Revealing Equity Principles from the Tax System *

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May 2019

Unfinished and preliminary, do not share without consent

Abstract

Which equity principles does the tax system reflect? This paper provides, first, a theoretical framework to reveal implicit *social equity principles* from tax policy. Second, the approach is applied to measure the effect of the equity principle ”equal treatment” in tax systems. A concern for equal treatment is modelled as a further constraint on tax policy, increasing the implicit costs of redistribution, thereby making the welfare weight schedule more steep across the income distribution. Using Norwegian data, I measure the size of this increase, and use it to separate the effects of the concerns for equal treatment (horizontal equity) and inequality reduction (vertical equity) that go in to the social preference for marginal income increases at each point in the distribution. This leads to an reinterpretation of steep welfare weights schedules, showing that they do not simply reflect a priority for low income individuals, but also self-imposed constraints on tax instruments derived from equity views indifferent to (vertical) inequality.

*This work is part of the research carried out at Oslo Fiscal Studies, which is supported by the Research Council of Norway. I thank Bård Lian for assistance with the LOTTE Tax Benefit Simulator. I am grateful for comments by Paolo G. Piacquadio. I have also benefited from discussions with Andreas S. Myhre, Kjetil Storesletten, Thor O. Thoresen and Gaute Torsvik.

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1 Introduction

Which equity principles should guide tax policy? Answering this question is a task economists usually want to avoid. While endorsing uncontroversial principles such as the Pareto principle, economists normally consider it beyond their role to impose further principles. One alternative to imposing further principles is to *reveal* equity principles from actual policy choices by the government. If research can establish an empirical link between actual policy choices and certain equity principles, economists can avoid making judgments about which equity principles to consider, and leave the choice to the democratic process.

This is the route followed here. The contribution is to apply *inverse optimal taxation* to show how not only the priority on inequality aversion, but also the priority on other equity principles can be revealed from the design of the tax system, and that these equity principles matter when evaluating the redistributive properties of tax policy.

In optimal taxation after Mirrlees (1971), public economists have studied tax policy using a specific social welfare function, where social welfare is defined as the sum of a concave transformation of individual utilities. While the framework restricts equity principles to the sum and distribution of individual utilities, it allows the researcher to remain agnostic to the inequality aversion in the social welfare function. Building on this agnostic feature (and the empirical implementability of the Mirrlees model developed by Saez (2001)), a literature following Bourguignon and Spadaro (2012)[1] uses actual tax-transfer systems to reveal welfare weights for each income group that make the current tax system the optimal one. Multiple contributions in this literature argue that these implicit welfare weights can in principle tell us how to value redistribution between different income groups.

Conveniently for present purposes, Saez and Stantcheva (2016) show that such weights can also be given a more general interpretation. They demonstrate that with

[1] Contributions include Bargain et al. (2014) for the US and certain European countries, Lockwood and Weinzierl (2016) for the US over time, Bastani and Lundberg (2017) for Sweden, and Jacobs, Jongen, and Zoutman (2017) for political parties in the Netherlands. Hendren (2014) relates the inverse approach to cost-benefit criteria. For an early contribution using the same idea for indirect taxation in Norway, see Christiansen and Jansen (1978).

the local optimum approach to optimal taxation, the value of one more dollar of consumption to an income group can be interpreted as *generalized social marginal welfare weights* on that group, and these weights can reflect a multitude of equity principles.

This paper provides evidence on how such equity principles support the design of current tax-benefit systems and affects the inferred welfare weights schedule over the income schedule. The findings presented demonstrate that the weights can be partly explained by a concern for *equal treatment*. While taxes could be conditioned on variables such as age, gender and height, there is little use of non-income characteristics in actual tax systems, and hence most of a person's post-tax income is decided by her pre-tax income[2]. However, empirical tax research shows (see Thoresen and Vattø 2015 and results in this paper for Norway) that tax responses differ across characteristics, providing an efficiency rationale for conditioning taxes on these characteristics. Since there is little conditioning on characteristics in actual tax systems, one natural explanation is that there is a counteracting *equity* rationale for not using characteristics. One such equity rationale is a concern for equal treatment of different characteristics.

By incorporating equal treatment into the model, I am able to estimate the weight that must be put on equal treatment for the current tax schedule to be optimal one. Importantly, the weight put on equal treatment affects the distribution of welfare weights necessary to make the current tax system optimal. As a consequence, when the model does not take into account that current tax policy is determined by more than the traditional concerns for efficiency and for inequality aversion, it risks reaching wrong conclusions about the implicit redistributive preferences in the tax system. By explicitly modelling the concern for equal treatment, I am able to correct the welfare weights and distinguish between the different forms of equity that determine the observed tax schedule.

The contribution is similar in spirit to Weinzierl (2014) and Lockwood and Weinzierl (2016), who argue that the traditional principles used in optimal taxation do not fit well with neither the principles people state in surveys nor with actual tax policy in

[2]There is a longstanding literature on *tagging* (basing tax policy on characteristics). See Akerlof (1978) for an early discussion of tagging and optimal taxation, and as examples of recent discussions, see Cremer, Gahvari, and Lozachmeur (2010) for gender tags, and Mankiw and Weinzierl (2010) on the optimal taxation of height.

the US. The main difference here is the theoretical framework, focusing on marginal welfare weights, and that I study a different equity principle. In addition, I measure how combinations of such principle can rationalize current tax systems.

The paper proceeds as follows. First, I present the model and the inverse optimal approach, including how the standard heterogeneity restriction can be generalized. I then turn to equity principles, establishing how a concern for equal treatment affects welfare weights. Attention is then shifted to the Norwegian tax-benefit system. Continuing, I show estimates of the elasticity of taxable income across the income distribution and the size of composition effects. Using these results, I then present the main findings on the effects of the equal treatment principle. Lastly, I conclude with some implications for evaluations of tax and expenditure policy.

2 Theoretical framework

2.1 Optimal tax model

Saez (2001) introduced a convenient tax reform approach to optimal taxation. The approach relies directly on observables such as income and tax response elasticities. The downside is that it is inherently a local approach, meaning that it cannot necessarily be applied to find the global optimum using currently observed parameters. This is unproblematic for the standard inverse optimum problem, as it relies on assuming that the current tax system is the optimal one.

Now, assuming no income effects. When the tax rate increases slightly at pre-tax income z it induces a revenue effect

$$dR = dz\delta\tau \left[1 - H(z) - h(z)e(z)z\frac{T'(z)}{1 - T'(z)}\right] \tag{1}$$

where dR is the change in revenue, $\delta\tau dz$ is the increase in tax payment for those with $z_i > z$, $1 - H(z)$ is the number of people above z, $h(z)$ is the number of people around z, $\epsilon(z)$ is the elasticity of pre-tax income at z and $T'(z)$ is the tax rate at z.

Then, there is also a positive welfare effect from increasing income by a lump sum transfer and a negative welfare effect on those above z who now have to pay higher tax

$$dW = dR\int_i g_i di - \delta\tau dz\int_{i:z_i\geq z} g_i di \tag{2}$$

Combining the two, the optimal tax rate is characterized by

$$T'(z) = \frac{1 - \overline{G}(z)}{1 - \overline{G}(z) + \alpha(z)\epsilon(z)} \tag{3}$$

where $\overline{G}(z)$ is the average welfare weight above z

$$\overline{G}(z) = \frac{\int_{i:z_i \geq z} g_i di}{Prob(z_i \geq z)\int_i g_i di} = \frac{\int_z^\infty \overline{g}(z) dH(z')}{1 - H(z)} \tag{4}$$

and $\alpha(z)$ is the *local Pareto parameter* at z

$$\alpha(z) = \frac{zh(z)}{1 - H(z)}. \tag{5}$$

The inverse optimum is then simply solving equation (13) for $g(z)$

$$g(z) = -\left(\frac{1}{h(z)}\right)\frac{d}{dz}\left[(1 - H(z)(1 - \frac{T'(z)}{1 - T'(z)}\epsilon(z)\alpha(z))\right]. \tag{6}$$

Assuming that $T(z)$ is piece-wise linear, the welfare weights from the inverse optimal problem are then given by (Bastani and Lundberg 2017)

$$g(z) = 1 - \frac{T'(z)}{1 - T'(z)}\epsilon(z)(\alpha(z) - \rho(z)) \tag{7}$$

where now $\rho(z)$ is the *elasticity of the local Pareto parameter*

$$\rho(z) = \frac{z\alpha'(z)}{\alpha(z)} \tag{8}$$

such that $\alpha(z) - \rho(z)$ is the *local elasticity of the income distribution* (Hendren 2014)

$$\alpha(z) - \rho(z) = -\left(1 + \frac{zh'(z)}{h(z)}\right). \tag{9}$$

Extensive margin following Jacquet, Lehmann, and Van der Linden (2013) and Jacobs, Jongen, and Zoutman (2017):

$$g(z) = 1 - \frac{T'(z)}{1 - T'(z)}\epsilon(z)\left(\alpha(z) - \rho(z)\right) - \epsilon^P(z)\left(\frac{T(z) + B^0}{z - T(z)}\right) \tag{10}$$

$e^P(z) = \frac{de_z}{d(z - T(z))}\frac{z - T(z)}{e_z}$ where e_z is the employment rate among individuals with potential income z.

Generalized Social Marginal Welfare Weights (GSMWWs) from Saez and Stantcheva (2016):

$$g_i = G'(u_i)\frac{\partial u_i}{\partial c} \tag{11}$$

Relation between the Pareto weights and GSMWWs in the optimum is

$$\omega_i = \frac{g_i}{u_i} \tag{12}$$

2.2 Inequality aversion

In the traditional Mirrlees model, the key equity feature is reflected in the concave transformation of individual utilities.

In the first best case in the traditional Mirrlees model it is impossible to identify how much the government values one extra dollar to the worse off compared to the better off, as all incomes will be equalized. When there is no trade-off between the total and the distribution of it, the valuation of redistribution cannot be identified. The standard social welfare function can be written as:

$$SWF = \int_i \omega_i u(c_i, l_i) d_i$$

The Pareto-weights, ω_i, will in the first best not vary across individuals, for the simple reason that everyone will be given the same utility when the government does not face any information constraints. The informational constraints, that the government cannot observe abilities but only market incomes, makes it possible to identify how much the current tax-benefit system values redistribution. With informational constraints an inequality aversion, the measure of marginal welfare weights will go from 1 on everyone to be falling across the income distribution (for standard assumptions), from higher than 1 at the bottom to lower than 1 at the top (usually converging towards 0). Similarly, the measured marginal welfare weights would be 1 also with informational constraints if society did not value redistribution. With informational constraints, someone will be worse off than others, and society may put a larger welfare weight on persons who are worse off because society value redistribution.

2.3 Equal treatment

Equal treatment is a plausible determinant of the current tax system. It is related to the concept of *horizontal equity*, relating to a long-standing discussion in public economics. In the classical work by Musgrave (1959), the key distinction made was between *horizontal* and *vertical* equity, or equity between the equally and differently situated, respectively. I use horizontal equity here to denote non-discrimination or non-use of observable characteristics, while vertical equity denotes standard inequality aversion. I model equal treatment as an additional constraint. This increases the "costs of redistribution" and will make the progressivity of welfare weights more pronounced than if society did not value equal treatment. The explanation is that while in the first best case in the traditional Mirrlees model it is impossible to identify how much the government values one extra dollar to the worse off compared to the better off, it is possible when there are informational constraints and inequality aversion, leading to progressive welfare weights schedules. Further constraints *can* affect the welfare weight schedule in the same manner. By the same logic, marginal welfare weights will be affected by adopting other or more normative principles, such as equal treatment.

To introduce a principle of equal treatment or horizontal equity, lets assume that the government not only observes income, but also observes a characteristic that is correlated with ability (or preference heterogeneity). However, because the government values equal treatment of incomes, it does not want to treat equal market incomes unequally, even if they reflect different observable characteristics that are correlated with ability. One constraint that accomplishes this is the following:

$$T'(z = z_i, o = 0) = T'(z = z_i, o = 1) \quad \forall z_i \tag{13}$$

Observable characteristics differ such that we have o_1, o_2 and o_l, hence o_k with $k(1, l)$. o_1 can be gender, o_2 can be age. Each o_k takes numerical values in $(0, m)$, such that o_1 (gender) takes values in $(0, 1)$, while o_2 (age) takes values in say $(0, 100)$. Where α are the vertical equity weights. μ is the lagrange multiplier/shadow value attached to the constraint (the value of equal treatment for society). The weights do not vary over values of the characteristics, such that it values equally the equal treatment of 20 and 21 year old persons as 20 and 40 year old persons. It provides a characterization of the government's preference not to use the observable characteristics it has available to distinguish between persons with similar income and different abilities.

A constraint on policy does not respect Pareto, and is therefore prone to the critique by Kaplow and Shavell (2001). This is avoided if the social welfare function can be represented by another social welfare function with different non-negative Pareto weights. MGSWWs are then determined by both ω's and μ

$$g(z) = f(\alpha(z), \mu(z)) \tag{14}$$

With μ is the observed system with equal treatment, while without μ composition effects are relevant. The point is that policy is more constrained than it looks, partly due to the horizontal equity concern. Equity concern makes redistribution to the poor lower than they would have been, because the "costs" of redistribution are higher than what was believed, as there is a further policy objective, namely equal treatment. Can find the "pure redistributive weights" by correcting for the additional equity concern.

One cannot directly measure the marginal welfare weights when equal treatment is not a constraint, as that tax system is unobserved. But, what one can do is to see what will happen with the distribution when the government does not value equal treatment. One initial possibility is that the government does not change its valuation of one extra NOK to the poor compared to the rich. However, the effect must be to make the welfare weight schedule less steep, as the problem is less constrained, and the fully unconstrained problem will equalize incomes, meaning that everyone has the same marginal welfare weight. This means that welfare weights are steeper the more the government values equal treatment, or, the higher is the shadow value of equal treatment. How much steeper are marginal welfare weights due to the concern for equal treatment? Depends on the gain from treating unequally, so measuring how large the gains are is necessary to know the effect on the steepness of the marginal welfare weights.

2.4 Two-type case

In this section, I present a simplified two-type model as an example of how an equity requirement restricting the use of observable characteristics can affect marginal welfare weights.

Classic Mirrlees two-type model: $w_1 < w_2$

Each individual maximizes utility

$$\max U(c_w, l_w) \ s.t. \ c_w = wl_w - T_w \to V_w(c, z)$$

Government maximizes weighted (indirect) utility

$$\max_{\tau} W = \omega_1 V_1 + \omega_2 V_2 \ s.t. \ T_1 + T_2 \geq R$$

And faces an asymmetric information problem, such that the government maxization problem is restricted by self-selection constraints

$$V_2(c_2, z_2) \geq V_2(c_1, z_1)$$

$$V_1(c_1, z_1) \geq V_1(c_2, z_2)$$

Indirectly observable productivities

Each individual is associated with an observable characteristic, $k \in (0, 1)$. First, assume that $w_1(k_1)$ and $w_2(k_2)$ and the information is known to the government. For now only consider potential mimicking by the high type.

Equal treatment-constraint Lagrange:

$$L_G = \omega_1 V_1(c_1, z_1) + \omega_2 V_2(c_2, z_2) + \lambda[T_1(z_1, k_1) + T_2(z_2, k_2) - R] + \gamma[V_2(c_2, z_2) - V_2(c_1, z_1)]$$

Direct implementation:

$$L_G = \omega_1 V_1(c_1, z_1) + \omega_2 V_2(c_1, z_1) + \lambda[z_1(k_1) - c_1(k_1) + z_2(k_2) - c_2(k_2) - R] + \gamma[V_2(c_2, z_2) - V_2(c_1, z_1)]$$

Since taxes can be set directly to each ability, we obtain

$$\omega_1 V'_{1,c} = \omega_2 V'_{2,c}$$

or, the first-best allocation. The self-selection constraint will not bind, $\gamma = 0$.

GMSWWs $g = \omega * u'_c$ in the optimum With observable characteristic and no equal treatment constraint: $g_1 = g_2$.

Equal treatment constraint

A further constraint: $T(z,k) = T(z)$. We need only add it for the high-type in this case, as we have already assumed that is the relevant self-selection constraint.

Lagrange:

$$L_G = \omega_1 V_1(c_1, z_1) + \omega_2 V_2(c_2, z_2) + \lambda[T_1(z_1, k_1) + T_2(z_2, k_2) - R] + \gamma[V_2(c_2, z_2) - V_2(c_1, z_1)] + \mu[T_1(z_1, k_2) - T_1(z_1)] \quad (15)$$

Now there is one new constraint, reflecting that society will not discriminate against the high type (when mimicking) based on the observable characteristic k. This means that taxes must be set according to z, which is the standard problem. The self-selection constraint will bind. The multiplier on the self-selection constraint now reflects the shadow price of equal treatment, since we go from a situation where the multiplier is zero to positive when we go from unequal treatment based on characteristics to equal treatment.

FOCs:

$$c_1 : \omega_1 V'_{1,c_1} - \lambda - \gamma V'_{2,c_1}$$

$$z_l : \omega_1 V'_{1,z_1} + \lambda - \gamma V'_{2,z_1}$$

$$c_2 : \omega_2 V'_{2,c_2} - \lambda + \gamma V'_{2,c_2}$$

$$z_2 : \omega_2 V'_{2,z_2} + \lambda + \gamma V'_{2,z_2}$$

Combining the first and third FOC:

$$\omega_1 V'_{1,c_1} - \lambda - \gamma V'_{2,c_1} = \omega_2 V'_{2,c_2} - \lambda + \gamma V'_{2,c_2}$$

$$\omega_1 V'_{1,c_1} - \gamma V'_{2,c_1} = \omega_2 V'_{2,c_2} + \gamma V'_{2,c_2}$$

$$\omega_1 V'_{1,c_1} - \omega_2 V'_{2,c_2} = \gamma \left(V'_{2,c_1} + V'_{2,c_2}\right) \geq 0$$

$$g_1 - g_2 \geq 0$$

Which means that the marginal welfare weight on the low type is now higher than on the high type. In this framework, it is not the self-selection constraints in themselves that creates the second-best problem. The government could have achieved the first-best if it was willing to discriminate, and the equal treatment constraint means that the second-best problem is self-imposed. The government redistributes less to the low type not only because the high-type might mimic, but because society values equal treatment. This reduction in redistribution produces steeper marginal welfare weights than in the case with discrimination.

In the case presented here, the natural conclusion to draw is that all of the difference in welfare weights is due to equal treatment, as the utility of the two agents could have been equalized were it not for the equal treatment constraint. In fact, even without any concern for inequality in utility, the marginal welfare weights on the two types would differ.

Of course, in more realistic models characteristics do not fully reveal types. When characteristics only partially reveal type or preference, not using the characteristics will only partly restrict the optimization problem. This is a necessary feature to distinguish between what part of the marginal welfare weights are due to equal treatment and what is due to vertical inequality aversion(?).

The difference between g_1 and 1 measures the *effect* of an equal treatment concern on the marginal social value of an income increase to the low type individual.

$\gamma \left(V'_{2,c_1} + V'_{2,c_2} \right)$ measures the steepness of the g-distribution. γ: The multiplier on the self-selection constraint reflects the shadow price of equal treatment.

2.5 General model

Saez (2001)-model with two separate problems: optimal tax for each gender, then optimal transfers between genders. Let welfare weights vary between genders for a given income.

As in Mankiw and Weinzierl (2010), the problem can be separated. Hence, first standard problem for each gender, then the optimal transfers between them.

$$R = T_f + T_m \tag{16}$$

T_m and T_f are taxes on each gender, respectively.

$$dR = dz_m d\tau_m \left(1 - H_m - h_m \varepsilon_m \frac{T'_m}{1 - T'_m}\right) + dz_f d\tau_f \left(1 - H_f - h_f \varepsilon_f \frac{T'_f}{1 - T'_f}\right) \tag{17}$$

The problem can be separated into a tax change for men and women, respectively. $k \in (m, f)$. Consider a small pertubation of one gender's tax schedule, keeping the other constant.

$$dR_k = dz_k d\tau_m \left(1 - H_k - h_k \varepsilon_k \frac{T'_k}{1 - T'_k}\right) \tag{18}$$

$$dW_k = dR_k \int_{i \in k} g_i di - d\tau dz \int_{i \in k: z_i \geq z} g_i di \tag{19}$$

Applying Saez (2001):

$$T'_k(z_k) = \frac{1 - \bar{G}(z_k)}{1 - \bar{G}(z_k) + \alpha(z_k)\varepsilon_k(z_k)} \tag{20}$$

And then the inverse problem:

$$g_k(z_k) = 1 - \frac{T'_k(z_k)}{1 - T'_k(z_k)} \varepsilon_k(z_k) \left(\alpha(z_k) - \rho(z_k)\right) \tag{21}$$

Where $g_k(z_k)$ is the welfare weight at each income level for each gender separately. Define $g_{\bar{k}}(z)$ as the average welfare weight across gender at each income level.

When information about gender is not used, the standard equation (2.7) holds. The idea is now to compare this standard $g(z)$ to $g_{\bar{k}}(z)$. The crucial point is that going from not using to using tags affects the welfare weight distribution. Typically, the welfare weight schedule will be flatter.

To find the effect of going from no tagging (observed/actual) to tagging (unobserved/counterfactual), I apply the fiscal externality logic from Hendren (2014). While welfare weights are the object of interest here, Hendren shows that they have a direct relationship to the "fiscal externality". A fiscal externality is the impact on the government budget of behavioural responses.

$$g(z) = 1 + FE(z) \tag{22}$$

The point here is that tagging reduces the fiscal externality at the bottom, as a tax system redistributing to lower incomes will be less distortive compared to no-tagging.

$$g(z) = g_{\bar{k}}(z) + \mu(z) \tag{23}$$

Where again $\mu(z)$ is the weight on equal treatment or equivalently, the extra fiscal externality at each income level imposed by equal treatment.

3 Empirics

3.1 Data

I use Norwegian income register data. In particular, I use data on pre-tax incomes, age, gender and country of birth. Only wage earners are considered.

3.2 Tax system

The Norwegian tax system is characterized by a progressive income tax schedule on labour earnings. I use the LOTTE tax-benefit calculator for wage earners in the year 2010 and add a flat VAT rate for all households.

The marginal tax schedule is shown in Figure 1. For the participation tax rate, I include social assistance and housing support as income dependent support. The participation tax rate also varies with income because the tax system is progressive. The participation tax rate is shown in Figure 2.

3.3 Intensive margin

I take into account different elasticities of taxable incomes across the income distribution and observable characteristics to analyze effects of a principle of equal treatment. Thoresen and Vattø (2015) find an ETI for wage earners in Norway of about 0.05.

Similarly to their approach, I estimate the ETI separately for each gender using a standard three-year first difference panel data approach with spline in base-year income

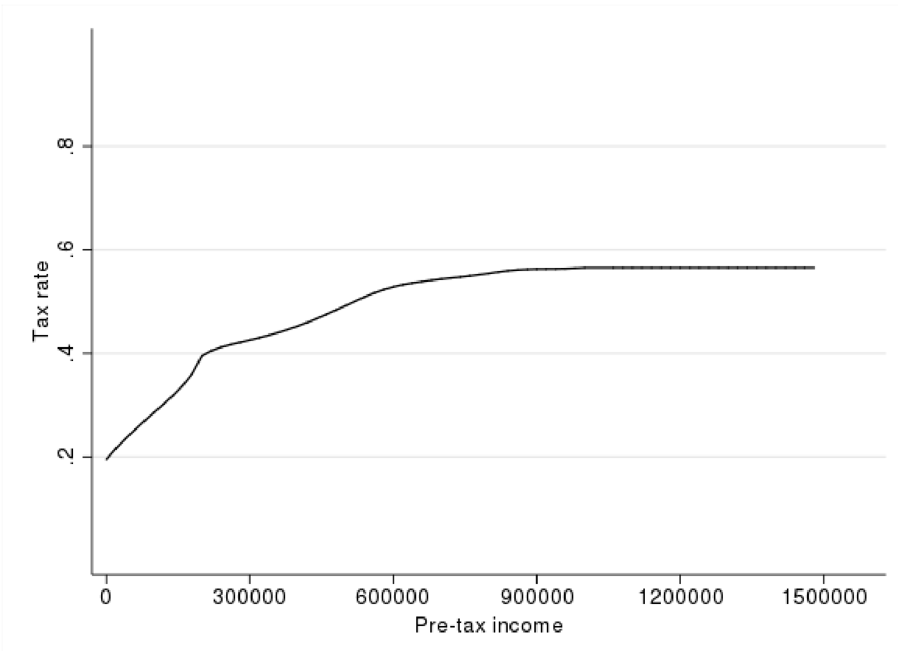

Figure 1: Marginal tax schedule

Notes: Wage earners. For the year 2010.

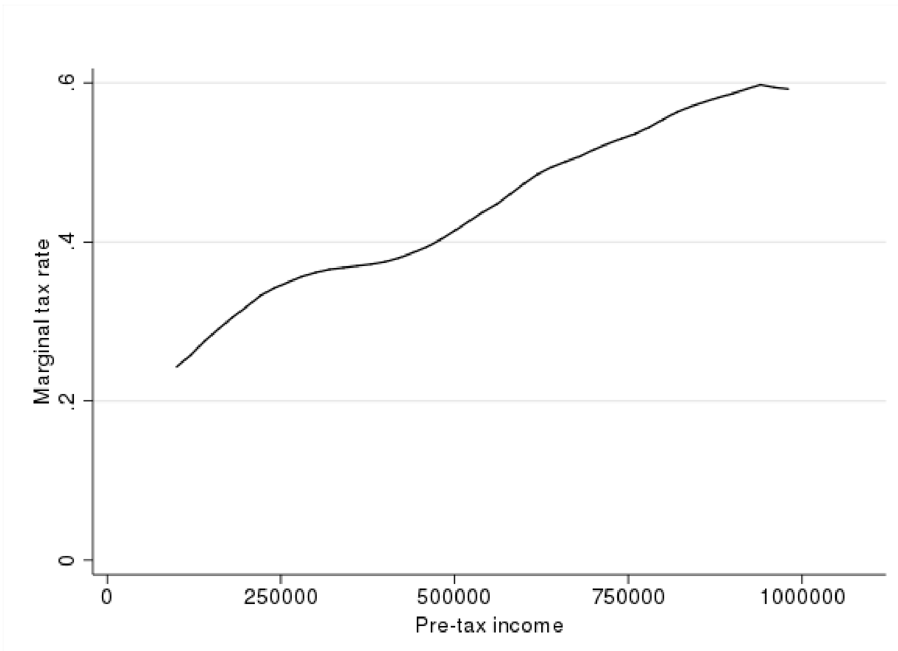

Figure 2: Participation tax schedule

Notes: Wage earners. For the year 2010.

and the lag of base-year income to control for mean reversion and exogenous trends in income (following Kopczuk (2005)) relying on identifying variation in tax rates is from the Norwegian 2006 tax reform. See results in Table 1.

$$log\left(\frac{z_{i,t+3}}{z_{i,t}}\right) = \alpha_t + \beta \log\left(\frac{1-\tau_{i,t+3}}{1-\tau_{i,t}}\right) + B_i'\theta + M_{i,t}'\eta + \theta \log\left(z_{i,t}\right) + \pi \log\left(\frac{z_{i,t-1}}{z_{i,t}}\right) + \epsilon_{i,t} \tag{24}$$

Where $x_{i,t}$ and $x_{i,t+3}$ are taxable income for individual i before and after the reform (t and $t+3$), $1-\tau_{i,t}$ and $1-\tau_{i,t+3}$ are the corresponding net-of-tax-rates, α_t is a time specific effect, B_i is a vector of individual observed characteristics that are time-invariant (but may change relationship with income over time), and $M_{i,t}$ is a vector of observed time-variant variables. β and ρ are parameters, whereas θ and η are vectors of parameters and the error term, $\epsilon_{i,t}$, is assumed to be independently and identically distributed.

The marginal tax rate in this set-up is clearly endogenous, and studies typically employ the change in net-of-tax rates based on fixed first period income as instrument in an IV regression, see Auten and Carroll (1999) and Gruber and Saez (2002). The instrument is obtained by letting the tax rate in year $t+3$ be applied to income in year t (base year), inflated by the average income growth. This means that $\log\left(\frac{1-\tau_{i,t+3}}{1-\tau_{i,t}}\right)$ is instrumented by $\log\left(\frac{1-\tau^I_{i,t+3}}{1-\tau_{i,t}}\right)$, where $\tau^I_{i,t+3}$ symbolizes the marginal tax rate in year $t+3$ when applied to income of year t. Further, Gruber and Saez (2002) propose adding a ten-piece spline in the log of base year income (each decile of the income distribution) to account for (exogeneous) developments in the income distribution, and Kopczuk (2005) suggests including splines in the lagged base year income and in the deviation of lagged base year income from base year income. Weber (2014) argues that further lags in the construction of the instrument is a better way. The difference in the estimates using further lags together with the Kopczuk controls is small (not shown).

3.4 Extensive margin

Using estimates from Bastani, Moberg, and Selin (2017) and Bastani and Lundberg (2017): 0.2 for lowest quintile, 0.15, 0.1, 0.05 and 0 for the second, third, fourth and

Table 1: ETI estimates

	All	Female	Male
b	0.038	0.052	0.015
se	0.002	0.004	0.003
N	4,723,318	2,012,938	2,710,380

Notes: ETI estimates separatly for gender groups using variation in tax rates is from the Norwegian 2006 tax reform.

fifth, respectively.

3.5 The income distribution

The other main determinant of welfare weights is the shape of the income distribution. The adaptive bandwidth Kernel density estimate of the income distribution for wage earners is shown in Figure 3.

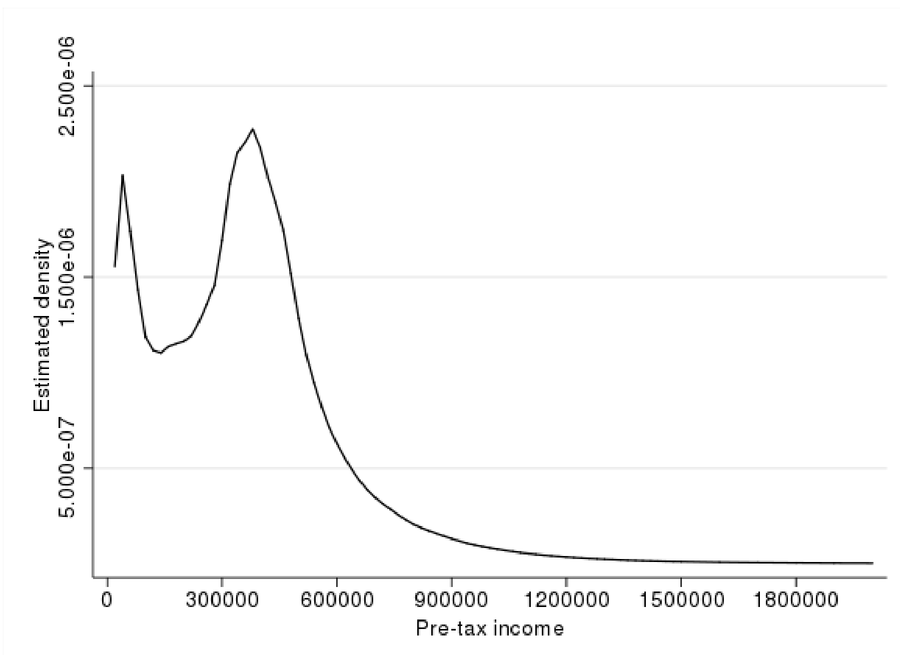

Figure 3: Kernel density of the income distribution

Notes: Wage earners. For the year 2010.

Following Hendren (2014), I estimate the local elasticity of the income distribution

$$\alpha(z) - \rho(z) = -\left(1 + \frac{zh'(z)}{h(z)}\right) \tag{25}$$

To find the local elasticity of the income distribution, I first estimate

$$\frac{\partial \log(h(z))}{\partial \log(z)} \tag{26}$$

with a fifth degree polynomial in z to produce the elasticity estimate, and then predict this for specific values of z. The results are seen in Figure 4.

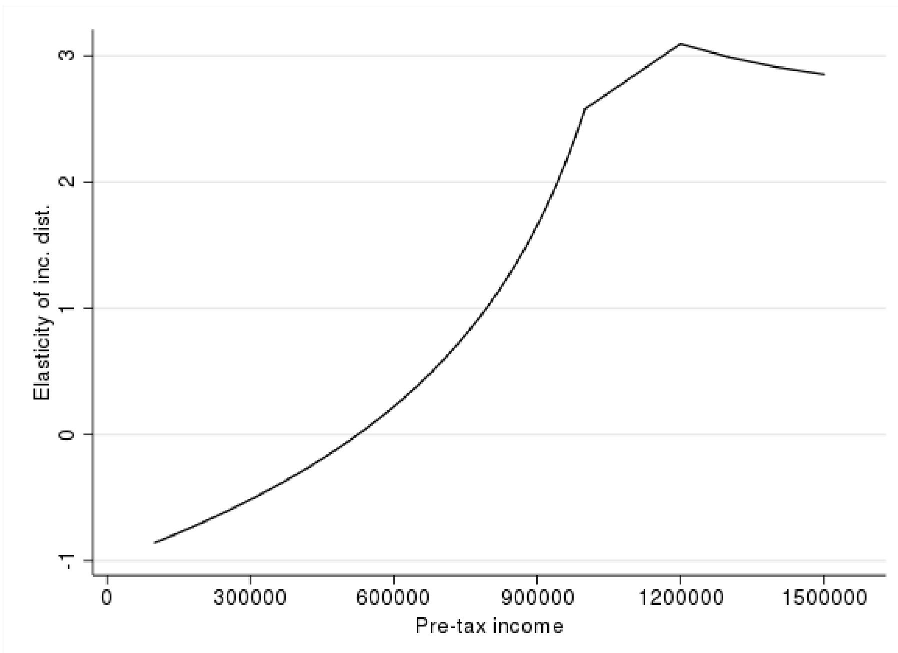

Figure 4: Local elasticity of the income distribution

Notes: For the full sample. For the year 2010.

3.6 Inverse optimal taxation

One issue is that to have a revealed preference interpretation of the weights, the ETI-estimates should reflect the policy-makers beliefs about responses rather than actual responses. However, I argue it can be more informative still to consider actual responses, since welfare weights can then be interpreted as *implicit weights* in the actual tax system. These implicit weights can then be presented to argue that the actual tax system places too much or too little weight on some principle or group.

Remember the equation for the welfare weights

$$g(z) = 1 - \frac{T'(z)}{1 - T'(z)} \epsilon(z)(\alpha(z) - \rho(z)) \tag{27}$$

Results for ETI$= 0.05$ is shown in Figure 5.

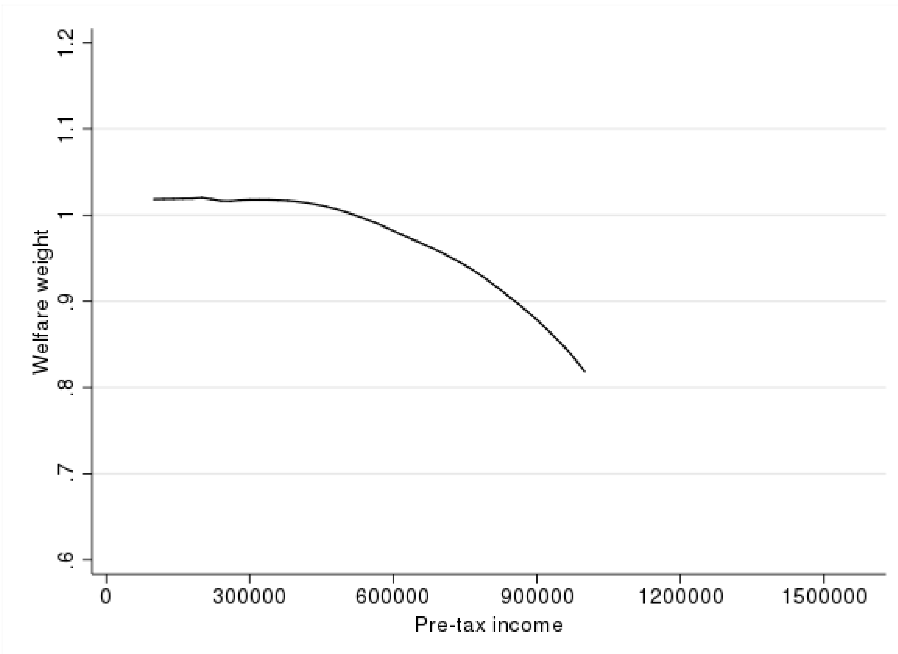

Figure 5: Welfare weights over the income schedule

Notes: Welfare weights for the whole sample for the year 2010.

3.7 Equal treatment

How much of the measured marginal welfare weights derive from not differentiating taxes between genders? Even though men and women respond differently, they are taxed the same. This can tell us about the valuation (or cost) of equal treatment, in the same manner as the efficiency distortions induced by the income tax system says something about the value of redistribution. But, the costs of redistribution could have been lower if there was not a principle of horizontal equity. By how much? I estimate that. Hence, inverse optimal tax overestimates the value put on redistribution, because the government also has other objectives, such as horizontal equity (as if the ETI was higher).

Even though the ETIs differ, there is no distinction made between genders. The implicit welfare weights for men and women must therefore differ. This equity has a cost. Measure the effect on the welfare weights by looking at optimal taxation separately for men and women. The income distributions and the inverse optimal tax welfare weight schedule, accounting for differences in ETIs, for men and women are shown in Figure 6 and Figure 7.

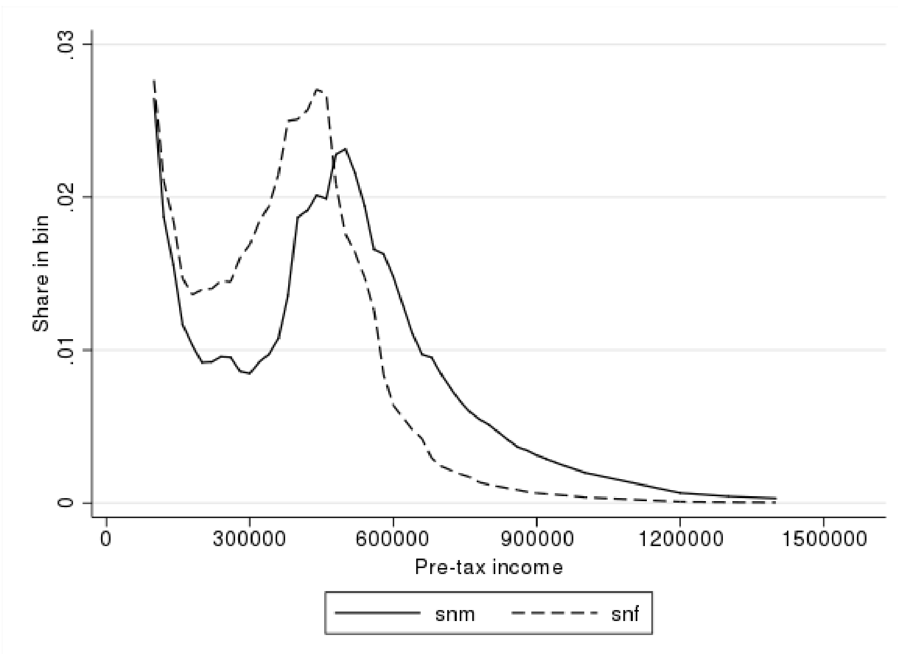

Figure 6: Income distribution of men and women

Notes: Men and women separately. Year 2010.

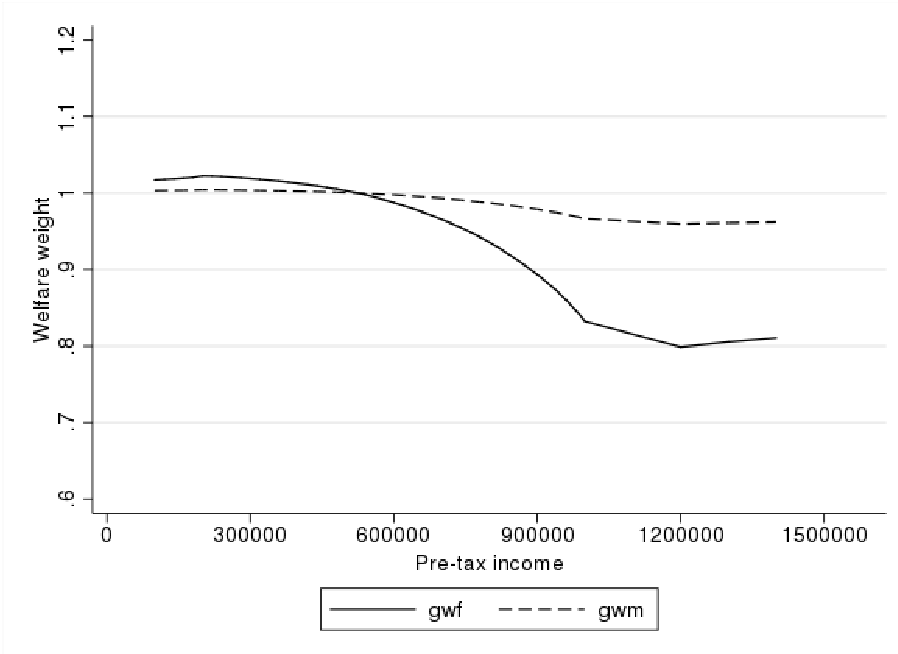

Figure 7: Welfare weights schedule for men and women

Notes: Men and women separately. Year 2010.

4 Conclusion

In this paper, I have shown how equity principles can be revealed from the tax system and how marginal welfare weights are determined by different equity principles. Furthermore, I have argued that the popular interpretation of welfare weight schedule from inverse optimal taxation is misleading. Factors contributing to the steep welfare weight schedule need in fact not be related to (vertical) inequality aversion, and can rather reflect views quite opposed to redistribution. The empirical application shows that implicit redistributive preferences are in fact less (vertically) redistributive than they might appear, as society also holds other principles, restricting itself from redistributing more.

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