the other self-selection constraint binds at the same time, i.e., low-productivity individuals will strictly prefer the allocation intended for them over the allocation intended for the high-productivity type. This assumption corresponds to the agent-monotonicity condition of Seade (1982) in the special case where all individuals share a common utility function.

Note in particular that not only the public budget constraint but also the self-selection constraint is independent of whether the government is paternalist or welfarist. The reason is, of course, that the government cannot directly force the individuals not to take relative consumption concerns into account, even if it would like to.

### C. *The Paternalist Government's Problem*

The paternalist government does not share the consumer preference for relative consumption. Instead, it wants each consumer to behave, at the margin, as if he/she is not concerned with relative consumption comparisons, and thus designs a tax policy that eliminates this perceived behavioral failure. To be able to focus on paternalism in terms of relative consumption, we also assume that the government respects all other aspects of consumer preferences.[14] That is, we assume that the government would like to maximize utilities for all individuals based on their actual utility functions as given by equation (1), with the only difference that the relative consumption is held constant, such that corresponding welfare effects due to changes in relative consumption are not taken into account by the government. In turn, this means that the paternalist government would like each individual of productivity type $i$ to maximize $u^i(x^i, z^i, K^i)$, where the relative consumption $\Delta^i = x^i - \bar{x} = K^i$ is treated as exogenous in equilibrium, instead of maximizing $u^i(x^i, z^i, \Delta^i)$. However, the individual will of course not follow this wish of the government. The individual will still maximize $u^i(x^i, z^i, \Delta^i)$, while the government in its social optimization bases the welfare evaluations on $u^i(x^i, z^i, K^i)$, such that $\Delta^i$ is treated as fixed in equilibrium. As explained below, this means that the marginal utility of consumption is given by $u_x^i$ from the perspective of the paternalist government, while it is given by $u_x^i + u_\Delta^i$ from each individual's own perspective.

An illustrative special case arises when the individual preferences are additively separable in $\Delta^i$, such that equation (1) can be written as $U^i = v^i(x^i, z^i) + \sigma^i(\Delta^i)$ .This

[14] See Blomquist and Micheletto (2006) for a two-type model of optimal income taxation without relative consumption comparisons, where the governmental objective function is formulated independently of the individual utility functions.

means that the government would base its objective on the first part, $v^i(x^i, z^i)$, whereas the second part, $\sigma^i(\Delta^i)$, would be treated as exogenous and hence disregarded. Nevertheless, throughout the paper we consider the general formulation in equation (1) instead of restricting the analysis to the case of additive separability.

The public decision problem then becomes

(P-Gov) $$\underset{l^1,x^1,l^2,x^2}{Max}\, u^1(x^1, z^1, K^1) \text{ s.t. } u^2(x^2, z^2, K^2) \geq U_0^2, \text{(6) and (7)}.$$

In problem (P-Gov), $U_0^2$ is a fixed minimum utility level that the government imposes on the high-productivity type. Note that although the government does not derive utility from the consumers' preferences for relative consumption, these preferences will, nevertheless, affect the self-selection constraint given in equation (6), since this constraint serves to make each high-productivity individual choose the combination of work hours and consumption intended for his/her productivity type. Individuals will of course base their choices of consumption and work hours on their own preferences (where relative consumption matters) and not on those of the government. Also, the government is assumed to recognize that the reference consumption is *endogenous* and given by $x^r = \bar{x} \equiv (n^1 x^1 + n^2 x^2)/(n^1 + n^2)$.

The Lagrangean corresponding to this decision problem can be written as

(8) $$\begin{aligned} \mathcal{L}_P &= u^1(x^1, z^1, K^1) + \mu\left[u^2(x^2, z^2, K^2) - U_0^2\right] \\ &\quad + \lambda\left[u^2(x^2, z^2, \Delta^2) - \hat{u}^2(x^1, 1-\phi l^1, \Delta^1)\right] + \gamma \sum_i n^i (w^i l^i - x^i), \end{aligned}$$

where $K^1$ and $K^2$ thus are treated as exogenous. Subscript $P$ refers to "paternalist," while $\mu$, $\lambda$, and $\gamma$ are Lagrange multipliers. The first-order conditions for $l^1$, $x^1$, $l^2$, and $x^2$ become

(9a) $$-u_z^1 + \lambda\phi\hat{u}_z^2 + \gamma n^1 w^1 = 0,$$

(9b) $$u_x^1 - \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2) - \gamma n^1 + \frac{n^1}{N}\frac{\partial \mathcal{L}_P}{\partial \bar{x}} = 0,$$

(9c) $$-(\mu + \lambda)u_z^2 + \gamma n^2 w^2 = 0,$$

(9d) $$\mu u_x^2 + \lambda\left(u_x^2 + u_\Delta^2\right) - \gamma n^2 + \frac{n^2}{N}\frac{\partial \mathcal{L}_P}{\partial \bar{x}} = 0.$$

Two things are worth noting. First, since the paternalist government wants the consumers to behave as if they are not concerned with their relative consumption (although it accepts all other aspects of consumer preferences), the social marginal utility of private consumption is given by $u_x^i$ for $i$=1,2, i.e., the marginal utility of absolute consumption, which is seen from equations (9b) and (9d). In turn, $u_x^i$ equals the total private marginal utility of consumption (the measure of relevance for the individual consumer), $U_x^i = u_x^i + u_\Delta^i$, times the degree of non-positionality, $1-\alpha^i$. Second, the partial derivative of the Lagrangean with respect to $\bar{x}$, $\partial \mathcal{L}_P / \partial \bar{x}$, measures the change in social welfare (from the perspective of the paternalist government) of increased reference consumption, ceteris paribus, and will be analyzed more thoroughly below.

### D. *The Welfarist Government's Problem*

For purposes of comparison, we also address the optimal tax policy decided by a welfarist government, which incorporates the consumer preferences for relative consumption in its own objective. This decision problem was previously examined by Aronsson and Johansson-Stenman (2008) and is given by

(W-Gov) $$\underset{l^1,x^1,l^2,x^2}{Max}\, u^1(x^1,z^1,\Delta^1) \text{ s.t. } u^2(x^2,z^2,\Delta^2) \geq U_0^2, \text{(6) and (7)}.$$

The corresponding Lagrangean becomes

(10) $$\begin{aligned} \mathcal{L}_W &= u^1(x^1,z^1,\Delta^1) + \mu\left[u^2(x^2,z^2,\Delta^2) - U_0^2\right] \\ &+ \lambda\left[u^2(x^2,z^2,\Delta^2) - \hat{u}^2(x^1,1-\phi l^1,\Delta^1)\right] + \gamma\sum_i n^i(w^i l^i - x^i) \end{aligned}.$$

The first-order conditions for $l^1$ and $l^2$ coincide with equation (9a) and (9c), respectively, whereas the first-order conditions for $x^1$ and $x^2$ change to read

(9b') $$u_x^1 + u_\Delta^1 - \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2) - \gamma n^1 + \frac{n^1}{N}\frac{\partial \mathcal{L}_W}{\partial \bar{x}} = 0,$$

(9d') $$(\mu+\lambda)\left(u_x^2 + u_\Delta^2\right) - \gamma n^2 + \frac{n^2}{N}\frac{\partial \mathcal{L}_W}{\partial \bar{x}} = 0.$$

In equations (9b') and (9d'), $\partial \mathcal{L}_W / \partial \bar{x}$ measures the partial welfare effect of increased reference consumption from the perspective of the welfarist government. In the following two sections, we will address the implications of equations (9) for optimal income taxation.

## III. First-Best Marginal Tax Rates

In the economy set out above, the government is unable to observe individual productivity and must, therefore, redistribute subject to the self-selection constraint. As a consequence, the government cannot rely on productivity type-specific lump-sum taxes for purposes of redistribution. However, if individual productivity were observable, the self-selection constraint would be redundant, meaning that nothing would prevent the government from redistributing through productivity type-specific lump-sum taxes. In that case, the sole purpose of marginal income taxation would be to correct for market failures (under a welfarist government) or behavioral failures (under a paternalist government). This case provides a natural starting point. We start by analyzing first-best taxation before turning to the second-best tax policy in Section IV.

The first best (i.e., full information) resource allocation follows as the special case of our model where the self-selection constraint does not bind, in which $\lambda = 0$. It is important to emphasize that the concept of "first best" just means the best that each government can accomplish under full information about individual productivity, given its objective and resource constraint. Thus, since the paternalist and welfarist governments have different objective functions, it follows that the first-best allocation based on a paternalist objective typically differs from the first-best based on a welfarist objective. Our purpose here is to compare the marginal tax policy used by a paternalist government to implement its first-best allocation with the corresponding marginal tax policy used by a welfarist government.

If $\lambda = 0$, it is straightforward to derive (see the Appendix)

(11a) $$\frac{\partial \mathcal{L}_P}{\partial \bar{x}} = 0,$$

(11b) $$\frac{\partial \mathcal{L}_W}{\partial \bar{x}} = -\gamma N \frac{\bar{\alpha}}{(1-\bar{\alpha})} < 0.$$

Therefore, while increased reference consumption is of no concern to the paternalist government as long as individual productivity is observable, increased reference consumption leads to a welfare loss from the point of view of the welfarist government through increased positional externalities. Despite this, the corrective tax policy implemented by a paternalist government need not necessarily differ from that of its welfarist counterpart. To see this, let $T'(w^i l^i)_P$ and $T'(w^i l^i)_W$ denote the marginal income tax rate implemented for productivity-type *i* by the paternalist and welfarist government, respectively, and consider Proposition 1.[15]

**Proposition 1.** *Suppose that individual productivity is observable to the government and that the relative consumption concerns are based on mean value comparisons. The optimal marginal income tax rates implemented by the paternalist government can then be written as*

$$T'(w^i l^i)_P = \alpha^i \text{ for all } i,$$

*while the welfarist government implements the following rates:*

$$T'(w^i l^i)_W = \bar{\alpha} \text{ for all } i.$$

Proof: See the Appendix.

Proposition 1 relates the optimal tax policy to the degrees of positionality, i.e., the extent to which the utility gain of increased consumption is driven by the preferences for relative consumption. Recall that the welfarist government respects the consumers' preferences for relative consumption and tries to internalize the externalities that the consumers impose on one another through these concerns. With mean value comparisons, each consumer contributes to the positional externalities to the same extent at the margin. The average degree of positionality, $\bar{\alpha}$, thus represents the value of the marginal externality per unit of consumption, which explains the second formula in the proposition. This welfarist tax formula is analogous to results derived in the context of representative agent models by, e.g., Ljungqvist and Uhlig (2000) and Dupor and Liu (2003), and of course also to the two-type model in Aronsson and Johansson-Stenman (2008).

A paternalist government, on the other hand, is not concerned with externality correction, as it gives no weight to relative consumption concerns in the social objective function, which can also be seen from equation (11a). In light of this observation, the optimal tax policy of the paternalist government may seem both highly surprising and unintuitive. Yet, the underlying intuition is actually

[15] It is straightforward to show that all first-best results presented in this paper, including the formulas in Proposition 1, take the same form irrespective of whether there are two or more productivity types.

straightforward to explain, as follows: Since the paternalist government does not include relative consumption concerns in its objective function, it wants the consumers to behave as if they were not concerned with their relative consumption. Hence, the government designs the marginal tax policy accordingly and taxes away people's utility gains from increased relative consumption. The size of this "relative utility gain" is, in turn, obviously measured by the individual's own degree of positionality, $\alpha^i$. Therefore, the marginal income tax rate imposed by the paternalist government depends on the individual's own degree of positionality.

The following corollary is an immediate consequence of Proposition 1:

**Corollary 1.** *Suppose that (a) individual productivity is observable to the government, (b) the relative consumption concerns are based on mean value comparisons, and (c) the type-specific degrees of positionality,* $\alpha^1$ *and* $\alpha^2$, *are fixed parameters.*

*(i) A paternalist government imposes a lower marginal income tax rate than the welfarist government on the less positional type and a higher marginal income tax on the more positional type.*

*(ii) If both consumer types share the same degree of positionality such that* $\alpha^1 = \alpha^2 = \alpha$, *then* $T'(w^i l^i)_P = T'(w^i l^i)_W = \alpha$ *for all i.*

Under the conditions of Corollary 1, the common marginal income tax rate decided by the welfarist government would equal the economy-wide average of the two rates (one for each productivity type) introduced by the paternalist government. The second part of the corollary is a very strong result as it implies that, given a common degree of positionality, the paternalist government would implement exactly the same marginal tax policy as its welfarist counterpart, although for a different reason. Thus, given the redistribution between types, it does not matter at all whether or not the government respects the consumer preferences for envy or jealousy—the marginal tax policy implications would be the same in both cases.

To take this discussion a bit further, consider the following utility function:

$$U^i = f^i\left(x^i - \alpha\bar{x}, z^i\right) = f^i\left(x^i(1-\alpha) + \alpha(x^i - \bar{x}), z^i\right). \tag{12}$$

From the expression after the second equality sign, it is obvious that the parameter $\alpha$ is interpretable as the common degree of positionality. This means that result (ii) of

Corollary 1 holds for the set of utility functions satisfying equation (12). A specific functional form consistent with equation (12) is given by

$$U^i = \frac{(x^i - \alpha\bar{x})^{1-\beta^i}}{1-\beta^i} - \psi^i z^i = \frac{(x^i(1-\alpha) + \alpha(x^i - \bar{x}))^{1-\beta^i}}{1-\beta^i} - \psi^i z^i \text{ for } i=1,2,$$

where $\alpha$, $\beta$, and $\psi$ are fixed parameters (with $\alpha$ interpretable as the degree of positionality). Such a utility function, but based on models with only one consumer type, has been analyzed by Ljungqvist and Uhlig (2000) and later discussed by Dupor and Liu (2003). This reconciles the paternalist approach with results in earlier studies on optimal marginal taxation based on representative agent models with a welfarist government.

## IV. Second-Best Marginal Tax Rates

Let us now turn to the more general second-best setting where asymmetric information prevents the government from redistributing through productivity type-specific lump-sum taxes. Here the marginal tax structure will reflect both the self-selection constraint and a motive for correction (for market failures in the welfarist case and behavioral failures in the paternalist case). We start by analyzing the model set out in Section II above and then continue with a modified version of the model with a binding self-selection constraint on the low-productivity type.

### A. *The Normal Case*

The welfare effects of increased reference consumption in the paternalist and welfarist cases, i.e., equations (11a) and (11b), will then change to read

(13a) $$\frac{\partial \mathcal{L}_P}{\partial \bar{x}} = \lambda\left(-u_\Delta^2 + \hat{u}_\Delta^2\right) = \lambda\left(-\alpha^2(u_x^2 + u_\Delta^2) + \hat{\alpha}^2(\hat{u}_x^2 + \hat{u}_\Delta^2)\right),$$

(13b) $$\frac{\partial \mathcal{L}_W}{\partial \bar{x}} = \gamma N \frac{\alpha^d - \bar{\alpha}}{(1-\bar{\alpha})},$$

where $\alpha^d = \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2)(\hat{\alpha}^2 - \alpha^1)/(\gamma N)$ is an indicator of the difference in the degree of positionality between the mimicker and the low-productivity type. If the mimicker is more (less) positional than the low-productivity type, so that $\hat{\alpha}^2 >$ (<) $\alpha^1$, then $\alpha^d > 0\ (< 0)$.

Equation (13b) was originally derived by Aronsson and Johansson-Stenman (2008) and shows that a welfarist government has two different motives for adjusting $\bar{x}$ through tax policy: to internalize the positional externality (captured by $\bar{\alpha}$) and relax the self-selection constraint by exploiting that the relative consumption concerns may differ between the mimicker and the low-productivity type (captured by $\alpha^d$). The latter effect provides an incentive for the welfarist government to relax the self-selection constraint through an increase in $\bar{x}$ if the mimicker is more positional than the low-productivity type ($\hat{\alpha}^2 > \alpha^1$), and through a decrease in $\bar{x}$ if the low-productivity type is more positional than the mimicker ($\hat{\alpha}^2 < \alpha^1$). In contrast, the paternalist government is not concerned with the positional externality *per se*, which explains why $\bar{\alpha}$ does not appear in equation (13a). Thus, the partial welfare effect of an increase in $\bar{x}$ faced by the paternalist government is due solely to the self-selection constraint. Furthermore, for a paternalist government, it is not an issue whether a mimicker is more or less positional than the low-productivity type, since $\bar{x}$ has no direct effect on the objective that the government imposes on the low-productivity type. Instead, what matters is just that $\bar{x}$ directly affects the self-selection constraint through $U^2$ and $\hat{U}^2$, which in turn explains equation (13a).

In what follows, we distinguish between individual marginal rates of substitution between leisure and private consumption as evaluated by a paternalist and welfarist government, respectively. From the point of view of a paternalist government, the marginal rate of substitution between leisure and private consumption for productivity type *i* and the mimicker is given by

(MRS-P) $$MRS_{z,x}^{P,i} = \frac{u_z^i}{u_x^i} > 0 \text{ for } i=1,2, \text{ and } M\hat{R}S_{z,x}^{P,2} = \frac{\hat{u}_z^2}{\hat{u}_x^2} > 0,$$

respectively, whereas the corresponding marginal rates of substitution for a welfarist government become

(MRS-W) $$MRS_{z,x}^{W,i} = \frac{u_z^i}{u_x^i + u_\Delta^i} > 0 \text{ for } i=1,2, \text{ and } M\hat{R}S_{z,x}^{W,2} = \frac{\hat{u}_z^2}{\hat{u}_x^2 + \hat{u}_\Delta^2} > 0.$$

Now, to be able to shorten the notation in the subsequent analyses, note that the optimal marginal tax policy implicit in the original Stiglitz (1982) model (the version with fixed before-tax wage rates) follows as the special case of our model where there is (a) no corrective motive for taxation and (b) no motive to relax the self-selection constraint via policy-induced changes in the level of reference consumption. If based on the MRS-P functions, the optimal marginal income tax rates in the original Stiglitz (1982) model can be written as

(14a) $$\tau_P^1 = \frac{\lambda \hat{u}_x^2}{\gamma n^1 w^1}\left[ MRS_{z,x}^{P,1} - \phi M\hat{R}S_{z,x}^{P,2} \right] \text{ and } \tau_P^2 = 0,$$

and if based on the MRS-W functions, they can be written as

(14b) $$\tau_W^1 = \frac{\lambda(\hat{u}_x^2 + \hat{u}_\Delta^2)}{\gamma n^1 w^1}\left[ MRS_{z,x}^{W,1} - \phi M\hat{R}S_{z,x}^{W,2} \right] \text{ and } \tau_W^2 = 0.$$

The implications of equations (14a) and (14b) are well known from previous studies: In the original two-type model with fixed before-tax wage rates, there is an incentive to relax the self-selection constraint through marginal income taxation of the low-productivity type. In doing this, one utilizes the difference in the marginal value attached to leisure between the mimicker and the low-productivity type, while there is no corresponding incentive to distort the behavior of the high-productivity type through marginal taxation. The reason for presenting these formulas here is that the variables $\tau_P^1$ and $\tau_P^2$ are part of the paternalist policy characterized below, whereas the variables $\tau_W^1$ and $\tau_W^2$ play a corresponding role for a welfarist policy. Consider Proposition 2.

**Proposition 2.** *Suppose that the relative consumption concerns are based on mean value comparisons. The second-best optimal marginal income tax rates implemented by a paternalist government can then be written as*

$$T'(w^1 l^1)_P = \tau_P^1 + (1-\tau_P^1)\alpha^1 + (1-\alpha^1)\frac{\lambda_P^1}{w^1}\frac{n^1 u_\Delta^2 + n^2 \hat{u}_\Delta^2}{n^1 N}$$

$$T'(w^2 l^2)_P = \alpha^2 - (1-\alpha^2)\frac{\lambda_P^2}{w^2}\frac{n^1 u_\Delta^2 + n^2 \hat{u}_\Delta^2}{n^2 N},$$

*where* $\lambda_P^i = \lambda\, MRS_{z,c}^{P,i} / \gamma > 0$ *for i=1,2, while a welfarist government implements the following second-best optimal marginal income tax rates:*

$$T'(w^1 l^1)_W = \tau_W^1 + \bar{\alpha}(1-\tau_W^1) - (1-\bar{\alpha})(1-\tau_W^1)\frac{\alpha^d}{1-\alpha^d}$$

$$T'(w^2 l^2)_W = \bar{\alpha} - (1-\bar{\alpha})\frac{\alpha^d}{1-\alpha^d}$$

Proof: See the Appendix.

Note first that the tax formulas presented in Proposition 1 follow as the special case where $\lambda = 0$, in which also $\tau_P^1 = \tau_P^2 = \tau_W^1 = \tau_W^2 = \lambda_P^1 = \lambda_P^2 = \alpha^d = 0$. The welfarist formulas in Proposition 2 can also be found in Aronsson and Johansson-Stenman (2008) and reflect three basic incentives for tax policy: (i) relaxation of the self-selection constraint by exploiting that the low-productivity type and the mimicker attach different marginal values to leisure, i.e., through $\tau_W^1$, (ii) internalization of positional externalities as reflected in the average degree of positionality, $\bar{\alpha}$, and (iii) relaxation of the self-selection constraint by exploiting that a mimicker may either be more or less positional than the low-productivity type as measured by $\alpha^d$. Since $\tau_W^1 > 0$ by our earlier assumptions and $\tau_W^2 = 0$, it follows that the corrective component in the formula for the low-productivity type, i.e., the second term on the right-hand side, is scaled down by the factor $(1-\tau_W^1) < 1$. The reason is that the fraction of the marginal income that is already taxed away for other reasons does not give rise to any positional externalities.

Note also that the welfarist government implements lower (higher) marginal income tax rates for both productivity types than it would otherwise have done if the mimicker is more (less) positional than the low-productivity type, ceteris paribus, i.e., if $\alpha^d > 0\ (<0)$, in which case an increase (decrease) in the reference consumption contributes to relax the self-selection constraint. If the utility functions are given by (12), it follows that the degree of positionality is the same for all, including the mimicker, such that $\alpha^d = 0$, implying

$$T'(w^i l^i)_W = \tau_W^i + \bar{\alpha}(1-\tau_W^i) \quad \text{for } i = 1,2.$$

The paternalist formulas are novel and written in a format comparable to the corresponding welfarist formulas. Thus, there are three basic policy incentives here as well: (i) relaxation of the self-selection constraint by exploiting that the low-productivity type and the mimicker attach different marginal values to leisure, as reflected in $\tau_P^1$, (ii) correction for behavioral failures, and (iii) relaxation of the self-selection constraint through policy-induced changes in the reference consumption. The first two aspects are reminiscent to their counterparts in the welfarist case in terms of qualitative implications for tax policy, whereas the third aspect is different. The first term on the right-hand side of the expression for $T'(w^1 l^1)_P$ is again the standard incentive for marginal income taxation of low-productivity individuals found in the original Stiglitz (1982) model, although in this case it is based on the MRS-P instead of MRS-W functions. With this modification, the component $\tau_P^1$ in the paternalist tax formula for the low-productivity type is interpretable in the same general way as $\tau_W^1$ in the corresponding welfarist formula. There is no similar component in the expression for marginal income taxation of the high-productivity type, since $\tau_P^2 = 0$.

The motive to correct for behavioral failures is captured by the second term in the formula for $T'(w^1 l^1)_P$ and the first term in the formula for $T'(w^2 l^2)_P$. As explained in the context of Proposition 1, this behavioral failure is captured by the individual's own degree of positionality. By analogy to the welfarist case, the corrective tax component imposed on the high-productivity type is the same as under first-best taxation, i.e., $\alpha^2$, whereas the corrective component is scaled down for the low-productivity type if $\tau_P^1 > 0$. The intuition behind the scale factor is, in this case, that marginal income taxes imposed for other reasons than correction will, nevertheless, eliminate part of the behavioral failure that the government wants to correct for. Thus, if the fraction $\tau_P^1$ of an additional dollar is already taxed away, only the fraction $1-\tau_P^1$ may be used for private consumption.

The final component of each paternalist tax formula is connected to the welfare effect of increased reference consumption in equation (13a), i.e., $\partial \mathcal{L}_P / \partial \bar{x}$, as well as to direct effects of $x^i$ on the self-selection constraint. As such, it reflects an incentive to relax the self-selection constraint through policy-induced changes in the consumption, and differs in a fundamental way from its counterpart in the welfarist case. Whereas the corresponding effect under a welfarist tax policy takes the same form and sign for both productivity types (where the sign depends on whether the mimicker is more or less positional than the low-productivity type), it differs in sign between the productivity types under a paternalist tax policy. More specifically, and although $\partial \mathcal{L}_P / \partial \bar{x}$ cannot be signed unambiguously, the final term in the tax formula for the low-productivity type is positive, while it is negative in the formula for the high-productivity type. This result follows because $x^i$ affects the self-selection constraint through two channels, i.e., a direct effect and an indirect effect via $\bar{x}$.

These two effects partly cancel out, leaving a positive net effect in the formula for the low-productivity type and a negative net effect in the formula for the high-productivity type (see the Appendix for technical detail). Therefore, with mean value comparisons, an increase in $x^1$ tightens, and an increase in $x^2$ relaxes, the self-selection constraint (recognizing that $x^1$ and $x^2$ affect $\bar{x}$). The government may thus relax the self-selection constraint by taxing the high-productivity type at a lower marginal rate than motivated by pure correction and correspondingly tax the low-productivity type at a higher marginal rate.

Thus, and if we assume that $\tau_P^1 > 0$ in accordance with the Stiglitz (1982) model, the following result is an immediate consequence of Proposition 2:

**Corollary 2:** *With a paternalist government and under mean-value comparisons, the optimal second-best policy satisfies*

$$T'(w^1 l^1)_P > \alpha^1$$

$$T'(w^2 l^2)_P < \alpha^2 .$$

Can we go further and compare the levels of marginal income taxation implemented by the two governments? In general, this is not possible since the degrees of positionality are endogenous variables. However, for the set of utility functions that can be written as equation (12), where the degree of positionality is a fixed parameter and takes the same value for all individuals (including potential mimickers), some such comparisons can be made. This scenario means that the paternalist government implements a lower marginal income tax rate for the high-productivity type than the welfarist government. We can see this result directly from the marginal income tax formulas in Proposition 2, since $\bar{\alpha} = \alpha^1 = \alpha^2 = \alpha$ and $\alpha^d = 0$ if all individuals share a common utility function given by equation (12). It is less straightforward to compare the marginal income tax rates that the two governments implement for the low-productivity type. This is because the variables $\tau_P^1$ and $\tau_W^1$ are likely to differ in equilibrium, although there is no a priori reason to believe any of these terms to be larger than the other. Still, if we again consider utility functions consistent with equation (12), and if we simply assume that $\tau_P^1 = \tau_W^1$, it follows that the second-best efficient marginal income tax for the low-productivity type is higher under the paternalist than under the welfarist government, i.e., the other way around compared with the high-productivity type.

### B. *The Non-Normal Case: Redistribution towards the High-Productivity Type*

In line with all earlier studies on optimal redistributive taxation under relative consumption concerns that we are aware of, we have so far assumed that the government wants to redistribute from the high-productivity to the low-productivity type, implying under our assumptions that equation (6) constitutes the relevant self-selection constraint. Yet, one cannot *a priori* rule out other redistribution profiles, suggesting that the case with a binding self-selection constraint on the low-productivity type should also be addressed.[16, 17]

With redistribution from the low-productivity to the high-productivity type, and by retaining the assumption that the high-productivity type has flatter indifference curves in the gross income-consumption space than the low-productivity type, the self-selection constraint that may bind can be written as follows:

$$U^1 = u^1(x^1, z^1, \Delta^1) \geq u^1(x^2, 1-\frac{1}{\phi}l^2, \Delta^2) = \hat{U}^1, \tag{15}$$

meaning that equation (15) replaces equation (6); otherwise, the model is the same as before.

Let $\delta$ denote the Lagrange multiplier attached to equation (15), while $\mu$ and $\gamma$ denote the Lagrange multipliers of the minimum utility restriction on the high-productivity type and resource constraint, respectively, as before. We can then proceed in the same way as in subsection IV.A. Based on the MRS-P and MRS-W

[16] We are grateful to an anonymous referee for suggesting this extension.

[17] We can think of this assumption as the case where the government in a first-best optimum redistributes income from the low-productivity type to the high-productivity one, rather than the other way around; cf. Stiglitz (1982). One motivation, following, e.g., Grossman (1991) and Acemoglu and Robinson (2006, Chapter 5), for analyzing such a case is that non-democratic governments may not care at all about the well-being of a large part of the population but must still keep these people from becoming too disappointed and hence make an uproar with bad consequences for the ruling elite that the government represents. Yet, such a case typically does not fit the model perfectly, since, in non-democratic countries both today and historically, governments have been able to use also other measures than income or consumption to separate different groups from each other, such as hereditary class belonging or ethnicity.

functions used above, we can once again shorten the notation by first characterizing the optimal marginal tax policy implicit in the original Stiglitz (1982) model where there is no corrective motive for taxation and no motive to relax the self-selection constraint via policy-induced changes in the level of reference consumption. For a paternalist government and associated MRS-P functions, and based on the self-selection constraint given in equation (15), we obtain

(16a) $$\tau_P^1 = 0 \text{ and } \tau_P^2 = \frac{\delta \hat{u}_x^1}{\gamma n^1 w^1}\left[ MRS_{z,x}^{P,2} - \frac{1}{\phi} M\hat{R}S_{z,x}^{P,1} \right],$$

while the corresponding formulas for the welfarist government and associated MRS-W functions become:

(16b) $$\tau_W^1 = 0 \text{ and } \tau_W^2 = \frac{\delta (\hat{u}_x^1 + \hat{u}_\Delta^1)}{\gamma n^1 w^1}\left[ MRS_{z,x}^{W,2} - \frac{1}{\phi} M\hat{R}S_{z,x}^{W,1} \right].$$

In a way similar to equations (14a) and (14b), equations (16a) and (16b) just reproduce the marginal tax policy implicit in the Stiglitz (1982) model; albeit in this case with a self-selection constraint imposed on the low-productivity type (instead of the high-productivity type). This means that the marginal tax is zero for the low-productivity type, while the marginal tax for the high-productivity type is typically negative (at least when based on the MRS-W functions). Equations (16a) and (16b) will thus play the same role here as equations (14a) and (14b) did in the normal case examined in subsection IV.A.

Now, define $\alpha^o = \delta(\hat{u}_x^1 + \hat{u}_\Delta^1)(\hat{\alpha}^1 - \alpha^2)/(\gamma N)$ to reflect the difference in positional concerns between the low-productivity mimicker and the (mimicked) high-productivity type. This variable is analogous to $\alpha^d$ in subsection IV.A. The marginal tax policy implemented by the paternalist government can then be characterized as

(17a) $$T'(w^1 l^1)_P = \alpha^1 - (1-\alpha^1)\frac{\delta_P^1}{w^1}\frac{n^2 u_\Delta^1 + n^1 \hat{u}_\Delta^1}{n^1 N},$$

(7b) $$T'(w^2 l^2)_P = \tau_P^2 + (1-\tau_P^2)\alpha^2 + (1-\alpha^2)\frac{\delta_P^2}{w^2}\frac{n^2 u_\Delta^1 + n^1 \hat{u}_\Delta^1}{n^2 N},$$

where $\delta_P^i = \delta\, MRS_{z,c}^{P,i}/\gamma > 0$, while the welfarist government implements the following marginal tax policy:

(18a) $$T'(w^1 l^1)_W = \bar{\alpha} - (1-\bar{\alpha})\frac{\alpha^o}{1-\alpha^o},$$

(18b) $$T'(w^2l^2)_W = \tau_W^2 + (1-\tau_W^2)\bar{\alpha} - (1-\bar{\alpha})(1-\tau_W^2)\frac{\alpha^o}{1-\alpha^o}.$$

Equations (17) and (18) are analogous to their counterparts in the case of redistribution toward the low-productivity type (i.e., Stiglitz' normal case) presented in Proposition 2. Starting with the paternalist policy, note that the final term on the right-hand side of equations (17a) and (17b), respectively, works to reduce the marginal tax rate implemented for the low-productivity type and increase the marginal tax rate implemented for the high-productivity type, i.e., these components thus have the opposite qualitative effects compared with in subsection IV.A. Consequently, equation (17a) implies $T'(w^1l^1)_P < \alpha^1$. The intuition is that the paternalist government may relax the self-selection constraint through a policy-induced increase in the low-productivity type's consumption. Yet, if $\tau_P^2$ is negative, $T'(w^2l^2)_P$ may either exceed or fall short of $\alpha^2$ despite that a policy-induced decrease in the high-productivity type's consumption in itself works to relax the self-selection constraint.

Turning to the welfarist policy, we see that $T'(w^1l^1)_W > 0$ if $\alpha^o \leq 0$. In this case, the mimicked high-productivity type is at least as positional as the mimicker (i.e., $\alpha^2 \geq \hat{\alpha}^1$), which means that a decrease in the level of reference consumption reduces the positional externality without tightening the self-selection constraint. However, if the mimicker is more positional than the high-productivity type ($\hat{\alpha}^1 > \alpha^2$), a decrease in the reference consumption will contribute to tighten the self-selection constraint. Thus, $T'(w^1l^1)_W$ can be either positive or negative, although the latter does not seem a very plausible outcome. For the high-productivity type, the optimal marginal tax rate can also be either positive or negative, since $\tau_W^2 < 0$ by our earlier assumptions and $\bar{\alpha} > 0$. Note also that the corrective tax element implemented for the high-productivity type exceeds the average degree of positionality, i.e., $(1-\tau_W^2)\bar{\alpha} > \bar{\alpha}$, since the subsidy component designed to relax the self-selection constraint ($\tau_W^2$) will contribute to increase the positional externality that each high-productivity individual imposes on other people.

As indicated above, these results are perfectly analogous to those presented in subsection IV.A: the only difference is that equation (15) is designed to deter the low-productivity type from mimicking the high-productivity type (and not the other way around). With a paternalist government, this means that the incentive to relax the self-selection constraint through policy-induced changes in the level of reference consumption gives tax policy responses opposite to those presented in Proposition 2. With a welfarist government, and based on the same argument as in subsection IV.A, the qualitative tax policy response to relative consumption concerns still depends on the difference in the degree of positionality between the mimicker and the mimicked agent.[18] Therefore, in the remainder of the paper, we will follow earlier comparable literature on optimal taxation and relative consumption in focusing on redistribution from the high-productivity to the low-productivity type, where the government wishes to prevent the high-productivity type from mimicking the low-productivity type.

## V. Extension with Alternative Reference Points

As mentioned in the introduction, it is by no means obvious whom people compare their own consumption with. The benchmark model in the previous sections simply follows the convention in most earlier literature in assuming that each consumer compares his/her own consumption with the economy-wide average. Yet, some existing empirical evidence points in the direction of more narrow social comparisons, such that individuals compare their own consumption with that of people who are similar to and/or wealthier than themselves. Consequently, we will here examine how the results presented above will change, and hence the robustness of the above findings, if the mean value comparison is replaced with within-type and upward comparisons.

### A. *Within-type Comparisons and Optimal Income Taxation*

With type-specific social comparisons, the reference consumption will also differ between types in the sense that $x^{1,r} = x^1$ and $x^{2,r} = x^2$. As before, the utility function faced by an individual of productivity type *i* can be written as $U^i = u^i(x^i, z^i, \Delta^i)$, but the relative consumption is now given by $\Delta^i = x^i - x^{i,r}$ for $i$=1,2. Also, recall that each individual consumer is assumed to behave as an atomistic agent in the sense of

[18] In particular, and for the same reason as in subsection IV.A, we cannot rule out a scenario where the mimicker is so much more positional than the mimicked agent that the welfarist government responds to relative consumption concerns by subsidizing labor at the margin.

treating the relevant reference measure as exogenous. The individual's first-order condition for work hours will then remain as in equation (5), with the modification that the reference measure is type specific.

As in Section III and subsection IV.A, we assume that the (paternalist and welfarist) government wants to redistribute from the high-productivity to the low-productivity type. We also assume that the high-productivity mimicker, who pretends to be a low-productivity individual, compares his/her own consumption with the reference point characterizing the low-productivity type, meaning that the utility of the mimicker is given by $\hat{U}^2 = u^2(x^1, 1-\phi l^1, \Delta^1)$.

The decision problem of the *paternalist* government then implies taking the first-order conditions of the following Lagrangean with respect to $l^1$, $x^1$, $l^2$, and $x^2$ (where $K^1$ and $K^2$ are treated as exogenous):

(19)
$$\begin{aligned}\mathcal{L}_P &= u^1(x^1, z^1, K^1) + \mu\left[u^2(x^2, z^2, K^2) - U_0^2\right] \\ &\quad + \lambda\left[u^2(x^2, z^2, \Delta^2) - \hat{u}^2(x^1, 1-\phi l^1, \Delta^1)\right] + \gamma\sum_i n^i(w^i l^i - x^i)\end{aligned}.$$

The first-order conditions for $l^1$ and $l^2$ remain as in equations (9a) and (9c), while those for $x^1$ and $x^2$ become

(20a)
$$u_x^1 - \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2) - \gamma n^1 + \frac{\partial \mathcal{L}_P}{\partial x^{1,r}} = 0,$$

(20b)
$$(\mu + \lambda)u_x^2 + \lambda u_\Delta^2 - \gamma n^2 + \frac{\partial \mathcal{L}_P}{\partial x^{2,r}} = 0,$$

where the final term in each equation measures the partial social welfare effect of increased reference consumption:

(21a)
$$\frac{\partial \mathcal{L}_P}{\partial x^{1,r}} = \lambda \hat{u}_\Delta^2 = \lambda \hat{\alpha}^2(\hat{u}_x^2 + \hat{u}_\Delta^2) > 0,$$

(21b)
$$\frac{\partial \mathcal{L}_P}{\partial x^{2,r}} = -\lambda u_\Delta^2 = -\lambda \alpha^2(u_x^2 + u_\Delta^2) < 0.$$

For purposes of comparison, we also define the corresponding decision problem faced by a *welfarist* government, whose Lagrangean is given by

(22)
$$\begin{aligned}\mathcal{L}_W &= u^1(x^1, z^1, \Delta^1) + \mu\left[u^2(x^2, z^2, \Delta^2) - U_0^2\right] \\ &\quad + \lambda\left[u^2(x^2, z^2, \Delta^2) - \hat{u}^2(x^1, 1-\phi l^1, \Delta^1)\right] + \gamma\sum_i n^i(w^i l^i - x^i)\end{aligned}.$$

The first-order conditions for $x^1$ and $x^2$ can be written as (while the first-order conditions for $l^1$ and $l^2$ are again given by equations [9a] and [9c])

(23a) $$u_x^1 + u_\Delta^1 - \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2) - \gamma n^1 + \frac{\partial \mathcal{L}_W}{\partial x^{1,r}} = 0,$$

(23b) $$(\mu + \lambda)\left(u_x^2 + u_\Delta^2\right) - \gamma n^2 + \frac{\partial \mathcal{L}_W}{\partial x^{2,r}} = 0,$$

where

(24a) $$\frac{\partial \mathcal{L}_W}{\partial x^{1,r}} = \frac{-\gamma n^1 \alpha^1 + \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2)(\hat{\alpha}^2 - \alpha^1)}{1 - \alpha^1} = \gamma n^1 \frac{\alpha^{dd} - \alpha^1}{1 - \alpha^1},$$

(24b) $$\frac{\partial \mathcal{L}_W}{\partial x^{2,r}} = -\gamma n^2 \frac{\alpha^2}{1 - \alpha^2} < 0.$$

In equation (24a), $\alpha^{dd} = \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2)(\hat{\alpha}^2 - \alpha^1) / \gamma n^1$ is a slightly modified measure of the difference in the degree of positionality between the (high-productivity) mimicker and the low-productivity type, which is interpretable in the same general way as its counterpart in Section IV.

Let us once again begin by considering a simplified version of the model, where individual productivity is observable to the government such that the self-selection constraint becomes redundant and $\lambda = 0$, meaning that the optimal tax policies will implement first-best (full information) resource allocations. We derive the following result:

**Proposition 3.** *Suppose that individual productivity is observable to the government and that the relative consumption concerns are based on within-type comparisons. The optimal marginal income tax rates implemented by the paternalist and welfarist governments can then be written as*

$$T'(w^i l^i)_P = \alpha^i$$
$$T'(w^i l^i)_W = \alpha^i$$

*respectively, for all i.*

Proof: See the Appendix.

Proposition 3 does not imply that the marginal income tax rate for each productivity type will take the same numerical value irrespective of whether the government is paternalist or welfarist, since the degrees of positionality are typically endogenous variables (except for very specific forms of the utility function). It means, instead, that the marginal tax rates are based on *exactly the same policy rule* in both cases. The intuition is that $\alpha^i$ measures the relative consumption concerns of an individual of productivity type *i* (which determines the behavioral failure that the paternalist government wants to correct for) as well as the value of the marginal externality that this individual imposes on referent others (which the welfarist government wants to correct for). Thus, a paternalist and welfarist government will use the same policy rule for corrective taxation, although for different reasons.

By analogy to the mean value comparison examined in Section IV, there are functional forms of the utility functions such that the degrees of positionality are independent of the individuals' consumption and leisure time. One set of utility functions that imply a common, parametric degree of positionality is given as follows:

(12') $$U^i = f^i\left(x^i - \alpha x^{i,r}, z^i\right) = f^i\left(x^i(1-\alpha) + \alpha(x^i - x^{i,r}), z^i\right).$$

For such preferences, the paternalist and welfarist governments implement the same marginal tax policy also in level terms.

Turning to the more general second-best setting where individual productivity is private information, the policy rules presented in Proposition 3 will be modified, since both the paternalist and welfarist government have incentives to relax the self-selection constraint through tax policy. This is described in Proposition 4 below:

**Proposition 4.** *Suppose that the relative consumption concerns are based on within-type comparisons. The second-best optimal marginal income tax rates implemented by a paternalist government can then be written as*

$$T'(w^1l^1)_P = \tau_P^1 + (1-\tau_P^1)\alpha^1,$$

$$T'(w^2l^2)_P = \alpha^2,$$

*while a welfarist government implements the following second-best optimal marginal income tax rates:*

$$T'(w^1l^1)_W = \tau_W^1 + (1-\tau_W^1)\alpha^1 - (1-\alpha^1)(1-\tau_W^1)\frac{\alpha^{dd}}{1-\alpha^{dd}},$$

$$T'(w^2l^2)_W = \alpha^2.$$

Proof: See the Appendix.

First, note that the marginal income tax rate implemented for the high-productivity type is still based on the first-best policy rule, measured by the type-specific degree of positionality, both in the paternalist and welfarist cases. This is so because if the relative consumption concerns are based on within-type comparisons, the allocation chosen for the high-productivity type will not directly affect the utility faced by the mimicker, i.e., $x^{1,r}$ does not directly depend on $x^2$. Second, the policy rules for marginal income taxation of the low-productivity type closely resemble those under mean value comparisons, with the exception that the externalities are type specific in the welfarist case.

Finally, note that the third policy incentive that we described in the context of mean value comparisons (i.e., policy-induced changes in the reference consumption to relax the self-selection constraint) does not affect the marginal income tax rates implemented by a paternalist government under within-type comparisons. The intuition is simply that direct effects of $x^1$ and $x^2$ on the self-selection constraint exactly cancel out the corresponding indirect effects via $x^{1,r}$ and $x^{2,r}$, respectively, meaning that the paternalist government cannot relax the self-selection constraint through policy-induced changes in the levels of reference consumption. In contrast, in the welfarist tax formula for the low-productivity type, there is still an incentive to relax the self-selection constraint through changes in the level of $x^{1,r}$, which depends on the difference in the degree of positionality between the mimicker and the low-productivity type. This component has the same interpretation as in the corresponding tax formula based on mean-value comparisons. Yet, if we assume preferences consistent with equation (12), the last term in the welfarist tax formula for the low-productivity type vanishes. This would imply that the welfarist and paternalist formulas have exactly the same structure for both types.

### B. *Briefly on Upward Comparisons*

As mentioned in the introduction, Micheletto (2011) compares paternalist and welfarist tax policy under upward social comparisons. He considers a model where each consumer compares his/her consumption with that of the adjacent higher productivity type, meaning that individuals of the highest productivity type are not concerned about their relative consumption. Consequently, he finds that individuals of the highest productivity type face lower marginal income tax rates under paternalism than welfarism, since these individuals cause positional externalities without having preferences for relative consumption. The opposite holds for individuals of the lowest productivity type, who are concerned about their relative consumption without causing any positional externalities. Therefore, upward comparisons constitute an extreme case in the sense of giving rise to potentially much larger differences between paternalist and welfarist policy than the comparison forms addressed above.

Let us here consider another, and equally plausible, variant of the upward comparison where all consumers compare their own consumption with that of the high-productivity type. A similar approach to modeling upward comparisons was employed by Aronsson and Johansson-Stenman (2010) under the assumption of a welfarist government, and we shall here contrast the marginal income tax rates chosen by a welfarist government with the marginal income tax rates implemented by a paternalist government.[19] In doing this, we have a common reference measure for all consumers, $x^r = x^2$, which means that only the high-productivity type gives rise to positional externalities, whereas all consumers are concerned about their relative consumption (i.e., the keeping-up-with-the-Joneses motive also exists among high-productivity individuals). Compared with the first-order conditions of the benchmark model in Sections III and IV, the only differences are that $\partial x^r / \partial x^1 = 0$ (instead of $n^1 / N$) and $\partial x^r / \partial x^2 = 1$ (instead of $n^2 / N$), resulting in a slight modification compared with equations (9b), (9d), (9b'), and (9d').

As seen above, the first-best policy rules for the paternalist government always take the same form, i.e., $T'(w^i l^i)_P = \alpha^i$ for $i$=1,2, irrespective of comparison form. In addition, and since all positional externalities are generated by the high-productivity type under upward comparison, a first-best policy for a welfarist government does not contain any corrective tax imposed on the low-productivity type. Therefore, we settle here by briefly characterizing the second-best policy.

**Proposition 5.** *Suppose that the relative consumption concerns are based on upward comparisons such that* $x^r = x^2$. *The second-best optimal marginal income tax rates implemented by a paternalist government can then be written as*

$$T'(w^1 l^1)_P = \tau_P^1 + (1-\tau_P^1)\alpha^1,$$

[19] Aronsson and Johansson-Stenman (2010) analyze an OLG model where each consumer lives for two periods. In their model, all young consumers compare their current consumption with the current consumption of the young high-productivity type, and all old consumers compare their current consumption with the current consumption of the old high-productivity type.

$$T'(w^2l^2)_P = \alpha^2 - (1-\alpha^2)\frac{\lambda_P^2}{n^2w^2}\hat{u}_\Delta^2,$$

*where* $\lambda_P^2 > 0$*,*[20] *while a welfarist government implements the following second-best optimal marginal income tax rates:*

$$T'(w^1l^1)_W = \tau_W^1,$$

$$T'(w^2l^2)_W = \frac{1}{\omega}\frac{N}{n^2}\frac{\alpha^2-\alpha^d}{1-\alpha^2},$$

*where* $\omega = \dfrac{1-\alpha^2+(N/n^2)(\bar{\alpha}-\alpha^d)}{(1-\alpha^2)}$.

The proof of Proposition 5 is analogous to the proofs of Propositions 2 and 4 and is therefore omitted. With a welfarist policy objective, there is no corrective component in the marginal income tax rate faced by the low-productivity type, since low-productivity individuals do not generate any positional externalities. Conversely, the marginal income tax rate implemented for the high-productivity type reflects both externality correction and an incentive to relax the self-selection constraint through policy-induced changes in the level of reference consumption (the sign of the latter effect is ambiguous and depends on $\alpha^d$).

Turning to the marginal income tax rates implemented by the paternalist government, at least three things are worth noting. First, the paternalist government has an incentive to use corrective taxation for both productivity types since both are concerned with their relative consumption (even if only the high-productivity type contributes to the externality). Second, if we assume (as we did above) that $\tau_P^1 > 0$, the marginal income tax rate is higher for the low-productivity type and lower for the high-productivity type than would follow from a first-best tax policy to correct for behavioral failures, i.e., we have $T'(w^1l^1)_P > \alpha^1$ and $T'(w^2l^2)_P < \alpha^2$. Third, while the welfarist results are also close to those presented in Micheletto (2011), the paternalist tax policy presented above differs from his results as he assumes that the highest productivity type is not concerned with relative consumption (in which case the first term on the right-hand side of the tax formula vanishes).

[20] See Proposition 2.

## VI. Numerical Simulations

In this section, we illustrate the main theoretical results by using numerical simulations.[21] In doing so we are also able to compare the welfarist and paternalist governments with respect to the *levels* of marginal tax rates (not only with respect to tax policy *rules*) as well as shed light on the implications of positional concerns for the optimal amount of redistribution from high-productivity to low-productivity individuals.

Yet, it should be noted that all our theoretical results derived so far are based on the very general governmental objective of obtaining a Pareto-efficient allocation. Thus, the optimal marginal tax policy rules presented above are necessary conditions for maximizing *any* social welfare function that fulfills the Pareto criterion. When addressing the levels of marginal (and average) tax rates, it should be obvious that these levels generally depend on which specific social welfare function we choose. We will in this section solely consider one specific social welfare function, namely the frequently used unweighted utilitarian one. Thus, we assume that the government maximizes

(25) $$W = n^1 U^1 + n^2 U^2 .$$

Two different functional forms of the utility function, $U^i$, will be used. Our benchmark utility function is characterized by a constant degree of positionality for all (including the mimicker) equal to $\alpha$ and given by

(26) $$U^i = \ln\left(x^i - \alpha x^r\right) + \beta \ln z^i .$$

Our alternative utility function is defined as

(27) $$U^i = \ln x^i + \eta \ln\left(x^0 + x^i - x^r\right) + \beta \ln z^i ,$$

where $\eta$ is the utility weight attached to the relative consumption. Equation (27) thus implies that the degree of positionality may vary between types and consumption levels. For the special case where the degrees of positionality are equal to zero (i.e., in

[21] All simulations are based on the two-type models examined in the theoretical sections. The simulations should thus not be seen as trying to mimic real economies. For example, it is well-known that the zero marginal tax rate on the highest productivity type (in the absence of positional concerns) does not typically reflect a good approximation of the optimal marginal tax rates of income levels close to the top one in a multi-type model.

the absence of any relative consumption concerns), both utility functions reduce to read $U^i = \ln x^i + \beta \ln z^i$, meaning that they are nested in this particular sense.

For both these utility specifications, we consider the three different reference consumption levels that we have dealt with theoretically, i.e., the economy-wide mean consumption level, the type-specific mean consumption level, and the mean consumption level of the high-productivity type.

In all simulations, we will use the same set of parameter values as follows: $\beta = 1, n^1 = 750, n^2 = 250, w^1 = 30, w^2 = 100$, together with a time endowment equal to one, and for the second specification in addition that $x^0 = w^1 = 30$.[22] We present the results based on different estimates of the average degree of positionality, taking the values of 0, 0.2, 0.5 and 0.8, respectively. In this way we will cover both the more modest values corresponding to questionnaire-based research and the high value of 0.8 consistent with some results in happiness-based research as well as some broader discussion within the social sciences. Furthermore, we test whether the self-selection constraint for the high-productivity type binds (which it does in all cases) and whether the self-selection constraint for the low-productivity type binds (which it never does). All numerical simulations are undertaken using the *Mathematica* software.

### A. *Simulation Results for the Benchmark Utility Function*

We start by analyzing the case with economy-wide mean comparisons, followed in turn by within-type comparisons and upward comparisons.

*The Benchmark Utility Function and Mean Value Comparisons.* The paternalist government would here maximize social welfare based on the utility function $U^i = \ln\left((1-\alpha)x^i + K^i)\right) + \beta \ln z^i$ for exogenous $K^i$:s, while the welfarist government would instead maximize social welfare based on the utility function $U^i = \ln\left((1-\alpha)x^i + \alpha(x^i - \bar{x})\right) + \beta \ln z^i = \ln\left(x^i - \alpha\bar{x}\right) + \beta \ln z^i$. The social optimum

[22] Note that all results presented in this section are independent of the number of individuals in the economy, implying, e.g., that the results would remain the same with $n^1 = 750 \cdot 10^6, n^2 = 250 \cdot 10^6$. Similarly, if the wage levels, together with $x^0$, would be multiplied by any constant, the resulting consumption levels in the optimal allocation would be multiplied by the same constant, while all other reported results would remain unaffected.

conditions are derived in the same way as in the more general models addressed earlier in the paper. In the Appendix, we describe how the marginal tax formulas are derived by combining the social first-order conditions with the private optimum condition for work hours.

Table 1 below shows that the allocation of consumption and leisure as well as the marginal and average tax rates are the same for both governments in the absence of any positional concerns.

TABLE 1--OPTIMAL MARGINAL AND AVERAGE TAX RATES AND CORRESPONDING LEVELS OF CONSUMPTION AND LEISURE BASED ON THE BENCHMARK UTILITY FUNCTION WITH MEAN VALUE COMPARISONS.

| Positionality | Consumption | | Leisure | | Average tax rates | | Marginal tax rates | |
|---|---|---|---|---|---|---|---|---|
| $\alpha$ | $x^1$ | $x^2$ | $z^1$ | $z^2$ | $T^A(w^1l^1)$ | $T^A(w^2l^2)$ | $T'(w^1l^1)$ | $T'(w^2l^2)$ |
| | | | | Paternalist Government | | | | |
| 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.2 | 17.8 | 37.6 | 0.70 | 0.36 | -0.95 | 0.41 | 0.37 | 0.09 |
| 0.5 | 20.2 | 35.4 | 0.68 | 0.32 | -1.19 | 0.48 | 0.61 | 0.26 |
| 0.8 | 24.1 | 32.2 | 0.67 | 0.25 | -1.43 | 0.57 | 0.84 | 0.55 |
| | | | | Welfarist Government | | | | |
| 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.2 | 17.7 | 35.5 | 0.70 | 0.39 | -0.94 | 0.42 | 0.36 | 0.20 |
| 0.5 | 19.4 | 30.5 | 0.70 | 0.39 | -1.12 | 0.50 | 0.60 | 0.50 |
| 0.8 | 21.0 | 25.5 | 0.70 | 0.39 | -1.30 | 0.58 | 0.84 | 0.80 |

As the degree of positionality increases, both the welfarist and paternalist governments respond by increasing the marginal income tax rates, which is in line with numerical findings in previous studies referred to in Section I. In the welfarist case, the marginal tax rate facing the high-productivity type equals the (unanimous) degree of positionality, whereas the paternalist government implements a marginal tax on the high-productivity type that falls below this degree. This follows directly from Proposition 2 in combination with equation (26). The marginal tax rates implemented for the low-productivity type are roughly the same under welfarism and paternalism. We can also note that increasing the degree of positionality strongly increases the optimal amount of redistribution regardless of government, where the average tax rates (defined as net tax payment divided by the before-tax income) are fairly similar for the two governments. The pattern with respect to redistribution is mixed in the sense that the consumption among high-productivity individuals decreases more with the welfarist government as the degree of positionality increases, while the consumption among low-productivity individuals increases more with the paternalist government. As a consequence, the optimal allocation of consumption and leisure differs more between the two governments when the degrees of positionality are high than when they are low.

TABLE 1--OPTIMAL MARGINAL AND AVERAGE TAX RATES AND CORRESPONDING LEVELS OF CONSUMPTION AND LEISURE BASED ON THE BENCHMARK UTILITY FUNCTION WITH MEAN VALUE COMPARISONS.

| Positionality | Consumption | | Leisure | | Average tax rates | | Marginal tax rates | |
|---|---|---|---|---|---|---|---|---|
| $\alpha$ | $x^1$ | $x^2$ | $z^1$ | $z^2$ | $T^A(w^1l^1)$ | $T^A(w^2l^2)$ | $T'(w^1l^1)$ | $T'(w^2l^2)$ |
| | | | | Paternalist Government | | | | |
| 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.2 | 17.8 | 37.6 | 0.70 | 0.36 | -0.95 | 0.41 | 0.37 | 0.09 |
| 0.5 | 20.2 | 35.4 | 0.68 | 0.32 | -1.19 | 0.48 | 0.61 | 0.26 |
| 0.8 | 24.1 | 32.2 | 0.67 | 0.25 | -1.43 | 0.57 | 0.84 | 0.55 |
| | | | | Welfarist Government | | | | |
| 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.2 | 17.7 | 35.5 | 0.70 | 0.39 | -0.94 | 0.42 | 0.36 | 0.20 |
| 0.5 | 19.4 | 30.5 | 0.70 | 0.39 | -1.12 | 0.50 | 0.60 | 0.50 |
| 0.8 | 21.0 | 25.5 | 0.70 | 0.39 | -1.30 | 0.58 | 0.84 | 0.80 |

*The Benchmark Utility Function and Within-Type Comparisons.* A welfarist government, as well as individuals, would here base their maximizations on the utility function $U^i = \ln\left(x^i - \alpha\bar{x}^i\right) + \beta \ln z^i$, while the objective of the paternalist government remains the same as above. Based on Proposition 4, together with the fact that equation (26) implies $\alpha^{dd} = 0$ and $\tau_P^1 = \tau_W^1$, it follows that the optimal marginal tax rates will be the same for both governments. We also show in the Appendix that the optimum conditions for the different governments will coincide such that the allocations as well as the average tax rates will also coincide.

Consistent with Proposition 4, Table 2 shows that the optimal marginal income tax rate for the high-productivity type equals the (type-specific as well as average) degree of positionality, while the marginal tax rate for low-productivity individuals exceeds this degree of positionality. Moreover, both the optimum allocation of consumption and leisure and the average tax rates are independent of the degree of positionality. This means that regardless of whether the government is paternalist or welfarist, and regardless of the degree of positionality, the optimal allocation of consumption and labor as well as the optimal degree of redistribution is the same. This illustrates that one cannot make general claims that relative consumption comparisons will increase the optimum amount of redistribution, which the results in Table 1 might seem to suggest.

TABLE 2--OPTIMAL MARGINAL AND AVERAGE TAX RATES AND CORRESPONDING LEVELS OF CONSUMPTION AND LEISURE BASED ON THE BENCHMARK UTILITY FUNCTION WITH WITHIN-TYPE COMPARISONS.

| Positionality | Consumption | | Leisure | | Average tax rates | | Marginal tax rates | |
|---|---|---|---|---|---|---|---|---|
| $\alpha$ | $x^1$ | $x^2$ | $z^1$ | $z^2$ | $T^A(w^1l^1)$ | $T^A(w^2l^2)$ | $T'(w^1l^1)$ | $T'(w^2l^2)$ |
| Paternalist Government and Welfarist Government (identical results) | | | | | | | | |
| 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.2 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.36 | 0.20 |
| 0.5 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.60 | 0.50 |
| 0.8 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.84 | 0.80 |

*The Benchmark Utility Function and Upward Comparisons.* The utility function facing an individual of productivity-type $i$ now reads $U^i = \ln\left(x^i - \alpha\bar{x}^2\right) + \beta \ln z^i$, which is also the utility function that the welfarist government bases the social welfare function on. As implied by Proposition 5, we can see in Table 3 that the marginal tax rate implemented for the high-productivity type falls short of the degree of positionality under a paternalist government, while it exceeds the degree of positionality under a welfarist government (since the simulation assumes $N / n^2 > 1$ and the benchmark utility function implies $\alpha^2 = \bar{\alpha} = \alpha$). Note also that the marginal tax rate for the high-productivity type is negative under a paternalist government as long as $\alpha > 0$, despite that this government would have taxed away any positional concerns in a full information setting. This exemplifies a case where the policy response to asymmetric information dominates: a marginal labor subsidy to the high-productivity type contributes to relax the self-selection constraint under the paternalist government and opens up for more redistribution.

Regarding the low-productivity type, only the paternalist government has an incentive to correct this type's behavior, since the low-productivity type does not generate any positional externalities if the positional concerns are driven by upward comparisons. Consistent with this, we can see in Table 3 that the marginal income tax rate implemented for the low-productivity type is higher with a paternalist than a welfarist government. However, despite that the low-productivity type does not generate any positional externalities, such that the welfarist government always chooses $T'(w^1l^1)_W = \tau_W^1$ irrespective of the degree of positionality according to Proposition 5, we can see that the marginal tax rate that the welfarist government implements for the low-productivity type nevertheless increases strongly with the degree of positionality. This may seem surprising, but the intuition is quite straightforward: To be able to redistribute additional tax revenue (raised by taxing the high-productivity type because this type generates externalities) in favor of the low-productivity type, the welfarist government must relax the self-selection constraint, which it does through higher marginal taxation of the low-productivity type. Consequently, the tax distortion imposed on the low-productivity type increases with the degree of positionality.[23]

TABLE 3--OPTIMAL MARGINAL AND AVERAGE TAX RATES AND CORRESPONDING LEVELS OF CONSUMPTION AND LEISURE BASED ON THE BENCHMARK UTILITY FUNCTION WITH UPWARD COMPARISONS.

| Positionality | Consumption | | Leisure | | Average tax rates | | Marginal tax rates | |
|---|---|---|---|---|---|---|---|---|
| $\alpha$ | $x^1$ | $x^2$ | $z^1$ | $z^2$ | $T^A(w^1l^1)$ | $T^A(w^2l^2)$ | $T'(w^1l^1)$ | $T'(w^2l^2)$ |
| Paternalist Government | | | | | | | | |
| 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.2 | 20.0 | 40.8 | 0.63 | 0.32 | -0.82 | 0.40 | 0.38 | -0.01 |
| 0.5 | 27.5 | 44.3 | 0.47 | 0.20 | -0.75 | 0.44 | 0.62 | -0.09 |
| 0.8 | 39.3 | 48.1 | 0.19 | 0.07 | -0.62 | 0.48 | 0.85 | -0.44 |
| Welfarist Government | | | | | | | | |
| 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.2 | 18.4 | 29.5 | 0.64 | 0.47 | -0.72 | 0.44 | 0.35 | 0.50 |
| 0.5 | 19.0 | 23.0 | 0.58 | 0.57 | -0.52 | 0.46 | 0.57 | 0.80 |
| 0.8 | 18.7 | 19.6 | 0.53 | 0.67 | -0.33 | 0.42 | 0.81 | 0.94 |

The pattern with respect to redistribution is mixed. By increasing the degree of positionality, the optimal consumption decreases among high-productivity individuals and increases among low-productivity individuals with a welfarist government, while

[23] In a first-best economy, a welfarist government with a utilitarian objective would implement a social optimum allocation where low-productivity individuals consume more than the high-productivity individuals (since consumption by the latter, but not the former, generates negative externalities), and this discrepancy increases with the degree of positionality. Yet, the self-selection constraint prevents this in a second-best world. It therefore follows that the higher the degree of positionality, the higher the shadow price associated with the self-selection constraint and hence the marginal tax rate of the low-productivity type.

the optimal consumption for both types increases with a paternalist government (the marginal labor subsidy toward the high-productivity type leads to a large increase in this type's gross income, part of which is redistributed to the low-productivity type). We can also observe large differences in average taxes and leisure.

### B. *Simulation Results for the Alternative Utility Function*

We will once again start by considering economy-wide mean comparisons, followed in turn by within-type comparisons and upward comparisons. Since the individual degree of positionality is endogenous in this case, we will choose parameter values of $\eta$ such that the average degree of positionality equals 0, 0.2, 0.5, and 0.8, respectively.

*The Alternative Utility Function and Mean Value Comparisons.* The welfarist government uses the individuals' own utility function $U^i = \ln x^i + \eta \ln\left(x^0 + x^i - \bar{x}\right) + \beta \ln z^i$ when forming the social welfare function according to equation (25), whereas the paternalist government instead uses $U^i = \ln x^i + \beta \ln z^i$. In accordance with Proposition 2, Table 4 shows that the marginal tax rate for the high-productivity type equals the average degree of positionality with a welfarist government (since the functional form of the utility function means that the mimicker and the low-productivity type are equally positional) and is slightly lower for the paternalist one. For the low-productivity type, the marginal tax rate is identical for the two governments and somewhat higher than the average degree of positionality. The amount of redistribution from high-productivity to low-productivity individuals increases substantially when the degree of positionality increases, and is of a similar magnitude for both governments.

TABLE 4--OPTIMAL MARGINAL AND AVERAGE TAX RATES AND CORRESPONDING LEVELS OF CONSUMPTION AND LEISURE BASED ON THE ALTERNATIVE UTILITY FUNCTION WITH MEAN-VALUE COMPARISONS.

| Positionality weight | Individual positionality | | Average positionality | Consumption | | Leisure | | Average tax rates | | Marginal tax rates | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\eta$ | $\alpha^1$ | $\alpha^2$ | $\bar{\alpha}$ | $x^1$ | $x^2$ | $z^1$ | $z^2$ | $T^A(w^1l^1)$ | $T^A(w^2l^2)$ | $T'(w^1l^1)$ | $T'(w^2l^2)$ |
| | | | | Paternalist Government | | | | | | | |
| 0 | 0 | 0 | 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.34 | 0.19 | 0.22 | 0.20 | 17.7 | 38.4 | 0.71 | 0.34 | -1.06 | 0.42 | 0.33 | 0.13 |
| 1.29 | 0.49 | 0.52 | 0.50 | 19.7 | 35.3 | 0.75 | 0.28 | -1.60 | 0.51 | 0.55 | 0.41 |
| 5.07 | 0.80 | 0.81 | 0.80 | 22.1 | 28.8 | 0.78 | 0.25 | -2.38 | 0.62 | 0.81 | 0.77 |
| | | | | Welfarist Government | | | | | | | |
| 0 | 0 | 0 | 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.34 | 0.19 | 0.22 | 0.20 | 17.7 | 37.0 | 0.71 | 0.36 | -1.04 | 0.42 | 0.33 | 0.20 |
| 1.32 | 0.49 | 0.52 | 0.50 | 19.6 | 33.1 | 0.74 | 0.32 | -1.49 | 0.52 | 0.55 | 0.50 |
| 5.14 | 0.80 | 0.81 | 0.80 | 21.9 | 28.0 | 0.77 | 0.27 | -2.16 | 0.62 | 0.81 | 0.80 |

*The Alternative Utility Function and Within-Type Comparisons.* The individual utility function is now given by $U^i = \ln x^i + \eta \ln\left(x^0 + x^i - \bar{x}^i\right) + \beta \ln z^i$, which is also the basis for the social welfare function used by the welfarist government. The paternalist government uses the same social welfare function as in the previous subsection. From Table 5 below shows that, similar to the within-type comparison with the benchmark utility function, the optimum conditions for the different governments will coincide such that the allocations as well as the marginal and average tax rates will be identical between the governments. Thus, relative consumption concerns have no impact on the optimal redistribution. In line with Proposition 5, the marginal tax rate implemented for the high-productivity type coincides with the type-specific degree of positionality, while the rate facing the low-productivity type exceeds the type-specific degree of positionality.

TABLE 5--OPTIMAL MARGINAL AND AVERAGE TAX RATES AND CORRESPONDING LEVELS OF CONSUMPTION AND LEISURE BASED ON THE ALTERNATIVE UTILITY FUNCTION WITH WITHIN-TYPE COMPARISONS.

| Positionality weight | Individual positionality | | Average positionality | Consumption | | Leisure | | Average tax rates | | Marginal tax rates | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\eta$ | $\alpha^1$ | $\alpha^2$ | $\bar{\alpha}$ | $x^1$ | $x^2$ | $z^1$ | $z^2$ | $T^A(w^1l^1)$ | $T^A(w^2l^2)$ | $T'(w^1l^1)$ | $T'(w^2l^2)$ |
| Paternalist Government and Welfarist Government (identical results) | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.35 | 0.16 | 0.31 | 0.20 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.33 | 0.31 |
| 1.47 | 0.44 | 0.66 | 0.50 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.56 | 0.66 |
| 6.09 | 0.77 | 0.88 | 0.80 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.82 | 0.88 |

*The Alternative Utility Function and Upward Comparisons.* This case implies that $U^i = \ln x^i + \alpha \ln\left(x^0 + x^i - \bar{x}^2\right) + \beta \ln z^i$, on which the welfarist government bases the social welfare function according to equation (25). The objective of the paternalist government is again the same as before. Table 6 gives the same qualitative picture as Table 3 (where we presented numerical results for the benchmark utility function under upward comparisons) with one important difference: the marginal tax rate that the paternalist government implements for the high-productivity type is typically positive in Table 6 (with one exception). As a consequence, this government's incentive to correct the high-productivity type's behavior (for the influence of positional concerns) is no longer always dominated by the incentive to relax the self-selection constraint. Otherwise, the results are similar to those presented in Table 3, and the marginal tax policy implied by Table 6 is clearly consistent with the prediction in Proposition 5.

Turning to the redistribution of consumption between productivity types, we can see that the consumption for high-productivity individuals decreases more with the welfarist government as the degree of positionality increases, while the consumption for low-productivity individuals increases more with the paternalist government. We can also observe opposing patterns with respect to the relationship between leisure and the average degree of positionality for the two governments. For the paternalist government, leisure increases for the low-productivity type and decreases for the high-productivity type as the degree of positionality increases, while the pattern is the opposite for the welfarist government. Moreover, contrary to the mean value comparison case addressed in Table 4, the upward comparison case illustrates that the optimal consumption-leisure allocations may differ substantially between the two governments, also when the equilibrium degrees of positionality are the same.

TABLE 6--OPTIMAL MARGINAL AND AVERAGE TAX RATES AND CORRESPONDING LEVELS OF CONSUMPTION AND LEISURE BASED ON THE ALTERNATIVE UTILITY FUNCTION WITH UPWARD COMPARISONS.

| Positionality weight | Individual positionality | | Average positionality | Consumption | | Leisure | | Average tax rates | | Marginal tax rates | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\eta$ | $\alpha^1$ | $\alpha^2$ | $\bar{\alpha}$ | $x^1$ | $x^2$ | $z^1$ | $z^2$ | $T^A(w^1l^1)$ | $T^A(w^2l^2)$ | $T'(w^1l^1)$ | $T'(w^2l^2)$ |
| | | | | Paternalist Government | | | | | | | |
| 0 | 0 | 0 | 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.11 | 0.22 | 0.13 | 0.20 | 17.4 | 40.6 | 0.71 | 0.33 | -1.01 | 0.39 | 0.36 | -0.06 |
| 0.70 | 0.51 | 0.46 | 0.50 | 19.6 | 36.6 | 0.75 | 0.27 | -1.58 | 0.50 | 0.58 | 0.28 |
| 4.20 | 0.80 | 0.80 | 0.80 | 22.1 | 28.9 | 0.78 | 0.24 | -2.38 | 0.62 | 0.81 | 0.77 |
| | | | | Welfarist Government | | | | | | | |
| 0 | 0 | 0 | 0 | 16.6 | 38.8 | 0.70 | 0.39 | -0.82 | 0.37 | 0.21 | 0.00 |
| 0.26 | 0.20 | 0.20 | 0.20 | 17.5 | 29.4 | 0.68 | 0.47 | -0.82 | 0.44 | 0.31 | 0.50 |
| 1.38 | 0.50 | 0.51 | 0.50 | 18.3 | 22.8 | 0.62 | 0.57 | -0.60 | 0.47 | 0.51 | 0.80 |
| 6.26 | 0.80 | 0.80 | 0.80 | 18.5 | 19.5 | 0.55 | 0.66 | -0.83 | 0.44 | 0.77 | 0.94 |

### *C. Summary of Simulation Results*

We would like to summarize the numerical results as follows. First, both the paternalist and welfarist governments typically respond to relative consumption concerns through higher marginal tax rates, although exceptions arise in the case of upward comparisons. Our theoretical decomposition of the policy rules for marginal taxation in Sections III–V enables us to relate the simulation results, and in particular the comparison between the two governments, to differences and similarities in these underlying policy rules. As expected from the theoretical analysis, although the two governments have different motives for intervention, the marginal tax policy may be very similar (and even identical as in the case of within-type comparisons). We have also seen that upward comparisons give rise to much larger differences between the paternalist and welfarist governments in terms of marginal tax policy than the other two comparison forms. Second, both governments redistribute income to a large extent. The simulations based on mean value and upward comparisons, respectively, indicate that the more people are concerned with their relative consumption (i.e., the higher the degrees of positionality), the larger the optimal amount of redistribution from the high-productivity to the low-productivity type, whereas the optimal redistribution is independent of positional concerns under within-type comparisons, based on our functional form assumptions. Therefore, although relative concerns may motivate more redistribution, the simulations presented here illustrate that this is not always the case.

## VII. Conclusion

This paper analyzes the income tax policy implications of relative consumption concerns from the perspective of a paternalist government, which does not share the consumer preferences for such concerns, and also compares the policy outcome with that following from a traditional welfarist government. The analysis is based on a model with two productivity types and nonlinear income taxation, where we examine the first-best corrective tax policy implemented by each type of government as well as the second-best policies that follow under asymmetric information about individual productivity.

There is one major take-away message from the present paper: Although the tax policy motives differ in a fundamental way between paternalist and welfarist governments, the policy rules for optimal income taxation may be remarkably similar. Indeed, in a first-best setting, where individual productivity is observable, we show that welfarist and paternalist governments implement exactly the same policy rules for marginal income taxation if either of the following two conditions is fulfilled: 1. The relative consumption concerns are driven by mean value comparisons and the consumers are equally positional. 2. The relative consumption concerns are driven by within-type comparisons (regardless of whether the consumers are equally positional). The intuition is that the externality that each individual imposes on other people (which is of importance for the welfarist government) coincides with the individual's own behavioral failure as perceived by the paternalist government. Moreover, these results are straightforward to generalize to a case with more than two productivity types. Consequently, it is not necessarily important for the policy outcome whether the government aims at correcting for positional externalities or tries to make the consumers behave as if they were not concerned with their relative consumption.

In a second-best world, there are somewhat larger differences in marginal tax policy between the paternalist and welfarist governments, since the welfare effect of increased reference consumption only works through the self-selection constraint in the paternalist case. Nevertheless, the major conclusion above holds also in the second-best case, i.e., there are no a priori reasons why social comparisons would affect the marginal income tax rates more with a welfarist than with a paternalist government. Here too, the basic insights can be generalized to a case with many productivity types. Moreover, we show that this conclusion prevails also with alternative reference points such that individuals instead compare their consumption with others of their own type or solely with those displaying the highest consumption level. Finally, extensive numerical simulations also confirm this conclusion. To conclude, also a government that does not respect individual preferences for relative consumption comparisons, but acknowledges that such comparisons exist, should in general make important modifications to the optimal tax policy in response to such comparisons.

## Appendix
## Mean value comparisons

In the paternalist case, the partial welfare effect of increased reference consumption follows from differentiation of $\mathcal{L}_P$ with respect to $\bar{x}$, i.e.,

$$\text{(A1)} \qquad \frac{\partial \mathcal{L}_P}{\partial \bar{x}} = \lambda\left[-u_\Delta^2 + \hat{u}_\Delta^2\right] = \lambda\left[-\alpha^2(u_x^2 + u_\Delta^2) + \hat{\alpha}^2(\hat{u}_x^2 + \hat{u}_\Delta^2)\right],$$

which is equation (13a). For the welfarist government, the corresponding expression reads

$$\text{(A2)} \qquad \begin{aligned} \frac{\partial \mathcal{L}_W}{\partial \bar{x}} &= -u_\Delta^1 - \mu u_\Delta^2 + \lambda\left[-u_\Delta^2 + \hat{u}_\Delta^2\right] \\ &= -(u_x^1 + u_\Delta^1)\alpha^1 - (\mu + \lambda)(u_x^2 + u_\Delta^2)\alpha^2 + \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2)\hat{\alpha}^2 \end{aligned}.$$

Solving equation (9b’) for $u_x^1 + u_\Delta^1$ and equation (9d’) for $(\mu + \lambda)(u_x^2 + u_\Delta^2)$ and then substituting into equation (A2) gives equation (13b).■

*Proof of Propositions 1 and 2*

Consider first the low-productivity type. For the paternalist case, combining equations (9a) and (9b) gives

$$\text{(A3)} \qquad \begin{aligned} \gamma n^1(w^1 - MRS_{z,x}^{P,1}) &= \lambda \hat{u}_x^2\left[MRS_{z,x}^{P,1} - \phi M\hat{R}S_{z,x}^{P,2}\right] \\ &\quad + MRS_{z,x}^{P,1}\left[\lambda \hat{u}_\Delta^2 - \frac{n^1}{N}\lambda(-u_\Delta^2 + \hat{u}_\Delta^2)\right] \end{aligned}.$$

Then, using equation (5) to derive

$$w^1 - MRS_{z,x}^{P,1} = w^1 T'(w^1 l^1)_P - MRS_{z,x}^{P,1}\alpha^1,$$

substituting into equation (A3), and rearranging gives the marginal income tax rate for the low-productivity type in Proposition 2 under a paternalist policy. The marginal income tax rate for the high-productivity type can be derived in the same general way by combining equations (5), (9c), and (9d).

With a welfarist policy, the marginal income tax rate for the low-productivity type is based on equations (9a) and (9b’). Combining these equations gives

$$\text{(A4)} \qquad \gamma n^1(w^1 - MRS_{z,x}^{W,1}) = \lambda(\hat{u}_x^2 + \hat{u}_\Delta^2)\left[MRS_{z,x}^{W,1} - \phi M\hat{R}S_{z,x}^{W,2}\right] - MRS_{z,x}^{W,1}\frac{n^1}{N}\frac{\partial \mathcal{L}_W}{\partial \bar{x}}.$$

Using $w^1 - MRS_{z,x}^{W,1} = w^1 T'(w^1 l^1)_W$ and the expression for $\partial \mathcal{L}_W / \partial \bar{x}$ in equation (13b), substituting into equation (A4), and rearranging gives the marginal income tax rate implemented for the low-productivity type in Proposition 2 under a welfarist policy. Again, the marginal income tax rate of the high-productivity type can be derived in an analogous way by combining equations (5), (9c), and (9d'). Finally, note that the marginal income tax rates in Proposition 1 follow as the special case where $\lambda = 0$.■

**Within-type comparisons**

By using equation (19), we can immediately derive

(A5a) $$\frac{\partial \mathcal{L}_P}{\partial x^{1,r}} = \lambda \hat{u}_\Delta^2 = \lambda \hat{\alpha}^2 (\hat{u}_x^2 + \hat{u}_\Delta^2) > 0$$

(A5b) $$\frac{\partial \mathcal{L}_P}{\partial x^{2,r}} = -\lambda u_\Delta^2 = -\lambda \alpha^2 (u_x^2 + u_\Delta^2) < 0$$

for the paternalist case. Similarly, for the welfarist case, differentiation of equation (22) with respect to each type-specific measure of reference consumption gives

(A6a) $$\frac{\partial \mathcal{L}_W}{\partial x^{1,r}} = -u_\Delta^1 + \lambda \hat{u}_\Delta^2 = -(u_x^1 + u_\Delta^1)\alpha^1 + \lambda (\hat{u}_x^2 + \hat{u}_\Delta^2)\hat{\alpha}^2$$

(A6b) $$\frac{\partial \mathcal{L}_W}{\partial x^{2,r}} = -(\mu + \lambda) u_\Delta^2 = -(\mu + \lambda)(u_x^2 + u_\Delta^2)\alpha^2 < 0 \,.$$

Solving equation (23a) for $u_x^1 + u_\Delta^1$, substituting into equation (A6a), and rearranging gives equation (20a). Similarly, solving equation (23b) for $(\mu + \lambda)(u_x^2 + u_\Delta^2)$, substituting into equation (A6b), and rearranging gives equation (24b).■

*Proofs of Propositions 3 and 4*

Consider again the low-productivity type. Starting with the paternalist case, we use equations (5), (9a), and (20a) to derive

(A7) $$\gamma n^1 w^1 T'(w^1 l^1)_P = \lambda \hat{u}_x^2 \left[ MRS_{z,x}^{P,1} - \phi M\hat{R}S_{z,x}^{P,2} \right] + \gamma n^1 \, MRS_{z,x}^{P,1} \, \alpha^1 \,.$$

Rearranging gives the marginal income tax rate for the low-productivity type in Proposition 4 under a paternalist policy. The marginal income tax rate for the high-productivity type can be derived analogously.

In the welfarist case, we use equations (5), (9a), and (23a) to derive

(A8) $$\gamma n^1 w^1 T'(w^1 l^1)_W = \lambda (\hat{u}_x^2 + \hat{u}_\Delta^2) \left[ MRS_{z,x}^{W,1} - \phi M\hat{R}S_{z,x}^{W,2} \right] - MRS_{z,x}^{W,1} \frac{n^1}{N} \frac{\partial \mathcal{L}_W}{\partial x^{1,r}}$$

for the low-productivity type. Substituting equation (24a) into equation (A8) and rearranging gives the marginal income tax rate for the low-productivity type in Proposition 4. Analogous calculations based on equations (5), (9c), (23b), and (24b) give the marginal income tax rate of the high-productivity type.

Finally, the marginal income tax rates in Proposition 3 follow as special cases of those presented in Proposition 4 when $\lambda = 0$.■

**Theoretical results underlying the numerical simulations**

*Benchmark utility function*

The utility function faced by a consumer of productivity type *i* is given by

(A9) $$U^i = \ln\left(x^i - \alpha x^r\right) + \beta \ln z^i .$$

Based on the individual budget constraint, the average tax rate can be written as

(A10) $$T^A(w^i l^i) \equiv \frac{T(w^i l^i)}{w^i l^i} = 1 - \frac{x^i}{w^i l^i} .$$

The marginal income tax is obtained as follows from using (A9) in equation (5):

(A11) $$T'(w^i l^i) = 1 - \beta \frac{x^i - \alpha x^r}{w^i z^i} .$$

The self-selection constraint on the high-productivity type implies[24]

(A12) $$\ln\left(x^2 - \alpha x^r\right) + \beta \ln z^2 \geq \ln\left(x^1 - \alpha x^r\right) + \beta \ln(1 - \phi l^1) .$$

The Lagrangean for a paternalist government is then given by

(A13a) $$\begin{aligned} \mathcal{L}_P &= n^1\left(\ln\left((1-\alpha)x^1 + K^1)\right) + \beta \ln z^1\right) + n^2\left(\ln\left((1-\alpha)x^2 + K^2)\right) + \beta \ln z^2\right) \\ &+\lambda\left[\ln\left(x^2 - \alpha x^r)\right) + \beta \ln z^2 - \ln\left(x^1 - \alpha x^r)\right) - \beta \ln(1 - \phi l^1)\right] \\ &+\gamma \sum_i n^i (w^i l^i - x^i) \end{aligned} ,$$

while the corresponding Lagrangean for a welfarist government is given by

(A13b) $$\begin{aligned} \mathcal{L}_W &= n^1\left(\ln\left(x^1 - \alpha x^r)\right) + \beta \ln z^1\right) + n^2\left(\ln\left(x^2 - \alpha x^r\right) + \beta \ln z^2\right) \\ &+\lambda\left[\ln\left(x^2 - \alpha x^r)\right) + \beta \ln z^2 - \ln\left(x^1 - \alpha x^r)\right) - \beta \ln(1 - \phi l^1)\right]. \\ &+\gamma \sum_i n^i (w^i l^i - x^i) \end{aligned}$$

*Mean comparisons*

[24] Since the self-selection constraint on the low-productivity type never binds, we have not written it out here.

Equation (A13a) implies the following social first-order conditions for the paternalist case when $x^r = \bar{x}$:

(A14) $$-n^1 \frac{\beta}{z^1} + \lambda \frac{\phi\beta}{1-\phi(1-z^1)} + \gamma n^1 w^1 = 0,$$

(A15) $$\frac{n^1(1-\alpha)-\lambda}{x^1-\alpha\bar{x}} + \left(1 - \frac{x^1-\alpha\bar{x}}{x^2-\alpha\bar{x}}\right)\frac{\lambda\alpha n^1/N}{x^1-\alpha\bar{x}} - \gamma n^1 = 0,$$

(A16) $$-n^2 \frac{\beta}{z^2} - \lambda \frac{\beta}{z^2} + \gamma n^2 w^2 = 0,$$

(A17) $$\frac{n^2(1-\alpha)+\lambda}{x^2-\alpha\bar{x}} + \left(\frac{x^2-\alpha\bar{x}}{x^1-\alpha\bar{x}} - 1\right)\frac{\lambda\alpha n^2/N}{x^2-\alpha\bar{x}} - \gamma n^2 = 0.$$

The numerical simulation results associated with the paternalist government in Table 1 are then obtained by combining equations (7), (A10)–(A12) for the case where $x^r = \bar{x}$ and (A14)–(A17).

In the welfarist case, the first-order conditions for $l^1$ and $l^2$ coincide with equations (A14) and (A16), respectively, and they also do so in all subsequent cases regardless of utility function or reference points. The first-order conditions for $x^1$ and $x^2$ change to read

(A18) $$\frac{n^1(1-\alpha n^1/N)-\lambda}{x^1-\alpha\bar{x}} - n^2\frac{\alpha n^1/N}{x^2-\alpha\bar{x}} + \lambda\left(1 - \frac{x^1-\alpha\bar{x}}{x^2-\alpha\bar{x}}\right)\frac{\alpha n^1/N}{x^1-\alpha\bar{x}} - \gamma n^1 = 0,$$

(A19) $$\frac{n^2(1-\alpha n^2/N)+\lambda}{x^2-\alpha\bar{x}} - n^1\frac{\alpha n^2/N}{x^1-\alpha\bar{x}} + \lambda\left(\frac{x^2-\alpha\bar{x}}{x^1-\alpha\bar{x}} - 1\right)\frac{\alpha n^2/N}{x^2-\alpha\bar{x}} - \gamma n^2 = 0.$$

The numerical results associated with the welfarist government in Table 1 are obtained by combining equations (7), (A10)–(A12) for the case where $x^r = \bar{x}$, and (A14), (A16), (A18), and (A19).

*Within-group comparisons*

Equations (A9)–(A13) continue to hold with the modification that the reference measures are type-specific such that $x^{i,r} = \bar{x}^i$ for $i$=1,2, where in equilibrium $x^{i,r} = x^i$. The first-order conditions for $x^1$ and $x^2$ turn out to be identical in the paternalist and welfarist cases, and given by

(A20) $$\frac{n^1-\lambda}{x^1} - \gamma n^1 = 0,$$

(A21) $$\frac{n^2+\lambda}{x^2}-\gamma n^2=0.$$

The numerical results associated with both the paternalist and welfarist governments in Table 2 are obtained by combining equations (7), (A10)–(A12) for the case where $x^{i,r}=\overline{x}^i$ for $i$=1,2, and (A14), (A16), (A20), and (A21). The reason that the allocation of consumption and leisure as well as the redistribution are independent of $\alpha$ is that the social first-order conditions do not depend on $\alpha$.

*Upward comparisons*

Equations (A9)–(A13) continue to hold with $x^r=\overline{x}^2$, where in equilibrium $x^r=x^2$. The first-order conditions for $x^1$ and $x^2$ in the paternalist case are given by

(A22) $$\frac{n^1(1-\alpha)-\lambda}{x^1-\alpha x^2}-\gamma n^1=0,$$

(A23) $$\frac{n^2+\lambda}{x^2}+\lambda\frac{\alpha}{x^1-\alpha\overline{x}^2}-\gamma n^2=0.$$

The numerical simulation results associated with the paternalist government in Table 3 are then obtained by combining equations (7), (A10)–(A12) for the case where $x^r=\overline{x}^2$, and (A14), (A16), (A22), and (A23).

The first-order conditions for $x^1$ and $x^2$ in the welfarist case can be written as

(A24) $$\frac{n^1-\lambda}{x^1-\alpha x^2}-\gamma n^1=0,$$

(A25) $$\frac{n^2+\lambda}{x^2}+(\lambda-n^1)\frac{\alpha}{x^1-\alpha\overline{x}^2}-\gamma n^2=0.$$

The numerical results associated with the welfarist government in Table 3 are obtained by combining equations (7), (A10)–(A12) for the case where $x^r=\overline{x}^2$, (A14), (A16), (A24) and (A25).

*Alternative utility function*

The utility function faced by a consumer of productivity type *i* is given by

(A26) $$U^i=\ln x^i+\eta\ln\left(x^0+x^i-x^r\right)+\beta\ln z^i.$$

The marginal income tax is obtained from using (A26) into (5)

(A27) $$T'(w^il^i)=1-\frac{\beta}{w^iz^i}\frac{x^i(x^0+x^i-x^r)}{x^0+x^i(1+\eta)-x^r}.$$

The self-selection constraint on the high-productivity type can be written as

(A28) $\ln x^2 + \eta \ln\left(x^0 + x^2 - x^r\right) + \beta \ln z^2 \geq \ln x^1 + \eta \ln\left(x^0 + x^1 - x^r\right) + \beta \ln(1 - \phi l^1)$,

while the corresponding self-selection constraint on the low-productivity type is suppressed for presentational convenience (it is always non-binding). The degree of positionality is endogenous here and given by

(A29) $$\alpha^i = \frac{\eta x^i}{\eta x^i + x^0 + x^i - x^r}.$$

The Lagrangeans for the paternalist and welfarist governments, respectively, are given by

(A30a)

$$\begin{aligned}\mathcal{L}_P &= n^1\left(\ln x^1 + \beta \ln z^1\right) + n^2\left(\ln x^2 + \beta \ln z^2\right)\\ &+\lambda\left[\ln x^2 + \eta \ln\left(x^0 + x^2 - x^r\right) + \beta \ln z^2 - \ln x^1 - \eta \ln\left(x^0 + x^1 - x^r\right) - \beta \ln(1 - \phi l^1)\right],\\ &+\gamma \sum_i n^i (w^i l^i - x^i)\end{aligned}$$

(A30b)

$$\begin{aligned}\mathcal{L}_W &= n^1\left(\ln x^1 + \eta \ln\left(x^0 + x^1 - x^r\right) + \beta \ln z^i\right) + n^2\left(\ln x^2 + \eta \ln\left(x^0 + x^2 - x^r\right) + \beta \ln z^2\right)\\ &+\lambda\left[\ln x^2 + \eta \ln\left(x^0 + x^2 - x^r\right) + \beta \ln z^2 - \ln x^1 - \eta \ln\left(x^0 + x^1 - x^r\right) - \beta \ln(1 - \phi l^1)\right].\\ &+\gamma \sum_i n^i (w^i l^i - x^i)\end{aligned}$$

*Mean comparisons*

Equation (A30a) implies the following social first-order conditions for the paternalist case when $x^r = \bar{x}$:

(A31) $$\frac{n^1 - \lambda}{x^1} - \frac{\lambda\eta}{x^0 + x^1 - \bar{x}} + \left(\frac{1}{x^0 + x^1 - \bar{x}} - \frac{1}{x^0 + x^2 - \bar{x}}\right)\lambda\eta \frac{n^1}{N} - \gamma n^1 = 0,$$

(A32) $$\frac{n^2 + \lambda}{x^2} + \frac{\lambda\eta}{x^0 + x^2 - \bar{x}} + \left(\frac{1}{x^0 + x^1 - \bar{x}} - \frac{1}{x^0 + x^2 - \bar{x}}\right)\eta\lambda \frac{n^2}{N} - \gamma n^2 = 0.$$

The numerical simulation results associated with the paternalist government in Table 4 are then obtained by combining equations (3), (7), (A10), (A12), (A27)–(A29) for the case where $x^r = \bar{x}$, and (A14), (A16), (A31), and (A32).

The corresponding first order conditions for the welfarist case are given by:

(A33) $$\frac{n^1-\lambda}{x^1}+\eta\frac{n^1(1-n^1/N)-\lambda}{x^0+x^1-\overline{x}}-n^2\frac{\eta n^1/N}{x^0+x^2-\overline{x}} \\ +\left(\frac{1}{x^0+x^1-\overline{x}}-\frac{1}{x^0+x^2-\overline{x}}\right)\lambda\eta\frac{n^1}{N}-\gamma n^1=0,$$

(A34) $$\frac{n^2+\lambda}{x^2}+\eta\frac{n^2(1-n^2/N)+\lambda}{x^0+x^2-\overline{x}}-n^1\frac{\eta n^2/N}{x^0+x^1-\overline{x}} \\ +\lambda\left(\frac{1}{x^0+x^1-\overline{x}}-\frac{1}{x^0+x^2-\overline{x}}\right)\eta\frac{n^2}{N}-\gamma n^2=0.$$

The numerical simulation results associated with the welfarist government in Table 4 are obtained by combining equations (3), (7), (A10), (A12), (A27)–(A29) for the case where $x^r=\overline{x}$ , and (A14), (A16), (A33), and (A33).

*Within-group comparisons*

The social first-order conditions for $x^1$ and $x^2$ take the same form in the paternalist and welfarist cases, and are identical to those of the benchmark model, i.e., equations (A20) and (A21), respectively.

The numerical results associated with both the paternalist and welfarist governments in Table 5 are then obtained by combining equations (3), (7), (A10), (A12), (A14), (A16), (A20), (A21) and (A27)–(A29) for the case where $x^{i,r}=\overline{x}^i$ for $i$=1,2. The reason that the allocation of consumption and leisure as well as the redistribution are independent of the degrees of positionality is that the social first-order conditions do not depend on $\eta$ and thus not on the positionality degrees.

*Upward comparisons*

Equations (A27)–(A29) hold with $x^r=\overline{x}^2$, where in equilibrium $x^r=x^2$. The first-order conditions for $x^1$ and $x^2$ in the paternalist cases are given by

(A35) $$\frac{n^1-\lambda}{x^1}-\lambda\frac{\eta}{x^0+x^1-\overline{x}^2}-\gamma n^1=0,$$

(A36) $$\frac{n^2+\lambda}{x^2}+\lambda\frac{\eta}{x^0+x^1-\overline{x}^2}-\gamma n^2=0.$$

The numerical simulation results associated with the paternalist government in Table 6 are obtained by combining equations (3), (7), (A10), (A12), (A27)–(A29) for $x^r=\overline{x}^2$ , and (A14), (A16), (A35), and (A36).

The corresponding first-order conditions for the welfarist case are given by

(A37) $$\frac{n^1-\lambda}{x^1}+\frac{\eta(n^1-\lambda)}{x^0+x^1-\bar{x}^2}-\gamma n^1=0,$$

(A38) $$\frac{n^2+\lambda}{x^2}+\frac{(\lambda-n^1)\eta}{x^0+x^1-\bar{x}^2}-\gamma n^2=0.$$

The numerical simulation results associated with the welfarist government in Table 6 are obtained by combining equations (3), (7), (A10), (A12), (A27)-(A29) for $x^r=\bar{x}^2$ , and (A14), (A16), (A37), and (A38).

## References

**Abel, A. B.** 2005. "Optimal Taxation When Consumers Have Endogenous Benchmark Levels of Consumption." *Review of Economic Studies* 72, 1–19.

**Acemoglu, D. and J. Robinson**. 2006. *Economic Origins of Dictatorship and Democracy*. Cambridge University Press.

**Akerlof, G. A.** 1997. "Social Distance and Social Decisions." *Econometrica* 65, 1005–27.

**Alpízar, F., F. Carlsson, and O. Johansson-Stenman**. 2005. "How Much Do We Care about Absolute versus Relative Income and Consumption?" *Journal of Economic Behavior and Organization* 56, 405–21.

**Aronsson, T. and O. Johansson-Stenman**. 2008. "When the Joneses' Consumption Hurts: Optimal Public Good Provision and Nonlinear Income Taxation." *Journal of Public Economics* 92, 986–97.

**Aronsson, T. and O. Johansson-Stenman**. 2010. "Positional Concerns in an OLG Model: Optimal Labor and Capital Income Taxation." *International Economic Review* 51, 1071–95.

**Aronsson, T. and O. Johansson-Stenman**. 2015. "Keeping up with the Joneses, the Smiths and the Tanakas: On International Tax Coordination and Social Comparisons." *Journal of Public Economics* 131, 71–86.

**Blackorby, C., Bossert, W. and Donaldson, D**. 2005. *Population Issues in Social Choice Theory, Welfare Economics and Ethics*. New York: Cambridge University Press.

**Blanchflower, D. G., and A. J. Oswald**. 2004. "Well-Being Over Time in Britain and the USA." *Journal of Public Economics* 88, 1359–86.

**Blomquist S. and L. Micheletto**. 2006. “Optimal Redistributive Taxation when Government’s and Agents’ Preferences Differ.” *Journal of Public Economics* 90, 1215–33.

**Boadway, R. and Keen, M**. 1993. “Public Goods, Self-Selection and Optimal Income Taxation.” *International Economic Review* 34, 463–78.

**Boskin, M. J. and E. Sheshinski**. 1978. “Individual Welfare Depends upon Relative Income.” *Quarterly Journal of Economics* 92, 589–601.

**Bowles, S. and Y.-J. Park**. 2005. “Inequality, Emulation, and Work Hours: Was Thorsten Veblen Right?” *Economic Journal* 15, F397–F413.

**Card, D., Mas, A., Moretti, E., and E. Saez**. 2012. “Inequality at Work: The Effect of Peers Salary on Job Satisfaction.” *American Economic Review* 102, 2981–3003.

**Carlsson, F., O. Johansson-Stenman, and P. Martinsson**. 2007. “Do You Enjoy Having More Than Others? Survey Evidence of Positional Goods.” *Economica* 74, 586–98.

**Clark, A. and C. Senik**. 2010. “Who Compares to Whom? The Anatomy of Income Comparisons in Europe.” *Economic Journal* 120, 573–94.

**Corneo, G. and O. Jeanne**. 1997. “Conspicuous Consumption, Snobbism and Conformism.” *Journal of Public Economics* 66, 55–71.

**Corneo, G. and O. Jeanne**. 2001. “Status, the Distribution of Wealth, and Growth.” *Scandinavian Journal of Economics* 103, 283–93.

**Dodds, S**. 2012. “Redistributive Taxation and Heterogeneous Relative Consumption Concerns.” *Canadian Journal of Economics* 45, 220–46.

**Dupor, B. and W. F. Liu**. 2003. “Jealousy and Overconsumption.” *American Economic Review* 93, 423–28.

**Easterlin, R. A**. 1995. “Will Raising the Incomes of All Increase the Happiness of All?” *Journal of Economic Behavior and Organization* 27, 35–47.

**Easterlin, R. A**. 2001. “Income and Happiness: Towards a Unified Theory.” *Economic Journal* 111, 465–84.

**Eckerstorfer, P. and R. Wendner**. 2013. “Asymmetric and Non-Atmospheric Consumption Externalities, and Efficient Consumption Taxation.” *Journal of Public Economics* 106(C), 42–56.

**Ferrer-i-Carbonell, A**. 2005. “Income and Well-being: An Empirical Analysis of the Comparison Income Effect.” *Journal of Public Economics* 89, 997–1019.

**Frank, R. H**. 2005. “Positional Externalities Cause Large and Preventable Welfare Losses.” *American Economic Review* 95, 137–41.

**Frank, R. H**. 2008. “Should Public Policy Respond to Positional Externalities?” *Journal of Public Economics* 92, 1777–86.

**Goodin, R. E**. 1986. “Laundering Preferences.” In *Foundations of Social Choice Theory*, edited by J. Elster and A. Hylland. Cambridge: Cambridge University Press.

**Grossman, H. I**. 1991. “A General Equilibrium Model of Insurrections.” *American Economic Review* 81, 912–21.

**Gruber, J. and B. Koszegi**. 2001. “Is Addiction Rational? Theory and Evidence.” *Quarterly Journal of Economics* 116, 1261–303.

**Harsanyi, J**. 1982. “Morality and the Theory of Rational Behavior.” In *Utilitarianism and Beyond*, edited by Sen, A. and Williams, B. Cambridge: Cambridge University Press.

**Johansson-Stenman, O**. 2008. “Mad Cows, Terrorism and Junk Food: Should Public Policy Reflect Subjective or Objective Risks?” *Journal of Health Economics* 27, 234–48.

**Johansson-Stenman, O., F. Carlsson, and D. Daruvala**. 2002. “Measuring Future Grandparents' Preferences for Equality and Relative Standing.” *Economic Journal* 112, 362–83.

**Kanbur, R., Keen, M. and Tuomala, M**. 1994. “Optimal Non-Linear Income Taxation for the Alleviation of Income-Poverty.” *European Economic Review* 38, 1613–32.

**Kanbur, R. and M. Tuomala**. 2010. “Relativity, Inequality and Optimal Nonlinear Income Taxation.” Tampere University, working paper no 75.

**Kanbur, R. and M. Tuomala**. 2013. “Relativity, Inequality and Optimal Nonlinear Income Taxation.” *International Economic Review* 54, 1199–1217.

**Layard, R**. 1980. “Human Satisfaction and Public Policy.” *Economic Journal* 90, 737–50.

**Ljungqvist, L. and H. Uhlig**. 2000. “Tax Policy and Aggregate Demand Management Under Catching Up with the Joneses.” *American Economic Review* 90, 356–66.

**McBride, M.** 2001. “Relative-Income Effects on Subjective Well-Being in the Cross-Section.” *Journal of Economic Behavior and Organization* 45, 251-278.

**Micheletto, L**. 2011. “Optimal Nonlinear Redistributive Taxation and Public Good Provision in an Economy with Veblen Effects.” *Journal of Public Economic Theory* 13, 71–96.

**Mill, J. S**. 1848. *Principles of Political Economy*. London: John W. Parker.

**Oswald, A**. 1983. “Altruism, Jealousy and the Theory of Optimal Non-Linear *Taxation*.” *Journal of Public Economics* 20, 77–87.

**Persson, M.**, 1995. “Why are Taxes so High in Egalitarian Societies?” *Scandinavian Journal of Economics* 97, 569–580.

**Piketty, T. and E. Saez**. 2013. “Optimal Labor Income Taxation.” Chap. 9 in *Handbook of Public Economics, Vol. 5,* edited by A. Auerbach, R. Chetty, M. Feldstein, and E. Saez. Elsevier-North Holland.

**Runciman, W. G.** 1966. *Relative Deprivation and Social Justice*, London: Routledge and Kegan Paul.

**Sandmo, A**. 1983. “Ex Post Welfare Economics and the Theory of Merit Goods.” *Economica* 50, 19–33.

**Seade, J. K**. 1982. “On the Sign of the Optimum Marginal Income Tax.” *Review of Economic Studies* 49, 637–43.

**Sen, A. K**. 1979. “Personal Utilities and Public Judgments: or What’s Wrong with Welfare Economics.” *Economic Journal* 89, 537–58.

**Solnick, S. and D. Hemenway**. 2005. “Are Positional Concerns Stronger in Some Domains than in Others?” *American Economic Review, Papers and Proceedings* 45, 147–51.

**Stern, N. H**. 1982. “Optimum Taxation with Errors in Administration.” *Journal of Public Economics* 17, 181–211.

**Stiglitz, J. E**. 1982. “Self-Selection and Pareto Efficient Taxation.” *Journal of Public Economics* 17, 213–40.

**Tuomala, M**. 1990. *Optimal Income Tax and Redistribution*. Oxford: Clarendon Press.

**Veblen, T**. 1899. *The Theory of the Leisure Class*. New York: Macmillan.

**Wendner, R. and L. H. Goulder**. 2008. “Status Effects, Public Goods Provision, and the Excess Burden.” *Journal of Public Economics* 92, 1968–85.