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Tax-Benefit Systems in Europe and the US: Between Equity and Efficiency*

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Abstract

Whether observed differences in redistributive policies across countries are the result of differences in social preferences or efficiency constraints is an important question that paves the debate about the optimality of welfare regimes. To shed new light on this question, we estimate labor supply elasticities on microdata and adopt an inverted optimal tax approach to characterize the redistributive preferences embodied in the welfare systems of 17 EU countries and the US. Implicit social welfare functions are broadly compatible with the fiction of an optimizing Paretian social planner. Some exceptions due to generous demogrant transfers are consistent with the ignorance of behavioral responses by some European governments and are partly corrected by recent policy developments. Heterogeneity in leisure-consumption preferences somewhat affect the international comparison in degrees of revealed inequality aversion, but differences in social preferences are significant only between broad groups of countries.

Key Words: Social preferences, redistribution, optimal income taxation, labor supply.

JEL Classification: H11, H21, D63, C63

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1 Introduction

The level of redistribution via tax and transfer programs differs greatly across countries. Yet does little redistribution in some systems reflect more utilitarian views or simply the fact that these countries face tighter efficiency constraints, i.e., redistribution is less easily achieved because of more elastic labor supply? This question paves the debate about the optimality of, and the differences between, welfare regimes in industrialized countries. This paper attempts to address both sides of the same coin by bringing optimal tax theory to the data. We first estimate labor supply behavior on harmonized household surveys for 17 EU countries and the US in order to evaluate potential responses. Given these estimated constraints, we then invert the Saez (2002) optimal income tax model to characterize the redistributive preferences embodied in the actual tax-benefit systems of these countries. This way we can cast usual observations about tax-benefit systems directly in terms of social welfare language, check whether obtained patterns pass minimum consistency checks (i.e., are compatible with the fiction of an optimizing Paretian planner), and quantify the extent to which inequality aversion truly differs across countries once country-specific labor supply behavior is accounted for.

This contribution is the natural follow-up of recent applications of the optimal taxation theory on microdata. The normative literature of the 1970s, following the seminal contribution of Mirrlees (1971), had remained mostly theoretical for lack of reliable information on the 'true' distribution of individual abilities. More recently, the increasing availability of representative household datasets has allowed implementing Mirrlees' models to question the optimality of actual tax-benefit systems (e.g., in Diamond, 1998, Saez, 2001, 2002). Yet empirical applications remain scarce because little is known about the two fundamental primitives of the model – which are directly related to efficiency and equity concerns – namely labor supply behavior and social preferences, respectively. In most applications some "reasonable" assumptions are usually made for both components.

On the one hand, optimal tax applications most often refer to plausible elasticities as drawn from the labor supply literature. However, even if a relative consensus has been reached on certain aspects – notably that wage elasticities of labor supply are positive, usually smaller than 1 and larger for married women (Blundell and Macurdy, 1999) – there is little agreement on their magnitude. The size of elasticities for a given country can vary greatly depending on the period of investigation or various methodological aspects. Our attempt in this paper is to capture the labor supply responses that are consistent with the same microdata used for optimal tax characterization and estimated in a comparable fashion for all countries.

On the other hand, reasonable levels of social inequality aversion are usually chosen to characterize optimal tax schedules. In the primal problem it is possible to verify which degree of inequality aversion actually makes the optimal schedule closest to the actual one (see Laroque, 2005). Hence, the representation of redistributive preferences for a country at a certain point in time can itself become the object of investigation. In fact, the inverse optimal problem allows directly recovering the redistributive preferences implicit in actual policies. This dual approach was first suggested in the context of optimal commodity taxation (see Decoster and Schokkaert, 1989, among others) and extended to Mirrlees' income tax problem by Bourguignon and Spadaro (2010) in an application on French data. We systematically apply this approach to characterize the equity-efficiency trade-off in many European countries and the US.

A well-known problem with the Mirrlees' model, however, is that it accounts only for behavioral responses at the intensive margin.[1] The crucial role of the extensive/participation margin has been recognized since Diamond (1980). We adopt here the discrete version of the optimal tax model from Saez (2002), in which the population is partitioned into income groups. This simplification allows both intensive and extensive margins to be incorporated relatively easily. In our empirical analysis, work-consumption preferences are estimated at the individual level and used to calculate elasticities along both margins for the different income groups.

The present study is also related to two recent contributions. Both of them place emphasis on the question whether transfers should target the workless poor through traditional demogrant policies (means-tested social assistance programs) or the working poor through in-work support. This point is also central to our analysis, as we illustrate how the policy choices made by past governments in Continental/Nordic Europe may reveal little desert-sensitive redistributive preferences together with extreme underestimations of participation elasticities.[2] Firstly, Immervoll et al. (2007) suggest an interesting measure of the efficiency cost of marginal transfers from the rich to the poor in 15 EU countries. Under their assumptions of neutral redistributive preferences and uniform elasticities, further redistribution to the workless poor would imply very large efficiency losses in some countries. If governments are ready to bear such costs, this must reflect highly Rawlsian social preferences – what we suggest here is a direct characterization of these preferences as revealed by existing tax-benefit institutions. We also depart from the assumption of uniform elasticities, by retrieving work-consumption preferences consistent with the data, and extend the analysis to the US and several Eastern European countries. Secondly, Blundell et al. (2009) follow the same approach as ours but focus on single mothers in the UK and Germany.[3] These two countries are interesting because of contrasted policy choices: in-work support is available for single mothers in the UK, while the German system almost exclusively relies on traditional out-of-work transfers. Our analysis suggests a more systematic characterization and comparison between a large number of countries – yet, like these authors, we also restrict our

[1] Most of labor supply adjustments occur, in fact, at the extensive margin, i.e., due to changes in participation decisions (Heckman, 1993). These may be particular strong at the bottom of the income distribution (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001), which crucially affect the debate about whether redistribution should be directed to the workless poor or to the working poor.

[2] Some authors have already focused on how generous welfare schemes (and confiscatory implicit taxation) at the bottom of the distribution could be grounded on the basis of optimal tax formulas in some European countries (see Diamond, 1998, Choné and Laroque, 2005), or in-work support programs (and negative implicit taxation) in the US (Saez, 2002). Our results complete their work by revealing the shape of social preferences that rationalize existing systems under "true" labor supply responses and reasonable variations around them.

[3] Their paper was written at the same time as, and independently from, an ancestor of the present paper, Bargain and Spadaro (2008).

analysis to an homogenous population. While policies concerning single mothers may be inspired by non-welfarist objectives (such as minimizing child poverty), we prefer to focus on childless singles in order to extract purely vertical equity concerns as incorporated in tax-benefit regimes.

Our main results are as follows. The inversion procedure shows that tax-benefit revealed social welfare functions for all countries verify basic properties: in particular they display some taste for redistribution and do not reject the assumption of Paretian governments. Yet the implicit social welfare function is not always concave in Continental/Nordic Europe precisely because of the choice of generous demogrant policies, which imply high effective taxation on the working poor. The assumption that behavioral responses were by and large ignored by governments at the time redistributive schemes were implemented partly corrects these inconsistencies. Interestingly, further corrections can be seen in recent years, mainly due to the introduction of transfers to the working poor. "True" elasticities, i.e., those recovered by econometric estimations, may well have come closer to what policy advisors have had in mind in recent years. With these elasticities we find that international heterogeneity in work-consumption preferences plays some role – yet our results essentially show that differences in the degree of inequality aversion are significant only across broad groups of countries. Revealed inequality aversion is consistent with direct evidence on citizens' redistributive views when comparing the US and Continental/Nordic Europe.[4]

The paper is structured as follows. Section 2 presents the optimal tax model and the inversion procedure. Section 3 describes the empirical labor supply model. Section 4 presents the main elements of the empirical implementation (data, selection, labor supply estimations). Section 5 briefly describes the redistributive and incentive potentials of national tax-benefit systems and discusses the results. Section 6 concludes. In the Appendix we show that results are robust to alternative assumptions regarding the treatment of unemployment benefits or the definition of income groups.

2 Theoretical Background

2.1 The Optimal Tax Model

The model of Saez (2002) is based on the standard optimal income tax framework. That is, a Paretian government is assumed to maximize a social welfare function subject to an efficiency constraint and a national budget constraint. This function aggregates individual utility levels, which themselves depend on disposable household income (equivalent to consumption in a static framework) and leisure. The form of the social welfare function characterizes the government's taste for redistribution, ranging from Rawlsian preferences, where the government cares only about the worst off individual, to utilitarian preferences, whereby all individuals are weighted

[4] In this line of research our contribution is complementary to studies in which people are asked about their tax preferences and results compared to actual tax schedules (Singhal, 2008, Corneo and Fong, 2008).

equally. Actual productivities are not observed, so that the government can only rely on second-best taxation based on incomes. The efficiency constraint, or incentive-compatibility constraint, states that agents modify their labor supply, and hence their taxable income, in response to the level of effective taxation.

In addition, Saez (2002) assumes that potential workers can be aggregated into $I+1$ discrete groups comprising I groups of individuals who work, ranked by increasing gross income levels Y_i ($i = 1, ...I$), and a group $i = 0$ of non-workers. To each level of market income Y_i corresponds a level of disposable income $C_i = Y_i - T_i$, where T_i is the effective tax paid by group i (it is *effective* in the sense that it includes all taxes and social contributions, minus all transfers). Non-workers may receive a negative tax, i.e., a positive transfer $-T_0$, identical to C_0 by definition and often referred to as a demogrant policy (minimum income, social assistance, etc.). Proportion h_i measures the share of group i in the population. With this discretized setting, Saez shows that optimal taxation has the following form:

$$\frac{T_i - T_{i-1}}{C_i - C_{i-1}} = \frac{1}{\zeta_i h_i} \sum_{j=i}^{I} h_j \left[1 - g_j - \eta_j \frac{T_j - T_0}{C_j - C_0} \right] \text{ for } i = 1, ..., I, \tag{1}$$

with η_i and ζ_i the elasticities at extensive and intensive margins respectively, and g_i the set of marginal social welfare weights assigned by the government to groups $i = 0, ..., I$. Note that $\frac{T_i - T_{i-1}}{C_i - C_{i-1}}$ is nothing else than $\frac{T_i'}{1 - T_i'}$ in the standard formulation of optimal tax rules, with $T_i' = \frac{T_i - T_{i-1}}{Y_i - Y_{i-1}}$ the effective "marginal" tax rate (EMTR) faced by group i. It is not exactly marginal in the usual sense, but is defined at the income group level. Formula (1) is very comparable to the usual Mirrlees' rule. In particular, the level of marginal taxation is inversely related to the size of the group and the intensive margin elasticity ζ_i. A noticeable difference, however, is the presence of the extensive margin elasticity η_i (see Diamond, 1980). If it is zero, the model is simply a discrete version of Mirrlees and negative marginal tax rates resulting from in-work support – such as the US Earned Income Tax Credit (EITC) – are never optimal, since they discourage productive workers at the intensive margin. However, the larger the extensive elasticity, the more likely are optimal schedules featuring smaller guaranteed income for non-workers and larger in-work support (and possibly negative marginal taxes at low income levels, see Saez, 2002, Choné and Laroque, 2005).

Note also that the definitions of the elasticities at the intensive and extensive margins are rather specific in the present context. They are defined as:

$$\zeta_i = \frac{C_i - C_{i-1}}{h_i} \frac{\partial h_i}{\partial (C_i - C_{i-1})} \tag{2}$$

$$\eta_i = \frac{C_i - C_0}{h_i} \frac{\partial h_i}{\partial (C_i - C_0)}, \tag{3}$$

respectively. The former captures the percentage increase in group i when $C_i - C_{i-1}$ is increased by 1%, and is defined under the assumption that individuals are restricted to adjust their labor supply to the neighboring choice. The latter, the extensive or participation elasticity, is defined as the percentage of individuals in group i who stop working when the difference between the disposable income out of work and at earnings point i is reduced by 1%.[5]

Finally in expression (1) social preferences are summarized by the set of weights g_i. These weights mingle the "primitive" social weight, i.e., the derivative of the implicit social welfare function integrated over all the workers within group i, and the individuals' marginal utility of income (theoretical models often rely on quasi-linear preferences, e.g., in Saez, 2001, so the latter is equal to 1). Hence, as argued by Saez (2002), these weights provide a more direct and transparent interpretation than the primitive weights and are preferably the object of our attention. Indeed, they represent the *(per capita) marginal social welfare of transferring one euro to an individual in group i, expressed in terms of public funds.* Given this definition, Saez' model does not require the specification of utility functions (since the marginal utility of income is incorporated in g_i). The only assumption made on preferences is that there is no income effect, a traditional restriction in this literature, which is supported by our empirical results as discussed below.[6] When income effects are ruled out, an additional constraint emerges from Saez (2002)'s model that normalizes weights as follows:

$$\sum_i h_i g_i = 1. \tag{4}$$

2.2 Retrieving the Marginal Social Welfare Weights

The inverse optimal tax problem is relatively straightforward. Rather than retrieving the optimal tax schedule under certain assumptions about elasticities and social preferences, as summarized by the set of weights g_i, we invert formula (1) to infer weights g_i from the knowledge of income levels Y_i (from the data), tax levels T_i (or disposable incomes $C_i = Y_i - T_i$, obtained by microsimulation) and elasticities (obtained by econometric estimations on the same data). More precisely, expression (1) directly gives the weight on the last group:

$$g_I = 1 - \eta_I \frac{T_I - T_0}{C_I - C_0} - \zeta_I \frac{T_I - T_{I-1}}{Y_I - Y_{I-1}}, \tag{5}$$

as well as weights

$$g_i = 1 - \eta_i \frac{T_i - T_0}{C_i - C_0} - \zeta_i \frac{T_i - T_{i-1}}{Y_i - Y_{i-1}} + \frac{1}{h_i} \sum_{j=i+1}^{I} h_j \left[1 - g_j - \eta_j \frac{T_j - T_0}{C_j - C_0} \right] \tag{6}$$

for groups $i = 1, ..., I-1$, which allows us to derive recursively the weights g_I to g_1. Finally, the weight g_0 for the group of non-workers is obtained using normalization (4). Weights g_i correspond in part to the marginal social welfare function in the continuous model à la Mirrlees.

[5] These elasticities are notably different from the traditional wage-elasticity of hours (participation) which are defined as the increase in working time (participation rate) when wage rates increase by 1%.

[6] In the empirical part we choose a very flexible utility function to estimate labor supply elasticities. Zero income effect is not imposed a priori in our estimation but checked a posteriori. We find small or insignificant effects, so that the assumption made here is acceptable as a first approximation.

Therefore, a necessary condition for the implicit social welfare function to be Paretian, i.e. non-decreasing at all productivity levels, is that weights are positive. We shall check this property in our empirical results.

An important remark must be made at this stage. Both the behavioral elasticities η_i and ζ_i and the group sizes h_i are endogenous to the tax-benefit system. This means that proportions h_i observed in the data and elasticities estimated on the same data cannot be used to derive the optimal tax schedule in Saez' primal problem, as it is sometimes suggested. Think of a no-tax initial scenario: the social planner sets tax rates optimally according to (1) and given parameters η_i, ζ_i, h_i in the no-tax situation. Agents would then respond to this policy, so that elasticities and group sizes (in particular the number of non-workers) would change. This in turn invalidates equation (1), i.e., tax levels are no longer optimal, and the optimal tax rule must be applied again, generating further responses, etc. Clearly, it must be assumed that at least one fixed point exists in which the left and right-hand sides of equation (1) are consistent. When using population shares and elasticities estimated on actual data, the actual tax-benefit system as deemed optimal is precisely such a fixed point.[7] In other words, observed shares and estimated elasticities can only be used in the dual approach to characterize actual tax-benefit schedules, but not to derive the optimal tax schedule based on (1) in the primal problem.[8]

3 Estimations of Labor Supply Behavior

Before recovering social welfare weights on some household microdata, we need to estimate behavioral elasticities η_i and ζ_i that are consistent with these datasets. We opt for a discrete choice model of labor supply. It requires the explicit parameterization of consumption-leisure preferences, then utility-maximization is reduced to choosing among a discrete set of possibilities (e.g., inactivity, part-time and full-time). This approach has several advantages in the present context: it allows for flexible individual preferences, directly accounts for both participation and working-time decisions, and deals easily with complex tax-benefit systems that yield non-linear budget constraints and, because of means-tested benefits, non-convex budget sets. That is, realistic budget constraints can be incorporated in order to disentangle pure preferences (and fixed costs of work) from policy effects on labor supply choices.

Essentially we follow Hoynes (1996), Aaberge et al. (2002) and van Soest (1995). We specify consumption-leisure preferences using a quadratic utility function, i.e., the utility of household

[7] Saez (2002) makes explicit the condition that endogenous population weights should coincide with empirical weights when the optimal schedule coincides with the actual one.

[8] Using the primal problem to derive optimal tax schedules from labor supply estimations would require a model where tax formulas are based directly on exogenous preferences (utility functions) rather than endogenous summary elasticity measures as used here (see Blundell and Shephard, 2008). See also exciting developments based on numerical simulations and labor supply estimations to characterize optimal tax schedules (Aarberge and Columbino, 2008) or optimal tax reforms (Creedy and Hérault, 2010).

k choosing the discrete choice $j = 1, ..., J$ can be written as:

$$U_{kj} = V_{kj}(c_{kj}, h_{kj}) + \epsilon_{kj} \quad (7)$$

$$\text{with } V_{kj}(c_{kj}, h_{kj}) = \alpha_{ck}c_{kj} + \alpha_{cc}c_{kj}^2 + \alpha_{hk}h_{kj} + \alpha_{hh}(h_{kj})^2 + \alpha_{ch}c_{kj}h_{kj} - f_{kj}, \quad (8)$$

with household consumption c_{kj} and worked hours h_{kj}. In the deterministic utility V_{kj}, coefficients on consumption and worked hours, namely α_{ck} and α_{hk}, are household-specific as they vary linearly with several taste-shifters (gender, polynomial form of age, region) and incorporate random components (so the model allows for unobserved heterogeneity and unrestricted substitution patterns between alternatives). The fit is improved by the introduction of fixed costs of work f_{kj}, as in Callan et al. (2009), equal to zero if $j = 1$ (inactivity) and non-zero otherwise. These costs also depend on observed characteristics (region and education level, to proxy possible differences in job search costs, see van Soest and Das, 2000) and capture the fact that there are very few observations with a small positive number of working hours.

For each hour choice j, disposable income is calculated as a function $c_{kj} = d(w_k h_{kj}, m_k)$ of labor income $w_k h_{kj}$ and non-labor income m_k. Function d is approximated by numerical simulation of tax and benefit rules (tax-benefit calculators are presented in the next section). Wages w_k are calculated using earnings and work hours for workers and Heckman-corrected predictions for non-workers. Because the model is non-linear, we take the wage rate prediction errors explicitly into account for a consistent estimation.

The deterministic utility is completed by i.i.d. error terms ϵ_{kj} for each choice assumed to represent possible observational errors, optimization errors or transitory situations. Under the assumption that error terms follow an extreme value type I (EV-I) distribution, the (conditional) probability for each household of choosing a given alternative has an explicit logistic form, function of deterministic utilities at all choices. The unconditional probability is obtained by integrating out the disturbance terms (unobserved heterogeneity and the wage error term) in the likelihood. In practice, this is done by averaging the conditional probability over a large number of draws, and the simulated likelihood function can be maximized to obtain all estimated parameters (Train, 2003).

In the present non-linear model, labor supply elasticities cannot be derived analytically. Yet several types of elasticities can be calculated by numerical simulations using the estimated model. First of all, "standard" income and wage elasticities are predicted simply by uniformly increasing non-labor income (which is bottom-coded for all those with zero values) or wage rates by 1 percent and by simulating labor supply responses. We follow a calibration method which is consistent with the probabilistic nature of the model at the individual level. For each household it consists of repeatedly drawing a set of $J+1$ random terms from an EV-I distribution, together with unobserved heterogeneity terms of the model in their estimated distribution, which generate a perfect match between predicted and observed choices. The same draws are kept when predicting labor supply responses to an increase in wages or non-labor income. Averaging individual responses over a large number of draws provides robust transition matrices.[9] Next,

[9] Confidence intervals for elasticities are obtained by repeated random draws of the preference parameters from

the particular elasticities used in the optimal tax model, as defined in expressions (2) and (3), can be obtained in the same fashion but necessitate to re-aggregate behavioral responses at the level of each income group (see also Blundell et al., 2009).

4 Empirical Implementation

4.1 Data, Income and Selection

The fundamental information required by the theoretical model is the effective tax $T_i = Y_i - C_i$, which is the aggregation of all direct taxes and transfers in a given income group. This information is sometimes available in household microdata but often suffers from reporting errors, especially as households do not report correctly the levels of taxes they pay or the transfers they receive. Since it is impossible to obtain administrative data for 18 countries, a reasonable option is to simulate as precisely as possible the levels of disposable incomes by combining tax-benefit calculators with standard household surveys. For Europe we use EUROMOD, a tax-benefit calculator designed to simulate the redistributive systems of members of the European Union prior to May 1, 2004 (the EU-15 countries) as well as of several new member states (NMS). This is a unique tool to obtain a complete picture of the redistribution and the incentives to work generated by European welfare regimes. An introduction to EUROMOD, a descriptive analysis of taxes and transfers in the EU countries and robustness checks are provided by Sutherland (2001) and Immervoll (2004). EUROMOD is also used in Immervoll et al. (2007) for EU-15 countries. For the US, tax-benefit calculations are conducted using TAXSIM, the NBER calculator presented in Feenberg and Coutts (1993) and used in several applications (e.g, Eissa and Hoynes, 2011).[10]

Data and years of simulations are listed in Table A.1 in the Appendix. For the US we use the CPS– IPUMS for the year 2006, with policy simulation on 2005 incomes. EUROMOD is combined with partly harmonized, microdata on incomes, labor force participation and demographics for each European country. We use datasets for 17 EU countries (Poland, Hungary, Estonia and the EU-15 except Luxembourg) and cover tax-benefit systems of either years 1998 or 2001 for the EU-15 and of year 2005 for NMS.[11] The different datasets at use respect the basic requirements for our exercise, i.e., they provide a representative sample of the population (and in particular of income distributions), with comparable variable definitions across countries and all the necessary information to estimate labor supply behavior. For each household k in

their estimated distributions and, for each draw, by applying the calibration procedure.

[10] For Europe, country reports are available with detailed information on the input data, tax-benefit rules and modeling plus validation at the national level at www.iser.essex.ac.uk/research/euromod. For the US, TAXSIM is presented in detail at www.nber.org/~taxsim/.

[11] Data are collected over the period 1994-2001 for EU-15, and some adjustments are necessary, as explained in Table A.1. Note also that given the enormous task of uprating tax-benefit calculations for so many countries, we are constrained to use what is available within the EUROMOD project at the time the paper was written. Nonetheless, future developments of the project will certainly allow the extension of our results to more recent data and policy years and more countries.

each country, we are able to calculate the amount of benefits the household is entitled to and the taxes and social contributions it should pay, and hence its actual level of disposable income c_k that is reaggregated to form average disposable incomes C_i for groups $i = 0, ..., I$. We also use tax-benefit simulations to calculate the disposable income c_{kj} of household k at each discrete choice j, in order to proceed with labor supply estimations as explained above.

As in standard labor supply studies, we select potential salary workers in the age range $18 - 64$ (i.e., excluding pensioners, student, farmers and the self-employed). To keep up with the logic of the optimal tax model, we exclude all households where capital income represents more than 25% of the total gross income. Most importantly, we focus on *single men and women without children*.[12] This restricts considerably the scope of the analysis but is in our view a necessary and reasonable choice to make, for at least two reasons. Firstly, aggregating different demographic groups within a social welfare function poses fundamental difficulties in terms of interpersonal comparisons (see attempts in Aaberge et al., 2008). Even if (well-behaved) money metric utility measures could be derived to express household welfare in a meaningful common unit – which is far from obvious in the state of the art – the proper equivalence scale to use is unknown. Indeed, this would be the one used by the social planner herself and not any arbitrary equivalence scale that would impose some re-ranking and bias measures of vertical equity (see Lambert and Ramos, 1997).[13] Focusing on one homogenous demographic group at a time – here childless singles – implicitly assumes some separability in the social planner's program, with a first stage redistribution between demographic groups and a second stage with vertical redistribution within homogenous groups. It is also assumed that fertility and partnering decisions are exogenous to tax-benefit policies. Secondly, it is not at all clear which labor supply elasticities should be used if couples were to be included in the analysis. Immervoll et al. (2007) allocate different elasticities to different demographic groups but ignore the issue of joint labor supply decision in couples. As in Blundell et al. (2009), we prefer to focus on one-adult households. Importantly, we show in the empirical results that redistribution analyses conducted on single individuals already reflect a good deal of the differences in redistributive potentials across selected countries.

4.2 Income Groups and Income Concepts

We partition the population of each country into a small number of groups, $I+1 = 6$, in order to ease cross-country comparisons. In our baseline, group 0 is composed of inactive individuals who

[12] We have considered the alternative choice of focusing on single mothers, as in Blundell et al. (2008). This would offer the possibility to include a group which is entitled to EITC-type of transfers in the US, the UK and Ireland. However, sample sizes were too small for several countries to pursue meaningful analysis – especially if we consider that extracting homogenous groups requires focusing on single mothers with the same number of children.

[13] Muellbauer and van de Ven (2004) retrieve implicit equivalence scales embodied in actual tax-benefit systems. Along this line, one could consider inverting the optimal tax model on a heterogeneous population in order to retrieve both implicit equivalence scales and social welfare weights. This sounds challenging but is not impossible.

report neither labor income nor replacement income (such as unemployment benefit). Indeed, contributory benefits can be seen as pure insurance in most countries, i.e, where payments are closely linked to workers' past earnings through social security contributions. For that reason, unemployment benefits (UB) are interpreted here as delayed salaries and treated *stricto sensus* as replacement incomes, i.e., those who receive this insurance are treated as workers in our baseline.[14] In our view it would not make much sense to mix in group 0 high-skill workers who receive high levels of UB (when replacement rates are very high, as in Scandinavian countries) together with low-skill workers who live on welfare (social assistance). We make some exceptions to this treatment, however, in the case of the UK, Ireland and Poland. For these countries, UB are paid according to flat rates and have no strong link to past contributions, hence are treated as redistribution.[15] Next, groups $i = 1, ..., I$ are simply calculated as income quintiles among workers. In Appendix B we show that results are not too sensitive to alternative choices regarding the treatment of UB recipients and the definitions of income groups.

The descriptive statistics of our selected sample are reported in Tables A.2 and A.3 in the Appendix. Since the selected population is relatively homogenous by definition, we do not report usual demographic characteristics and essentially focus on the characteristics of the discretized income groups – the main ingredients of the model – including group shares h_i, average levels of gross income Y_i and disposable income C_i for each group $i = 0, ...I$, and effective "marginal" tax rates T_i' as defined above. The redistributive and incentive characteristics of each national system as captured in these tables are commented extensively in the section on results.

4.3 Labor Supply Elasticities and Heterogeneity in Individual Preferences

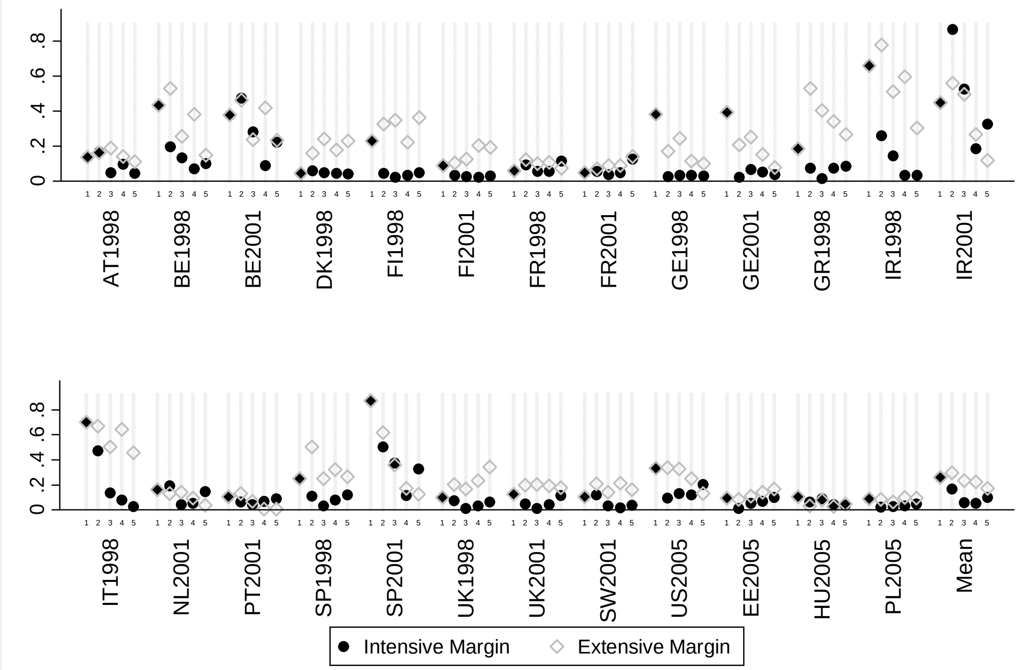
The last component to be used in the inverse optimal tax characterization is the set of behavioral elasticities. In our baseline labor supply model, we make use of a thin discretization with $J = 7$ choices, from 0 to 60 hours/week with a step of 10 hours, to capture as much as possible the country-specific variations in work hours. Since elasticities are a key component, we have also checked alternative levels of discretization and alternative model specifications: results, available from the authors, do not change significantly.[16] For lack of space, we do not report detailed estimates of preference parameters or goodness-of-fit measures for 18 countries – available upon request – but simply comment on our findings. Results are relatively standard, in that taste shifters related to age most often display a parabolic pattern and are often, but not systematically, significant. Costs of work are most often significantly positive. Higher education leads

[14] This is also consistent with the pure supply-side logic of the optimal tax model, in which involuntary unemployment is ignored and job seekers who claim benefits are treated as (potential) workers. On the explicit introduction of involuntary unemployment and job search decisions in an optimal tax framework, see Boone and Bovenberg (2004).

[15] In fact the treatment of unemployment insurance has little effect for these countries since, for singles, payments of UB are very similar to levels of income support. Non-contributory social transfers and contributory UB are described in Tables A.6, A.7 and A.8 in the Appendix and commented in the next section.

[16] We have also performed estimations on a broader group, including single parents, in order to increase sample size and calculated elasticities for each demographic sub-group.

to lower costs, which can be interpreted as lower job search costs for educated workers (see van Soest and Das, 2000). The pseudo-R2 are at conventional levels and the distribution of actual and predicted frequencies for the different hour choices compare well.



Notes: This Figure represents estimated Saez' extensive and intensive margin elasticities for the five groups of workers (for group 1, extensive and intensive margins are equal by definition).

Figure 1: Saez' Elasticities at the Extensive/Intensive Margins (Point Estimates)

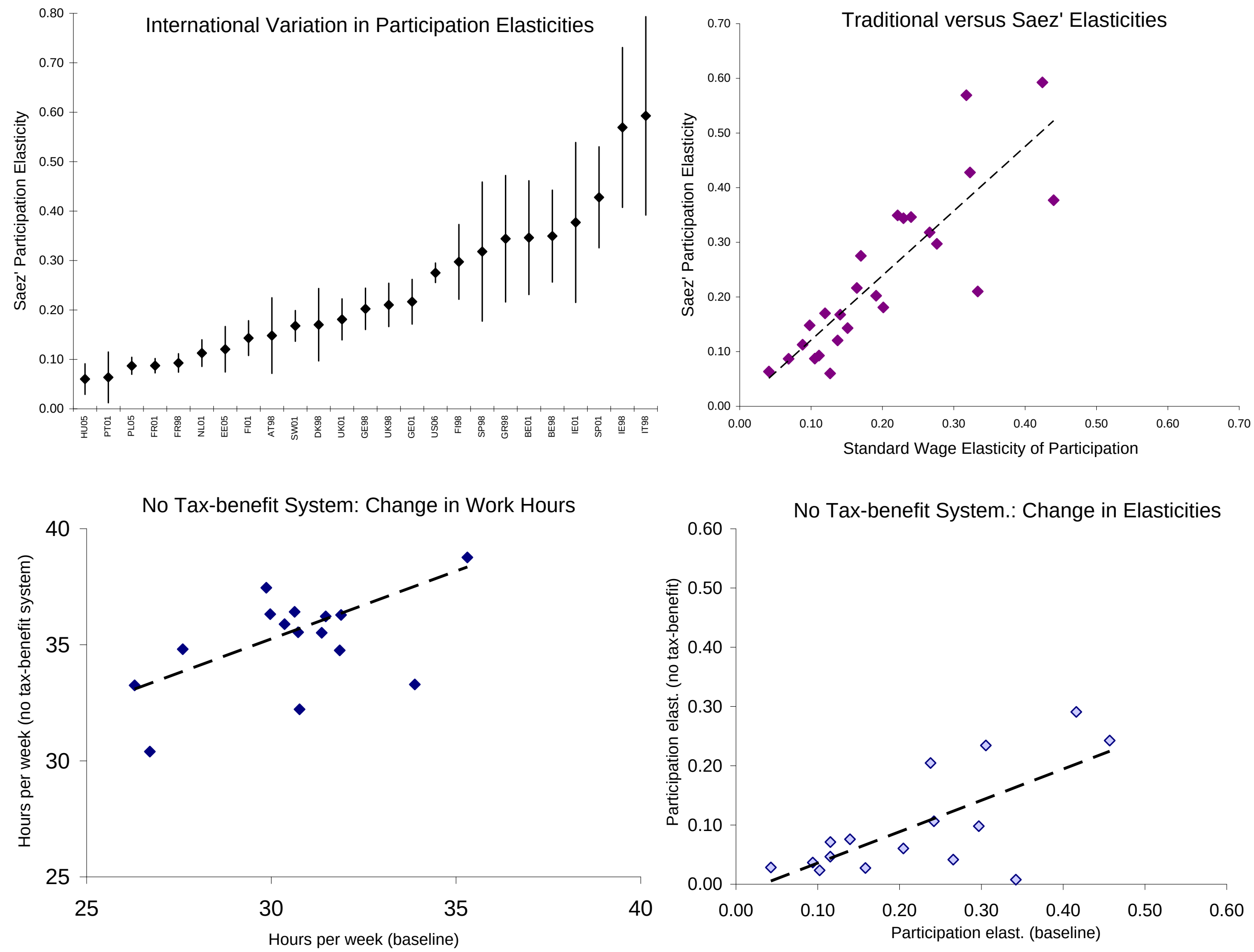
"Standard" income and wage elasticities have been produced in a comparable way for the 18 selected countries. Mean elasticities are reported in the upper panels of Tables A.4 and A.5 in the Appendix. *Income elasticities* are found to be very small in all countries, often not significantly different from zero and systematically smaller than .1 in absolute value. A few countries show absolute elasticities between .02 and .06 (Ireland, Hungary, Sweden), others of that same magnitude but statistically insignificant (Denmark, Italy), and the elasticities for the remaining countries are smaller than .01. Ignoring income effects in the theoretical model and for the selected population is therefore a reasonable approximation. *Wage elasticities* of hours and participation are in line with recent evidence based on discrete choice models (see Blundell and Macurdy, 1999, and the meta-analysis of Evers et al., 2008). Yet there is in fact little evidence concerning single individuals because the literature has focused on groups known to be more responsive to financial incentives, in particular married women and single mothers. Thus, we provide here some novel evidence concerning labor supply elasticities for single individuals in several industrialized countries. The first observation is that our hour elasticity, which incorporates both change in hours for those in work and the participation effect, is close to the pure participation elasticity. This conveys that also for single individuals, most of the total hour adjustment occurs at the extensive margin. Elasticities are particularly small in France (see Evers et al., 2008), the Netherlands (see Euwals and van Soest, 1999) as well as in Austria (Dearing et al., 2007 report particular low responses, even for married women), Denmark, Portugal, the Netherlands, Hungary and Poland. They are especially large in Spain, Ireland (as supported by Callan et al., 2009) and Italy (particularly large responses in Italy are reported in Aaberge et al., 2002, and Evers et al., 2008). Other countries have intermediary values, which correspond to small elasticities around $.1 - .2$, for instance in Germany (see also Haan and Steiner, 2000). Estimates are relatively precise and we find no systematic differences between (childless) single men and women.

Saez' elasticities at the extensive and intensive margins, i.e., η_i and ζ_i, are shown in Figure 1 for the income groups of workers $i = 1, ..., I$.[17] Given the specific definition of these elasticities, we do not expect their magnitude to match exactly the standard wage elasticities of hours and participation as discussed above. Yet the marked differences observed across countries mirror previous results with traditional definitions, in particular the larger elasticities at the *extensive margin* in Ireland, Spain and Italy, in contrast to particularly small response in France, Eastern Europe, Portugal and the Netherlands. As expected, most of the extensive margin response is due to groups 1 and 2, the low income groups, then decreases with income levels. As in Blundell et al. (2009), we find that elasticities at the *intensive margin* are much smaller than participation elasticities, except for group 1, for which intensive and extensive elasticities are by definition identical (see equations 2 and 3). Together with slightly larger elasticities for the last group, possibly due to backward-bending labor supply, this yields a U-shaped average pattern over the different quintiles.

In Figure 2 we provide some useful additional information, focusing on elasticities at the extensive margin. The top-left panel first shows confidence intervals for the mean participation elasticities over income groups $i \geq 1$, based on bootstrapped standard errors. Estimates appear to be relatively precise in general but 95% confidence bounds can be as broad as $.4 - .8$ for Italy or $.2 - .5$ for Ireland. As we shall see, this may affect the international comparability of tax-benefit revealed social inequality aversion. The top-right quadrant compares Saez' participation elasticities with traditionally defined elasticities: even if the former are slightly larger, we confirm there that both types of elasticity capture the international differences in labor income responsiveness. In the lower panels we investigate whether this heterogeneity across countries is genuine or is in fact affected by existing tax-benefit systems themselves. Indeed, as discussed above, elasticities are endogenous to tax-benefit policies.[18] We suggest a simple experiment to check whether differences in work-consumption preferences actually do matter. Using estimated

[17] Point estimates and standard errors are reported in the lower panels of Tables A.4 and A.5 in the Appendix.

[18] In particular, lower participation elasticities for group 1 compared to group 2 in some countries are possibly due to confiscatory EMTRs in that income range that cancel most of the wage/income increment used to calculate elasticities.



The top-left panel represents Saez' participation elasticities averaged over income groups i=1,...,I (point estimates) and 95% bootstrapped confidence intervals. The top-right panel compares these elasticities with traditionally defined participation elasticities. Lower panels describes a situation with no tax-benefit system (change in hours and participation elasticities).

Figure 2: Characterization of Labor Supply Elasticities (Extensive Margin)

preferences we simulate the situation whereby the tax-benefit system of each country is completely removed (a reform which replaces existing systems with a common flat-tax policy yields similar results). As expected, given this radical reform, the bottom-left panel shows an increase in labor supply in almost all countries. This is accompanied, in the bottom-right panel, by a mechanical decrease in elasticities. Most importantly, countries with larger responses in the baseline also tend to have larger responses in the no-tax-benefit situation. These results thus suggest that individual work-consumption preferences – and possibly also other institutions that may affect fixed costs of work but are not explicitly simulated – are sufficiently heterogeneous between countries to explain significant differences in efficiency constraints.

5 Main Results

5.1 National Tax-Benefit Systems: An Overview

Before presenting the main results, we suggest a brief overview of the redistributive policies in the countries under study. Our comments below are based on Tables A.6, A.7 and A.8 in the Appendix, which give an overview of the rules governing taxes, contributions and transfers for working-age single individuals in the EU and the US. Our aim is to show the diversity of situations that may, to some extent, reveal important differences in political and normative views across countries. For that purpose we present a traditional but suggestive characterization of the redistributive and incentive potential of the different tax-benefit systems. For redistributive effects we simply look at inequality as measured by the Gini coefficient.[19] Efficiency aspects are characterized by implicit taxation on labor income. Both dimensions will be integrated in the optimal tax approach that follows. Detailed results on redistributive policies are provided in Figures A.1 and A.2 in the Appendix, for the whole population and for our selection, respectively. Disincentive effects of taxation are summarized by the EMTRs reported in Appendix Tables A.2 and A.3 and compared graphically in Figure 4 below.

Redistributive Effects Graphs in Figures A.1 and A.2 report Gini coefficients of equivalized income and the percentage reduction in Gini due to the tax-benefit systems. Gini coefficients are shown for four income concepts starting with gross/market incomes and including gradually the different policy instruments, i.e., benefits, social security contributions (SSC) and taxes. Firstly, we can see that the most important redistributive effect for the whole population is on account of transfers.[20] Comparing Figures A.1 and A.2 shows that this is also true for our selection of childless singles, but to a lesser extent. In both groups we see that in Nordic countries, the Netherlands, Germany, Belgium and France, benefits alone bring the Gini coefficient below the .35 mark. In some countries in the middle of the ranking, like Ireland and the UK, benefits (and non-contributory income support in particular) also help to reduce considerably the initially high levels of market income inequality. In our selection of working-age singles, redistribution to the poor through means-tested social assistance is substantial in Nordic and Continental Europe but absent in other European countries and the US, with the exception of some disability benefits.

SSC levied on earnings, and sometimes on benefits, are generally designed as a flat-rate scheme, aimed to finance pensions, health and unemployment insurance, and are relatively neutral in terms of redistribution. The effect of income taxation is more important. Taxes naturally have a larger redistributive impact than transfers in countries where the latter are

[19] Gini levels for the whole populations are in line with common wisdom (see Gottschalk and Smeeding, 1997). More complete analyses using other inequality/poverty measures or further decomposing the redistributive effect into different components (e.g., the effect of taxation into tax levels and progressivity effects) can be found in Wagstaff et al. (1999).

[20] This result holds whatever the order in which policy instruments are added to (or withdrawn from) gross income. The order retained here is justified by the fact that benefits are taxable in some countries (so that certain combinations, such as gross income minus SSC and taxes, would lead to negative incomes).

small (e.g., Hungary or the US). They sometimes have a significant role even when benefits are generous (e.g., in Denmark). Tax structures in almost all of the countries are progressive, with the exception of flat tax schemes in Baltic countries (represented here by Estonia). Low earners do not usually pay taxes thanks to tax allowances or tax-free brackets. The degree of vertical redistribution due to income tax schedules depends on a complex mix of tax level, tax progressivity and scope (tax base), as studied in Wagstaff et al. (1999). International rankings on the levels of public spending (and in particular spending on redistribution) mirror tax levels, with lower taxation in Southern and Eastern Europe and the US at one end and high tax redistribution in Nordic countries at the other.

Figure 3 provides important additional information. In the left panel we plot the Gini-reduction effect of tax-benefit policies as previously defined, i.e., which include unemployment benefits (UB) as part of the redistribution function, against the same effect when UB are treated as market income. We see that the international ranking is broadly preserved: countries with high levels of redistribution through the tax-benefit system alone are also countries with higher rates of replacement incomes. Nonetheless, the high replacement rates of UB in countries like Denmark make the system even more redistributive than when the sole tax-benefit policies are accounted for. As argued before, we shall treat UB as pure insurance in our main results in order to be consistent with the logic of the optimal tax model. The right panel of Figure 3 compares Gini reductions in two different samples: our selection of working-age childless singles versus the whole population. As expected more redistribution occurs in the full population, in particular because of in-work support programs like those operated in the US (EITC) and the UK (WFTC) or demogrant policy targeted at single parents (such as the TANF in the US). Interestingly, however, the figure shows a high correlation: countries which do not redistribute much among childless single individuals do not redistribute much in general. This is reassuring for what follows: our selection is certainly restrictive but captures well the redistributive intentions of social planners in terms of pure vertical equity.

Incentive Effects Turning to the incentive effect of tax-benefit systems, we directly use EMTRs as previously defined at the income group level, i.e., $\frac{T_i - T_{i-1}}{Y_i - Y_{i-1}}$, rather than at the individual level (as, e.g., in Immervoll et al., 2007). The characterization is nonetheless very much in line with previous international comparisons (see Immervoll, 2004). In Figure 4 the upper quadrants show that in Continental (left) and Nordic (right) European countries, EMTRs are larger in upper income groups, due to progressive taxation. In addition, they are particularly large for group 1 (and sometimes group 2). Such high implicit taxation on poor workers is due to high withdrawal rates of means-tested social assistance programs together with the absence of transfers to the working poor (they are excluded from any form of redistribution for the years under consideration, with a few exceptions). Combining the two factors explains a U-shaped pattern of EMTRs extensively discussed in the literature (Bourguignon, 1999, Immervoll, 2004,

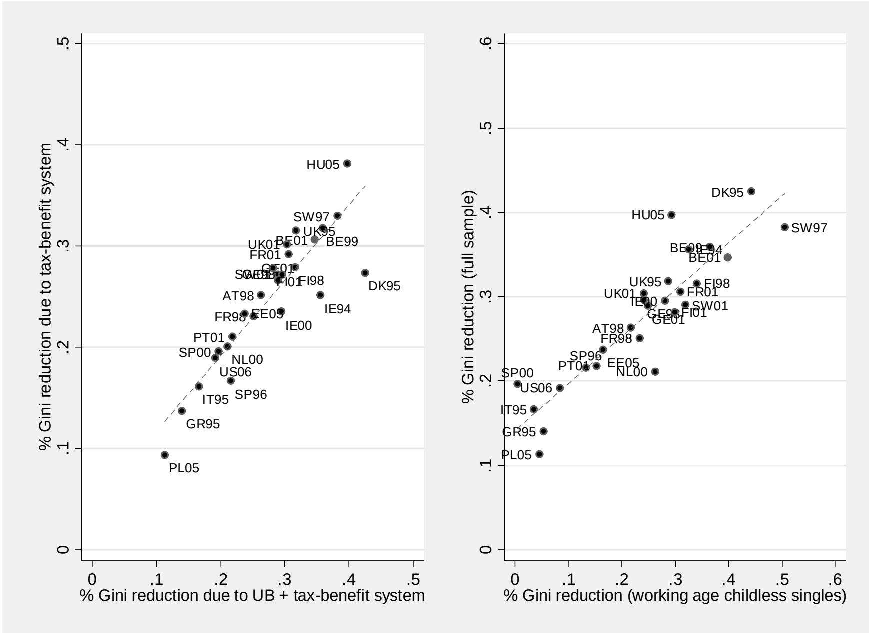


Figure 3: Vertical Redistribution: Impact of Unemployment Benefits and Sample Selection

among others).[21]

The lower panels show EMTRs in Eastern European countries and Anglo-Saxon countries (bottom left) and Southern Europe (bottom right). In contrast to Continental/Nordic Europe, the overall level of net taxation is lower, and the distribution of EMTR flatter, with a few exceptions. For one thing, this characterizes the absence of social assistance schemes in most of these countries. In the US, and to some lesser extent in the UK and Ireland, redistribution is usually targeted to those in-work and with children (hence it is not apparent in our results). Yet social assistance (Income Support) in the UK is not marginal and also creates high implicit taxation among low-wage workers, which is not compensated by tax credits in the case of childless singles for the years under consideration. There are other exceptions on the income tax side, notably fairly higher tax levels can be observed in some Eastern countries (Poland, Hungary) as well as in Ireland and Italy. Tax progressivity is also more pronounced in the income tax schedule of several Southern countries (Greece, Portugal, Italy).

5.2 Tax-Benefit Revealed Redistributive Preferences

We now move to the core results of our analysis. We present for each country the pattern of marginal social welfare weights g_i for all six income groups $i = 0, ..., 5$, as derived from the

[21] Tables A.2 and A.3 also report effective participation tax rates (EPTR), defined as $\frac{T_i - T_0}{Y_i - Y_0}$ for $i = 1, ..., I$. They add to the picture that implicit taxation when leaving assistance and taking up a job on the labor market is very high in these countries.

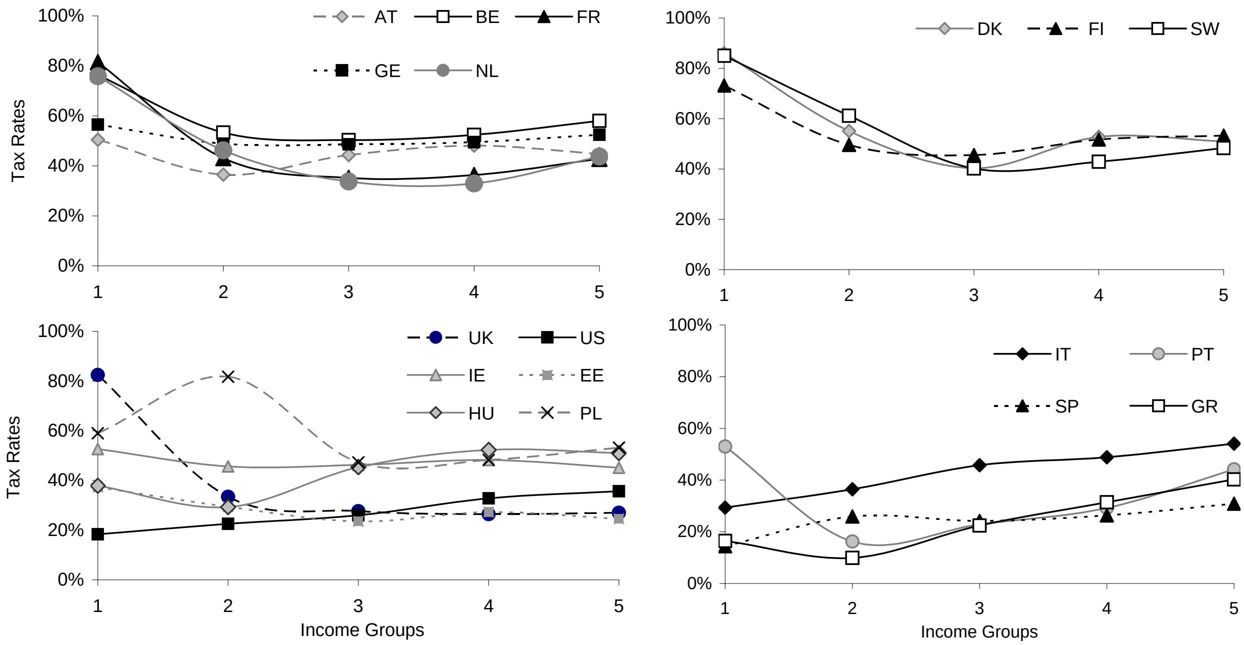


Figure 4: Effective Marginal Tax Rates

inverse optimal tax approach and using estimated labor supply elasticities. Recall that each of these weights represents the dollar equivalent value for governments of distributing an extra dollar uniformly to individuals working in group i. The main set of results is shown in Figure 5. While the patterns of welfare weights can be compared across countries, the exact magnitude for each income group cannot be directly compared because the normalization (4) is country-specific. Blundell et al. (2008) suggest expressing all weights relatively to the weight of group 0. Given the large number of countries, our choice is to summarize the shape of redistributive preferences in a single-valued index. To do so, we use the parameterization suggested by Saez (2002) to relate weights and net incomes, i.e.:

$$g_i = 1/(p \cdot C_i)^{\gamma} \quad \text{for all } i = 0, ..., I. \tag{9}$$

In this expression, p denotes the marginal value of public funds and γ is a scalar parameter reflecting the social aversion to inequality. The higher γ the more pro-redistribution social preferences are, from $\gamma = 0$, defining utilitarian preferences, to $\gamma = +\infty$, corresponding to the Rawlsian criterion. In practice, Saez (2002) states that γ values around .25 (1) imply a reasonably low (high) taste for redistribution, while a value of 4 is high enough to proxy the Rawlsian benchmark. Using the values of g_i obtained by inverting the optimal tax model, we estimate expression (9) to recover the parameter γ for each country.

Overall Patterns and Consistency From results in Figure 5 we first check whether tax-benefit revealed marginal social welfare functions show reasonable properties. A necessary con-

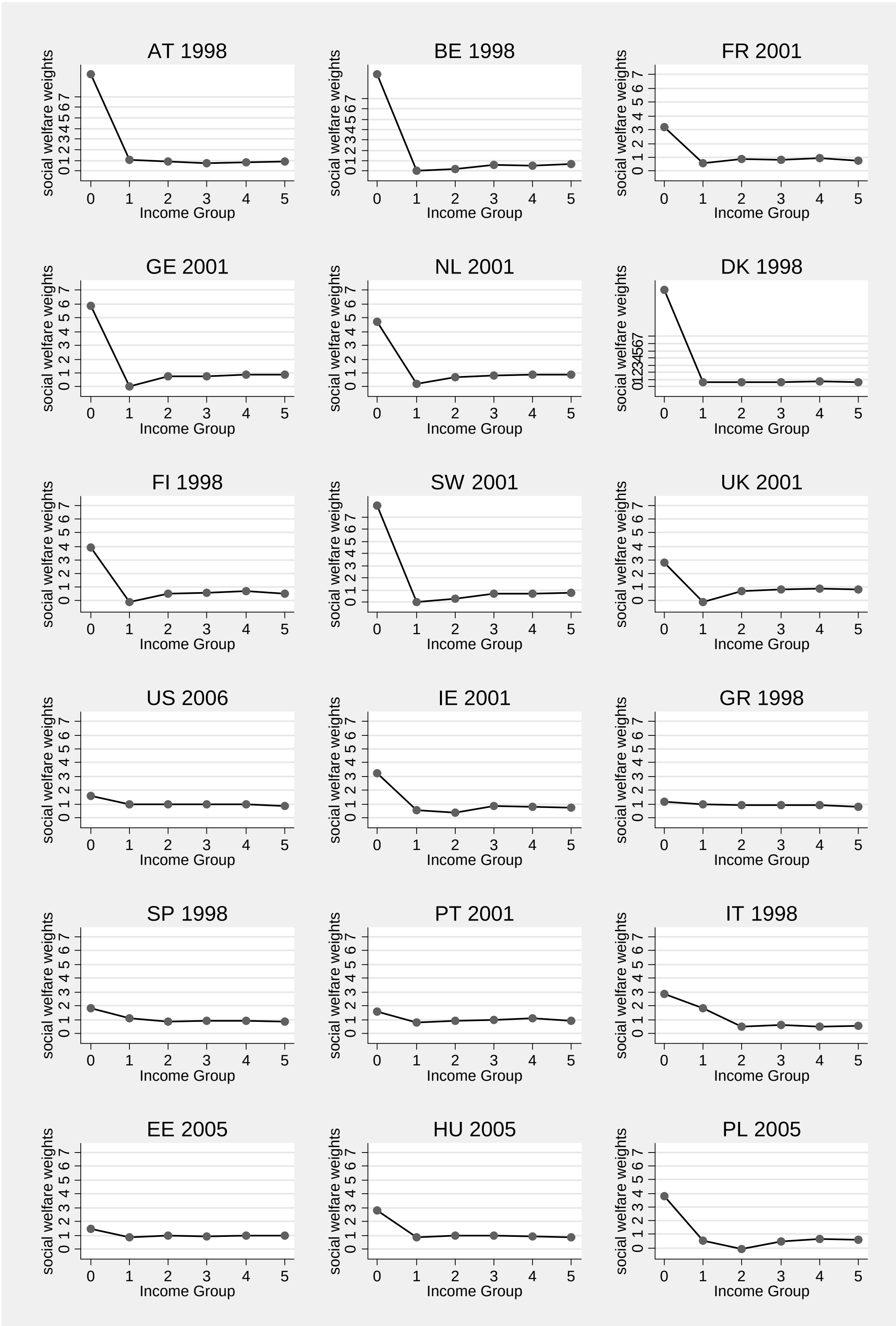


Figure 5: Marginal Social Welfare g_i

dition for them to be Paretian, i.e., non-decreasing at all productivity levels, is that weights be positive. Our results show that this is the case for all countries and all income groups – even if weights are close to zero in some specific cases concerning groups 1 and 2, which we shall discuss in length below. Hence, we cannot reject Paretianity.[22]

Next we discuss the shape of the implicit social welfare functions: is marginal social welfare monotonically decreasing with income and how Rawlsian are the various countries? We first see that the patterns are consistent with some social aversion to inequality, with the largest welfare weight placed on the poorest, the workless poor of group 0, in all countries. Yet this weight is particularly small in countries where demogrant policies are absent or marginal, i.e., in Southern Europe, Hungary, Estonia and the US. In these countries, revealed preferences are close to utilitarianism with a relatively flat pattern. There are some exceptions and notably a slightly lower weight on the top income group due to progressive taxation in some countries, consistent with the more pronounced progressivity in EMTRs as discussed above (e.g., in Portugal and Greece). We have also shown that implicit tax levels are higher in Italy, which is reflected here by the fact that welfare weights are significantly lower than 1 in the upper half of the distribution.

All the other countries operate some non-marginal transfers toward the bottom of the distribution. As a result, the weights on group 0 are much higher (sometimes very high, as is the case for Austria, Denmark, Sweden and Belgium). At the same time, weights on group 1 (and sometimes 2) are extremely small in most of these systems. This result does not come as a surprise: it simply reflects the way the optimal tax model rationalizes the very high distortions imposed on the working poor, as previously discussed.[23] For these countries the concavity of the implicit social welfare function is then not ensured at all income levels. This apparent inconsistency may reveal two things. On the one hand, it is likely that governments had completely different beliefs about the extent of behavioral responses – when generous social assistance programs were implemented – than what is evaluated by the econometrician. On the other, it may be the case that governments have neglected the group of working poor and placed a higher weight on the workless poor. Interestingly, the policy trend observed in these countries in the more recent years precisely consists in a correction of this feature, a reduction in the welfare weight gap between groups 0 and 1, which possibly reflects a change in preferences (towards more desert-sensitive redistribution) and/or a reassessment of behavoral responses. We investigate these points further below.

Sensitivity to Elasticity Size We pursue here our social welfare characterization with a series of sensitivity checks around the *estimated values* of behavioral elasticities. We essentially focus on different scenarios regarding participation elasticities (results for key groups 0 and 1

[22] Using the confidence interval of estimated elasticities shows that this result holds in all cases except for the UK, Sweden, Finland, Belgium and Germany. For these countries, the marginal social weight on group 1 turns negative when the upper bound elasticity is used. However, this upper level is implausibly high.

[23] There are exceptions, e.g., Denmark, where a small extensive-margin elasticity on group 1 compensates this effect (cf. Table A.4).

depend less crucially on the intensive margin, cf. Saez, 2002). We are mainly interested in international comparisons, and hence report in Figure 6 the revealed social inequality aversion parameters γ obtained under different scenarios.[24] First of all, we check the consequences of ignoring cross-country differences in the size of participation elasticity. Indeed, previous applications of optimal tax theory usually use uniform values drawn from the literature. For each income group $i = 1, ..., 5$, we apply the estimated participation elasticity averaged over all countries. Results are compared to a scenario with uniform participation elasticities as used in Immervoll et al. (2007), i.e., from .4 in group 1 to 0 in group 5 with step .1. Results in the top-left quadrant of Figure 6 show that the international ranking in levels of implicit inequality aversion is much in line with the standard redistribution analysis, placing Southern countries and the US at a low level of inequality aversion (around .25), while Nordic and Continental European countries show more Rawlsian preferences (around 1 or above). In addition, it transpires that elasticities used in Immervoll et al. (2007) do a good job in representing mean estimates: the ranking is the same in both scenarios and the magnitude of inequality aversion is relatively similar.[25] Next, the top-right panel compares the uniform elasticity scenario based on mean estimated elasticities to the results based on country-specific estimates, i.e., to the levels of inequality aversion embodied in our baseline results of Figure 5. The ranking is affected to some extent. For instance, countries with small, below-average elasticities appear automatically "less Rawlsian" because the efficiency constraint is not as tight as previously assumed with the mean elasticities. Interestingly, there is now less variation across countries when "true" elasticities are accounted for, with Continental Europe, the UK, Ireland and Finland around 1, Southern/Eastern Europe and the US at lower levels, and Scandinavian countries plus Belgium far above 1.

We also replicate the inversion procedure when using the limit values of the 95% confidence interval of estimated participation elasticities. This directly leads to confidence bounds on marginal social welfare weights as depicted for the US and France in Figure 7. In that example we observe that the weight on group 0 is significantly larger in France than in the US, and weights on higher groups are significant smaller (and smaller than 1). Without ambiguity, we can say that under estimated behavioral responses, the implicit preferences in the French welfare regime are more Rawlsian than in the US system. Differences are not significant for all pairs of countries, however. Transformed into social inequality aversions, results in the bottom-left quadrant of Figure 6 confirm significantly lower aversion in the US compared to France, but show an incomplete ordering over all countries. In fact, we can distinguish the same three groups of countries as delineated above, but differences between countries within a group are usually insignificant (for instance differences between Scandinavian countries in the top group).

[24] Not to overload the graphs, we take the mean inequality aversion over the two periods when two years of data are available. A specific sub-section is dedicated to time change below.

[25] It is slightly smaller using the elasticities in Immervoll et al. (2007) because the distance between g_0 and g_I is smaller, as a result of lower responses in upper income groups (in contrast to their assumption, our estimates point to non-zero elasticities at the top).

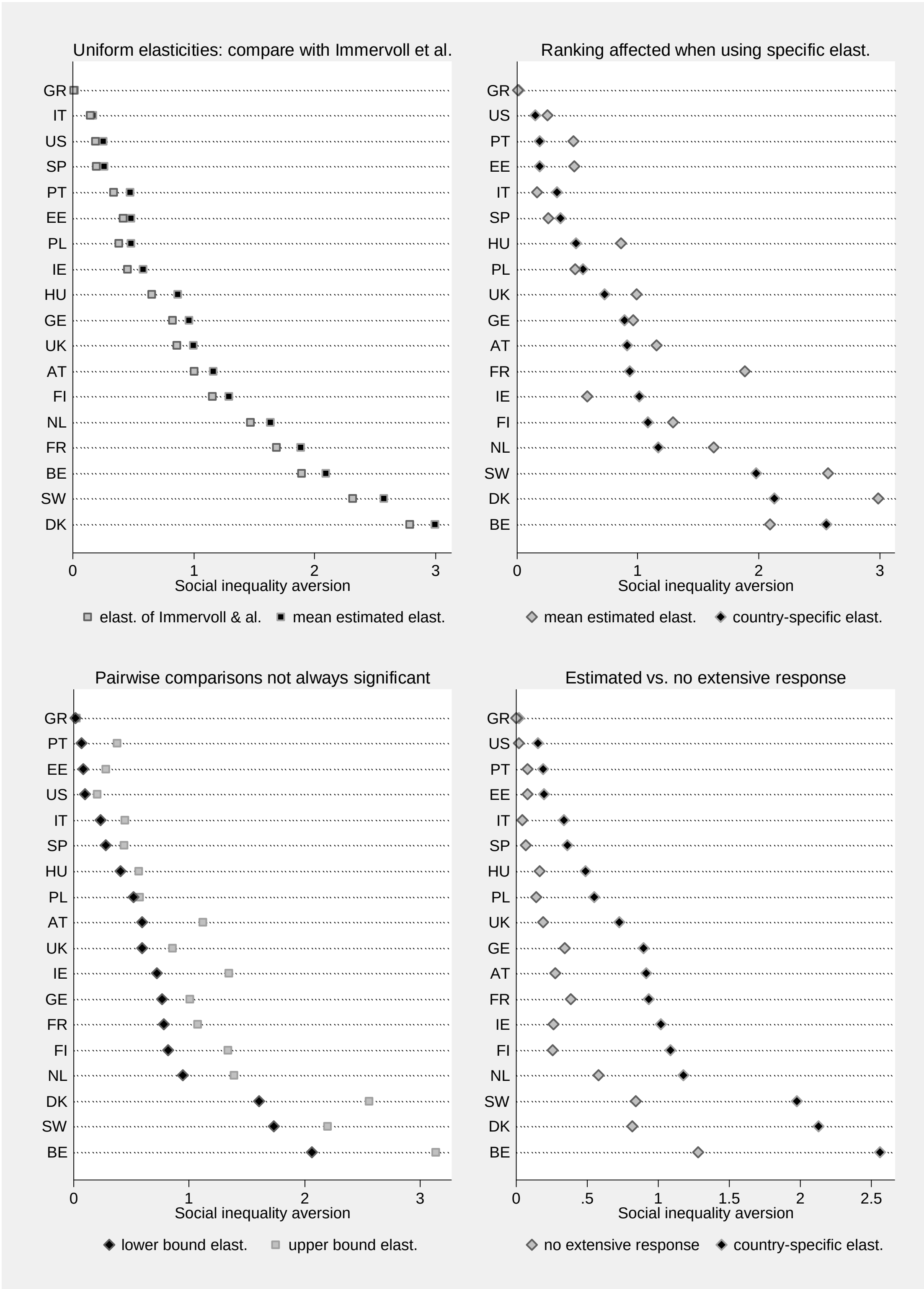


Figure 6: Tax-benefit Revealed Social Inequality Aversion γ

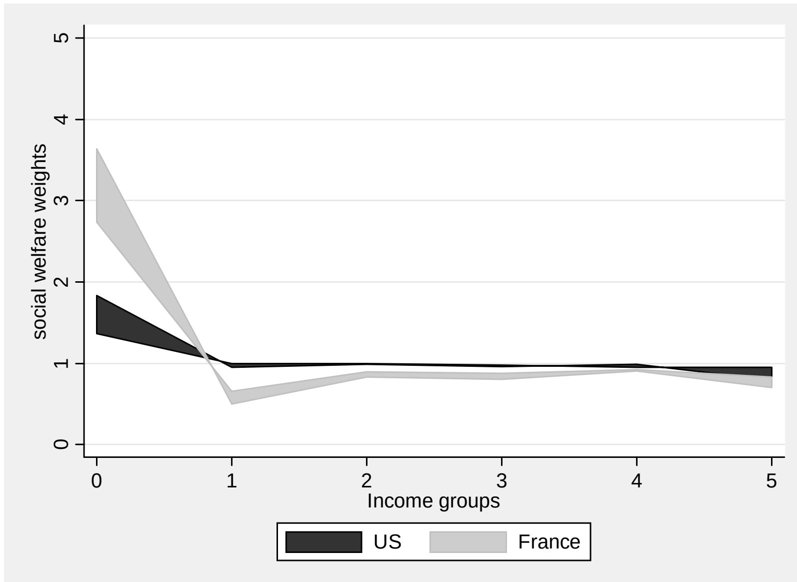


Figure 7: Tax-Benefit Revealed Social Welfare: US and France

Elasticities: from Econometrics to Politics We have just characterized the redistributive preferences embodied in actual tax-benefit system when predictions of a structural model about labor supply elasticity are taken seriously. If we assume instead that governments had completely different priors about behavioral responses, we may retain an extreme scenario where elasticities are set to zero. As argued above, this may well apply to the context of Continental and Nordic European countries when generous demogrant policies were designed.[26] To illustrate this situation, the bottom-right quadrant of Figure 6 compares our baseline results to revealed inequality aversion in the case where extensive elasticities are zero. While the international ranking is roughly preserved, the absolute aversion level mechanically decreases. More interestingly, differences between some of the countries decrease, e.g., between Sweden/Denmark and the Netherlands. To further analyze this point, Figure 8 compares the two scenarios when results are cast in terms of welfare weights. We focus on four countries with generous demogrant policies and high implicit taxation on group 1 (and group 2 in Sweden and the Netherlands). When setting participation elasticities to zero, irregularities on group 1 (and 2) partly disappear: the distribution of marginal social welfare weights becomes flatter. Smaller and more similar weights on group 0 can be observed and are consistent with the lower and more similar levels of inequality aversion discussed above. Admittedly, weights on group 1 (and 2) are still lower

[26] The French case is an enlightening illustration. After the introduction of the minimum income scheme (RMI) in 1989, the number of recipients quickly expanded to a level – more than a million households – that is impossible to justify on the basis of mass unemployment and work incapacity. In the late 1990s policy makers realized that what had been designed as a safety net to prevent extreme poverty was responsible for strong work disincentives and had progressively pushed part of the population into a state of welfare dependency. This concern is witnessed by the large number of policy discussions and advisory reports of that period (e.g., Bourguignon, 1997, 1999).

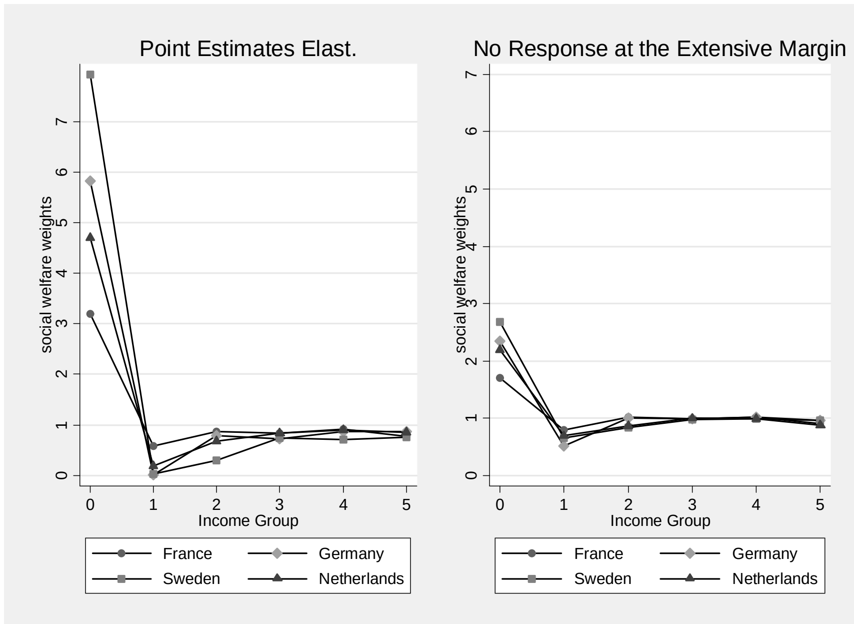


Figure 8: Tax-Benefit Revealed Social Welfare: Estimated versus Under-estimated Extensive Responses (2001)

than for most other groups because the policy behind the result has not changed: the model still rationalizes the fact that workless poor receive substantial transfers, while working poor receive nothing (in addition, intensive margin elasticities are non-zero and are actually associated to a move from 1 to 0 for the working poor). However, and most importantly, our results show that the likely understatement of behavioral responses by policy makers, together with a genuine desire to redistribute to the poorest, partly explains inconsistencies in implicit social welfare patterns.

Time Change and Recent Trends We exploit the fact that two years of data are available for some countries. Results are presented for four countries in Figure 9 for the policy years 1998 and 2001. First of all, stable results for France and the UK are reassuring.[27] Interestingly, more significant changes can be observed for Finland and Ireland. As discussed in Bargain and Callan (2010), several policy changes have occurred over the short period 1998-2001 that contributed to increase inequalities in Finland (notably a reduction in tax progressivity). "Incentive trap reforms" were carried out as early as the late 1990s in Finland, with tax incentives on low-wage work (via extensions of tax allowance) and slow nominal adjustment on social transfers, which actually increased financial gains to work (Laine, 2002), and hence decreased the gap between

[27] Few of the New Labour reforms affect the picture for the UK. In particular, the 1999 boost in in-work support, the WFTC reform, is not apparent, as we focus on childless singles. What can be seen here is only an increase of weight 0 due to nominal adjustments of income support.

groups 0 and 1, as can be seen in Figure 9. In Ireland too, substantial cuts in income tax have clearly reduced the redistributive effect of the system. The overall curve is higher in 2001 because of a change in relative group size – in particular group 0 became smaller – but an extension of the tax-free bracket and moderation on social assistance have also contributed to reducing the distance between groups 0 and 1.

Also for other countries, several reforms that tend to correct the abnormally small weight on group 1 (and 2) have also taken place, but unfortunately for a more recent period that is not covered by our data and tax-benefit simulations. We nonetheless comment briefly on these reforms and leave their characterization for future work. Aforementioned policies of lowering tax rates for low-wage earners or lowering social assistance applied to other countries (in particular Denmark since 2003), but two types of measures deserve particular attention. Firstly, we observe since 2001 the implementation of in-work supports in the form of refundable earned income tax credits in France (see Stancanelli, 2008), the Netherlands and Belgium from 2002 to 2004 (see Orsini, 2006) as well as exemptions of social security contributions aimed at "making work pay", in particular in Germany (the “mini-job” reform, see Steiner and Wrohlich, 2005) and Belgium after 2004.[28] Interestingly, most of these reforms consist of individualized schemes and hence directly affect the group of childless singles under study.[29] Secondly, several countries have introduced activation policies (for instance within the Hartz IV reform in Germany) or extended existing ones (as in Nordic countries and notably in Denmark) – see Eichhorst and Konle-Seidl (2006). This type of workfare policy is rarely simulated since information concerning active job search is missing. However this would boil down to a reduction in the (long-run) expected value of social assistance and hence a decrease in the weight on group 0 (and the gap between 0 and 1) in our framework.

[28] A possible change in social values in Continental Europe may have occurred, and the role of Anglo-Saxon influence and international convergence in this process is potentially important (see Banks et al., 2005), notably with respect to the principle of “making work pay”. Note that some of these reforms were, however, relatively small and unlikely to have changed the weight on group 1 much. This is the case with the French earned income tax credit, which is included in our simulation for 2001 and is so small that it has almost no effect. For that country, things changed in 2009, with a major reform consisting in the extension of social assistance (RMI) to low-wage workers.

[29] The case of the UK is particularly interesting: in the 1990s, the Family Credit followed by the WFTC were operated for working poor households with children only. Following the 2003 reform, the WFTC was split into a child tax credit (aimed at reducing child poverty) and a pure in-work support (the Working Tax Credit, WTC) which became available to all working poor, with or without children.

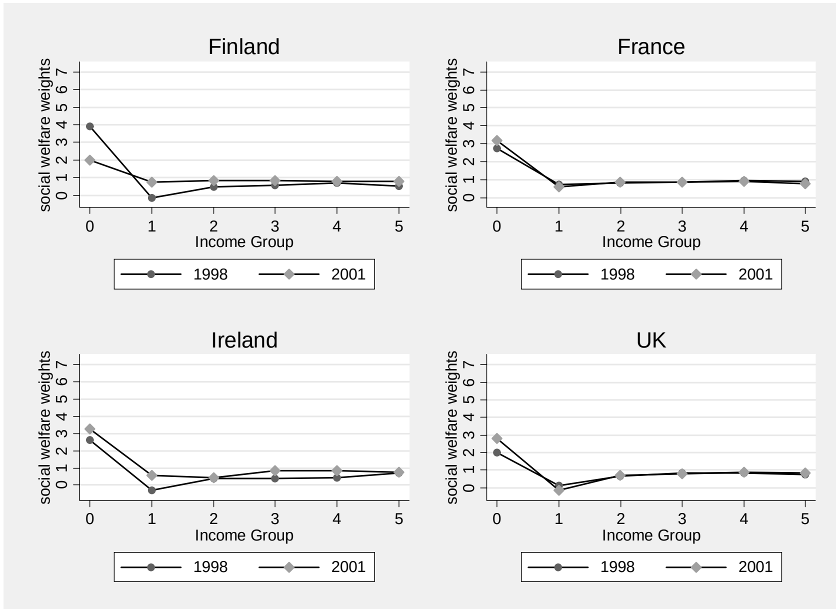


Figure 9: Tax-Benefit Revealed Social Welfare: Time Change

Direct Evidence on Redistributive Tastes Results of an inverted optimal tax problem, as presented here, can be interpreted as revealed preferences. Hence, it is tempting to compare them to direct measures of social preferences as reported in, e.g., the International Social Survey Program (ISSP), and exploited in the political economy literature. Precisely, several papers studying the role of culture and international differences in redistributive preferences make use of a question about *whether it is the responsibility of the government to reduce differences in income between people with high incomes and those with low incomes* (see, e.g., Corneo and Grüner, 2002, Isaksson and Lindskog, 2009). For a subset of countries for which similar periods are available, we translate answers to this question in a score measure and compare it against our revealed inequality aversion index. Not surprisingly, the most robust result is the divide between the US and Continental/Nordic Europe, mainly because low tastes for redistribution in the US support the low inequality aversion embodied in the tax-benefit system (for a specific analysis of the EU and US difference, see Alesina and Angeletos, 2005). The UK has a somewhat intermediary position. For the rest, citizens of Southern and Eastern countries show the highest levels of support for redistribution, while living among the least redistributive systems. Why redistributive tastes do not translate into more redistributive policies is still an open question, clearly beyond the scope of this paper. Nonetheless, we can say that the broad group of countries with low levels of revealed inequality aversion in our results is mixed and influenced by possibly very different cultural and historical characteristics. For Eastern countries, the negative correlation between declared preferences and revealed inequality aversion is not only consistent with persistent left-wing ideology (Corneo and Grüner, 2002, Alesina and Fuchs-Schündeln, 2007) but also with the increasing public sentiment that the process of income distribution was in fact flawed and inefficient (Grosfeld and Senik, 2010). In Southern Europe, family support is still seen as a substitute to state intervention towards the unemployed and low-wage workers (see Bentolila and Ichino, 2008) – yet political scientists describe Southern systems as an immature version of Continental Corporatist systems (Esping-Andersen, 1990). Strong reliance on the market is observed in the US, together with targeted policies (aimed at child poverty alleviation) and desert-sensitive redistribution, notably through EITC-type of instruments.

6 Conclusion

It is natural to think that real world tax-benefit schedules result from complex historical shocks and political economy forces rather than from the pursuit of some well defined social objectives.[30] Nevertheless, this means that there is room for Pareto-improving reforms if analysts could dispose of the proper parameters for social welfare evaluation. In the meantime, deriving social welfare functions implicit in different national tax-benefit systems provides an interesting way of checking how far we are from the fiction of a Paretian social planner and comparing countries' implicit tastes for redistribution. We follow this path by inverting the optimal tax model suggested by Saez (2002). That is, we characterize the social welfare weights that rationalize tax-benefit institutions in the US and 17 European countries. Since we aim to compare pure vertical equity concerns across countries, we focus on a homogenous group – childless singles. To approximate true behavioral responses, we estimate labor supply on the same datasets and retrieve elasticities at the extensive and intensive margins. Heterogeneity in work-consumption preferences affects international comparisons in terms of revealed inequality aversion to some extent. More importantly, as a consequence of the estimated variances of labor supply preferences, differences in tax-benefit revealed social preferences across nations are greatly attenuated: essential differences remain between broad groups of countries only. We also check whether tax-benefit revealed social welfare weights respect basic properties as established in the optimal tax literature. Social welfare weights are positive and tend to decrease with income level, with more Rawlsian profiles in Nordic/Continental Europe compared to Eastern/Southern Europe and the US. However, in the former set of countries, transfers to the workless poor – and the absence of transfers to the working poor for the period and group considered – lead to some non-concavity of the implicit social welfare function. This is coherent with the fact that governments' beliefs regarding behavioral responses are not necessarily those of the econometrician – and were possibly greatly understated when generous social assistance schemes were implemented in Europe. Interestingly, policy developments at the turn of the decade and in recent years tend to correct this "anomaly" either through the development of individualized in-work support (in the UK and Continental Europe) or activation and workfare policies (in Scandinavian countries). These policy trends possibly denote a reassessment of potential labor supply responses by governments,

[30] Note, however, that the fiction of a social planner can be seen as a proxy for a more complex political model: see, e.g., Coughlin (1992), who shows equivalence between a planner with a weighted social welfare function and a probabilistic voting model with two candidates competing for votes.

but also a likely change in social preferences toward more desert-sensitive policies.

Future research could extend our results in many ways. Following the bulk of the literature, we have ignored margins other than labor supply. This is certainly acceptable as a first approximation – especially as we focused on workers (and excluded capitalists), so that taxable income essentially coincides with labor income. Yet top earners may nonetheless react along different margins than pure hours of work (Saez, 2004, nonetheless show that tax evasion/migration is concentrated in the top 1%). We have also assumed that fertility and marital status were fixed – even if it is suspected that social systems influence behavior in this respect (see, e.g., Hoynes, 1997). More generally, our study considers a partial optimization problem. That is, we focus only on the optimal design of direct taxes/transfers concerning childless single individuals. *Firstly*, it is in principle possible to replicate the analysis on different (demographically homogenous) groups. Most interestingly, an examination of couples would show more variations in policies over time and across countries (i.e., EITC and WFTC would enter the analysis). We have argued, however, that the treatment of joint labor supply decisions in an optimal tax framework is not an easy task (see Kleven et al., 2009). *Secondly*, we have excluded some policies that may well have redistributive effects. This is the case of non-cash benefits (see Haan and Wrohlich, 2007) and public goods like public health and education – in particular, systems where health insurance is financed by proportional to income contributions (or progressive taxation), but tranfers are universal, must generate substantial redistribution. *Thirdly*, tax-benefit policies are part of a broader set of policy decisions including labor market regulations, minimum wages, etc. In that respect, high redistribution towards the workless poor is consistent with high minimum wages and stringent regulations that produce insider/outsider segmentations. Indeed, demogrant policies complement unemployment insurance in this type of labor market, especially for young workers (who have never contributed to social security) or long-term unemployed (who have exhausted their rights). In contrast in Anglo-Saxon countries, more flexible labor markets have generated more working poverty and hence the need for appropriate (in-work) transfers of the EITC-type. These considerations should be better incorporated in the present framework. *Fourthly*, it could be interesting to replicate the exercise suggested in this paper with non-welfarist objectives (e.g., Kanbur et al., 2006) or welfare measures that preserve individual heterogeneity (see Decoster and Haan, 2010). *Fifthly*, very little is known about the complex mechanisms behind tax-benefit policy design in the real world, which involve many dimensions (e.g., labor market policies, as noted above) and agents (unions, lobbies, experts, international influence, etc.) often not accounted for by theory. It would nonetheless be interesting to extend the present approach to some explicit political economy model – e.g., Atella et al., 2005, introduce a voting scheme for compiling individuals' equity preferences into a social decision and reveal corresponding social preferences – even if simple representations like the median voter hypothesis are clearly of limited applicability (cf. Alesina and Giuliano, 2011) and social choice models in presence of endogenous labor supply are rare.

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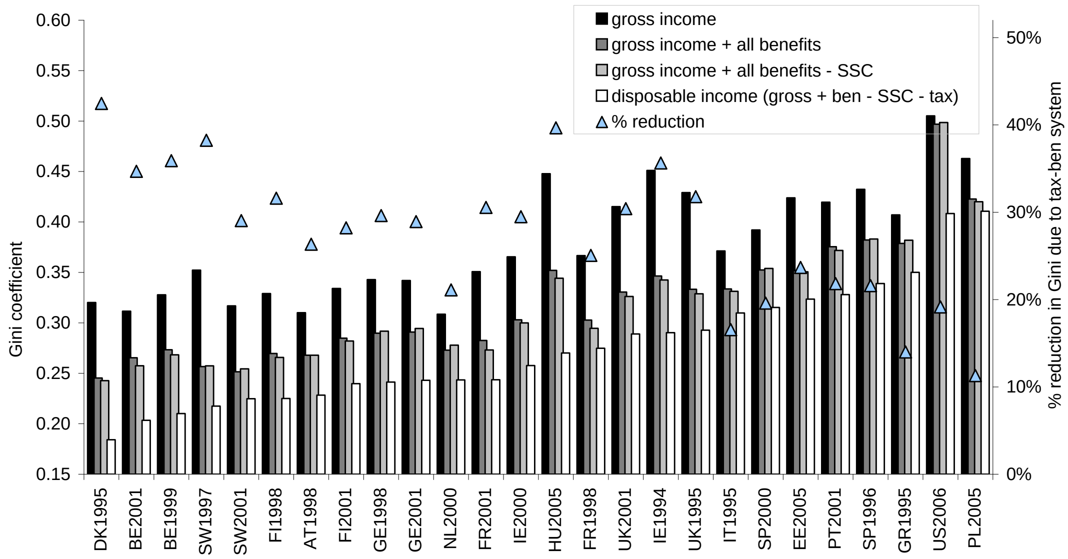
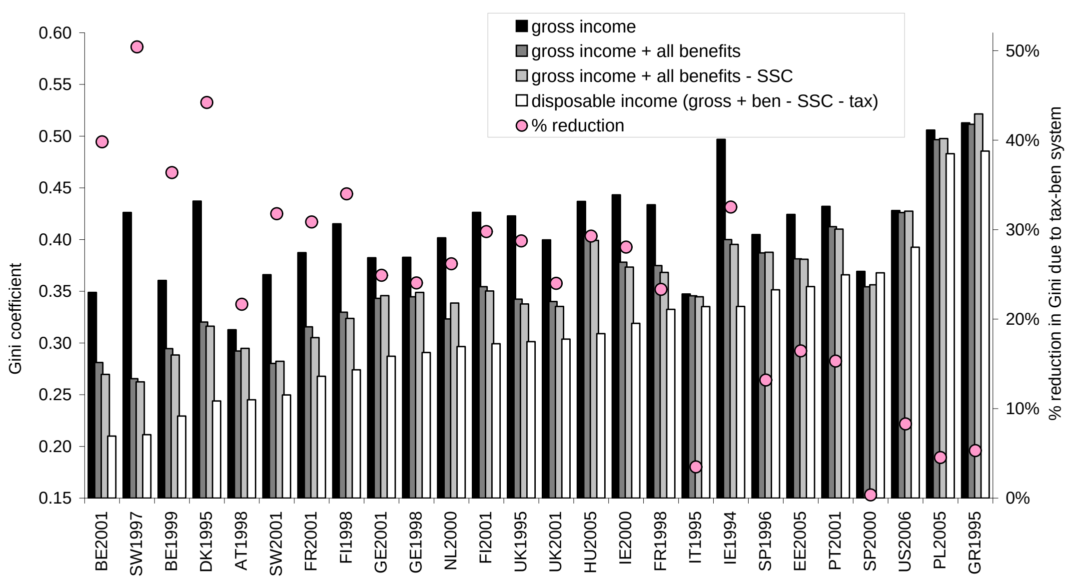
A Appendix A



Sample: whole population. Bars (left x-axis) represent Gini coefficients of equivalized income for different income concepts from gross/market income to disposable income (gross income +benefits - SSC - taxes). Income is equivalized using the modified OECD scale. We also represent (right x-axis) the % reduction in Gini due to tax-benefit policies. Countries are ranked according to the Gini of disposable income.

Figure A.1: Redistributive Effects of Tax-Benefit Policies (Whole Population)



Sample: selection of childless singles. Bars (left x-axis) represent Gini coefficients of equivalized income for different income concepts from gross/market income to disposable income (gross income +benefits - SSC - taxes). We also represent (right x-axis) the % reduction in Gini due to tax-benefit policies. Countries are ranked according to the Gini of disposable income.

Figure A.2: Redistributive Effects of Tax-Benefit Policies (Singles)

Table A.1: Datasets at Use

Country	Data	Years: Data collection	Years: Incomes	Years: Simulated policy	No of observations (original samples)
Austria	European Community Household Panel	1999	1998	1998	7,386
Belgium	Panel Survey on Belgian Households	1999	1998	2001	9,100
Belgium	Panel Survey on Belgian Households	2002	2001	2001	7,335
Denmark	European Community Household Panel	1995	1994	1998	7,044
Estonia	Household Budget Survey	2005	2005	2005	9,201
Finland	Income Distribution Survey	1998	1998	1998	25,010
Finland	Income Distribution Survey	2001	2000	2001	28,303
France	Household Budget Survey	1995	1994	1998	29,158
France	Household Budget Survey	2000-1	2000-1	2001	25,803
Germany	German Socio-Economic Panel	1998	1997	1998	18,227
Germany	German Socio-Economic Panel	2001	2000	2001	16,874
Greece	European Community Household Panel	1995	1994	1998	15,062
Hungary	Household Budget Survey	2005	2005	2005	17,958
Ireland	Living in Ireland Survey	1994	1994	1998	14,585
Ireland	Living in Ireland Survey	2000	2000	2001	11,436
Italy	Survey of Households Income and Wealth	1996	1995	1998	23,924
Netherlands	Sociaal-Economisch Panelonderzoek	2000	1999	2001	10,344
Poland	Household Budget Survey	2005	2005	2005	106,826
Portugal	European Community Household Panel	2001	2000	2001	13,092
Spain	European Community Household Panel	1996	1995	1998	18,991
Spain	European Community Household Panel	2000	1999	2001	14,787
Sweden	Income Distribution Survey	1997-98	1997	1998	38,756
Sweden	Income Distribution Survey	2001	2001	2001	33,223
UK	Family Expenditure Survey	1995-6	1995-6	1998	16,586
UK	Family Expenditure Survey	2000-1	2000-1	2001	15,914
US	Current Population Survey	2006	2005	2005	208,562

Note: As in Immervoll et al. (2007), some adjustments were required in the few cases where the year of data collection did not match the simulated policy year, e.g., for Denmark (1998 redistributive system simulated on 1995 data). In these cases we have updated incomes using specific uprating factors for different income types (wages, pension, property income, etc.) in order to be able to apply the policy system without creating any artificial fiscal drag or similar phenomenon.

Table A.2: Description of the Discretized Population of Childless Singles

Income Groups	AT 98	BE 98	BE 01	DK 95	FI 98	FI 01	FR 95	FR 01	GE 98	GE 01	GR 95	IE 95	IE 00
Gross income Y_i (note: $Y_0 = 0$)													
1	222	203	238	127	190	185	139	189	172	145	113	215	187
2	376	347	392	397	329	356	286	301	373	359	165	371	361
3	452	436	502	545	398	437	360	373	471	490	216	470	454
4	577	532	613	646	481	528	457	467	576	605	263	542	651
5	845	737	856	860	704	769	732	703	814	889	476	724	882
Disposable income C_i													
0	61	96	138	140	110	113	110	151	59	80	1	67	65
1	183	181	214	154	178	181	134	171	148	141	101	199	206
2	277	243	284	282	242	273	217	232	245	250	145	287	334
3	321	286	341	367	279	314	267	276	298	320	189	337	433
4	394	333	394	428	326	368	335	338	345	381	219	374	539
5	533	435	510	518	434	491	519	482	475	520	358	478	689
Effective "Marginal" Tax Rate (EMTR)													
1	45%	58%	68%	89%	64%	64%	83%	89%	49%	58%	12%	38%	24%
2	39%	57%	54%	53%	54%	46%	43%	45%	51%	49%	15%	44%	27%
3	42%	52%	48%	42%	46%	48%	34%	39%	47%	47%	14%	49%	-6%
4	42%	50%	53%	40%	43%	42%	28%	34%	55%	47%	37%	49%	46%
5	48%	50%	52%	58%	51%	49%	33%	39%	45%	51%	35%	43%	35%
Effective Participation Tax Rate (EPTR)													
1	45%	58%	68%	89%	64%	64%	83%	89%	49%	58%	12%	38%	24%
2	43%	57%	63%	64%	60%	55%	62%	73%	50%	53%	13%	41%	25%
3	42%	56%	59%	58%	58%	54%	57%	66%	49%	51%	13%	43%	19%
4	42%	55%	58%	55%	55%	52%	51%	60%	50%	50%	17%	43%	27%
5	44%	54%	57%	56%	54%	51%	44%	53%	49%	51%	25%	43%	29%
Group size h_i (in %)													
0	0.04	0.20	0.15	0.19	0.23	0.20	0.12	0.13	0.15	0.12	0.31	0.30	0.13
1	0.19	0.16	0.17	0.16	0.15	0.16	0.18	0.18	0.17	0.18	0.14	0.15	0.18
2	0.19	0.16	0.17	0.16	0.15	0.16	0.17	0.17	0.17	0.17	0.14	0.14	0.20
3	0.19	0.16	0.17	0.16	0.15	0.16	0.18	0.18	0.17	0.18	0.14	0.14	0.15
4	0.20	0.16	0.17	0.16	0.15	0.16	0.18	0.18	0.17	0.17	0.13	0.16	0.19
5	0.18	0.16	0.17	0.16	0.15	0.16	0.17	0.17	0.17	0.17	0.14	0.12	0.16
# observations	206	357	278	518	931	963	1,080	1,013	967	933	164	148	130

Notes: Group 0 = non-participants and Y_0=0. Other groups: increasing income levels of participants. EMTR are calculated as 1 - $\{C_i - C_{i-1}\}/\{Y_i - Y_{i-1}\}$ and EPTR as 1 - $\{C_i - C_0\}/\{Y_i - Y_0\}$ for all income groups i>0. All incomes in euros per week.

Table A.3: Description of the Discretized Population of Childless Singles (cont.)

Income Groups	IT 95	NL 00	PT 01	SP 96	SP 01	UK 95	UK 01	SW 01	EE 05	HU 05	PL 05	US 06
Gross income Y i (note: Y 0 = 0)												
1	188	189	88	134	165	221	229	172	33	41	36	162
2	314	400	150	238	250	361	397	359	56	72	71	362
3	381	505	222	327	335	463	522	439	77	109	102	528
4	484	617	368	458	423	573	661	522	102	151	141	715
5	632	867	639	649	646	818	999	760	152	267	238	1194
Disposable income C i												
0	3	137	25	17	6	133	144	151	13	16	3	17
1	129	186	77	126	151	191	205	179	33	44	17	149
2	209	298	128	204	215	289	316	247	48	64	25	303
3	251	361	182	268	281	362	406	293	65	86	40	426
4	299	443	273	364	339	441	507	345	84	105	59	557
5	375	599	416	496	491	622	751	478	120	162	106	863
Effective "Marginal" Tax Rate (EMTR)												
1	33%	74%	41%	19%	13%	74%	73%	84%	38%	33%	60%	18%
2	37%	47%	18%	25%	24%	30%	34%	64%	35%	35%	78%	23%
3	37%	40%	24%	27%	23%	28%	28%	43%	21%	42%	53%	26%
4	53%	27%	38%	27%	34%	28%	28%	36%	23%	55%	50%	30%
5	48%	37%	47%	31%	32%	26%	28%	44%	27%	50%	52%	36%
Effective Participation Tax Rate (EPTR)												
1	33%	74%	41%	19%	13%	74%	73%	84%	38%	33%	60%	18%
2	34%	60%	31%	22%	16%	57%	57%	73%	37%	34%	69%	21%
3	35%	55%	29%	23%	18%	50%	50%	68%	32%	36%	64%	23%
4	39%	50%	33%	24%	21%	46%	45%	63%	30%	42%	60%	25%
5	41%	47%	39%	26%	25%	40%	39%	57%	29%	45%	57%	29%
Group size h i (in %)												
0	0.16	0.10	0.08	0.13	0.09	0.24	0.15	0.11	0.15	0.10	0.19	0.06
1	0.18	0.18	0.20	0.18	0.20	0.15	0.17	0.18	0.17	0.18	0.16	0.19
2	0.16	0.18	0.17	0.17	0.17	0.15	0.17	0.18	0.17	0.18	0.16	0.20
3	0.16	0.18	0.24	0.17	0.18	0.15	0.17	0.18	0.16	0.18	0.16	0.19
4	0.17	0.18	0.13	0.18	0.18	0.15	0.17	0.18	0.18	0.18	0.16	0.18
5	0.16	0.18	0.18	0.17	0.18	0.15	0.17	0.18	0.16	0.18	0.16	0.19
# observations	163	555	106	191	202	561	669	1,768	233	354	1,273	7,053

Notes: Group 0 = non-participants and Y0=0. Other groups: increasing income levels of participants. EMTR are calculated as 1 - {Ci - Ci-1}/{Yi -Yi-1} and EPTR as 1 - {Ci - C0}/{Yi - Y0} for all income groups i>0. All incomes in euros per week.

Table A.4: Labor Supply Elasticities

	AT 98	BE 98	BE 01	DK 95	FI 98	FI 01	FR 95	FR 01	GE 98	GE 01	GR 95	IE 95	IE 00
Standard elasticities													
Wage elasticity - Hours	.13	.25	.31	.09	.27	.16	.14	.13	.20	.17	.24	.25	.50
	(.05)	(.05)	(.06)	(.04)	(.05)	(.03)	(.02)	(.02)	(.03)	(.02)	(.05)	(.07)	(.08)
Wage elasticity - Participation	.10	.22	.24	.12	.28	.15	.11	.11	.19	.16	.23	.32	.44
	(.04)	(.03)	(.05)	(.03)	(.04)	(.02)	(.01)	(.01)	(.02)	(.02)	(.04)	(.06)	(.07)
Income elasticity - Hours	.00	.00	.00	.00	.10	.01	.00	.00	.01	.00	.00	-.03	-.02
	(.00)	(.00)	(.00)	(.01)	(.02)	(.01)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Saez (2002)'s elasticities													
Intensive margin:													
Mean	**.10**	**.16**	**.25**	**.04**	**.08**	**.04**	**.08**	**.06**	**.09**	**.11**	**.09**	**.20**	**.36**
Group 1	.14	.43	.38	.04	.23	.09	.06	.05	.38	.39	.18	.66	.45
	(.06)	(.11)	(.09)	(.01)	(.04)	(.03)	(.01)	(.01)	(.07)	(.08)	(.09)	(.17)	(.08)
Group 2	.17	.20	.47	.06	.05	.03	.09	.06	.03	.02	.07	.26	.86
	(.06)	(.04)	(.10)	(.02)	(.01)	(.01)	(.01)	(.01)	(.01)	(.00)	(.02)	(.11)	(.17)
Group 3	.05	.13	.28	.05	.02	.03	.06	.04	.03	.07	.02	.15	.52
	(.02)	(.03)	(.02)	(.03)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)	(.02)	(.05)
Group 4	.10	.07	.09	.04	.04	.02	.06	.05	.03	.05	.07	.03	.19
	(.04)	(.01)	(.01)	(.03)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)	(.02)	(.05)
Group 5	.04	.10	.22	.04	.05	.03	.12	.12	.03	.04	.08	.03	.33
	(.02)	(.02)	(.11)	(.03)	(.01)	(.01)	(.02)	(.03)	(.01)	(.01)	(.02)	(.02)	(.05)
Extensive margin:													
Mean	**.15**	**.35**	**.35**	**.17**	**.30**	**.14**	**.09**	**.09**	**.20**	**.22**	**.34**	**.57**	**.38**
Group 1	.14	.43	.38	.04	.23	.09	.06	.05	.38	.39	.18	.66	.45
	(.04)	(.07)	(.05)	(.01)	(.03)	(.02)	(.01)	(.01)	(.04)	(.05)	(.05)	(.08)	(.08)
Group 2	.16	.53	.46	.16	.32	.11	.12	.07	.17	.21	.53	.78	.56
	(.05)	(.08)	(.07)	(.03)	(.05)	(.02)	(.01)	(.01)	(.02)	(.02)	(.10)	(.10)	(.10)
Group 3	.19	.25	.24	.24	.35	.13	.10	.09	.25	.25	.40	.51	.49
	(.05)	(.04)	(.03)	(.06)	(.05)	(.02)	(.01)	(.01)	(.02)	(.02)	(.07)	(.08)	(.08)
Group 4	.14	.38	.42	.18	.22	.20	.11	.09	.11	.15	.34	.60	.27
	(.04)	(.04)	(.07)	(.04)	(.02)	(.02)	(.01)	(.01)	(.01)	(.01)	(.06)	(.05)	(.05)
Group 5	.11	.15	.23	.23	.36	.19	.07	.14	.10	.08	.27	.30	.12
	(.02)	(.02)	(.07)	(.05)	(.05)	(.02)	(.01)	(.01)	(.01)	(.01)	(.05)	(.11)	(.11)

Note: standard elasticities are computed numerically by simulation of responses to a 1% uniform increase in wage rates or unearned income. Saez elasticities are obtained by simulated increases corresponding to 1% of the difference in mean disposable incomes between a given income group and the closest lower group (mobility) or the group of nonworkers (participation). Bootstrapped standard errors in brackets.

Table A.5: Labor Supply Elasticities (cont.)

	IT 95	NL 00	PT 01	SP 96	SP 01	UK 95	UK 01	SW 01	EE 05	HU 05	PL 05	US 06	Mean
Standard elasticities													
Wage elasticity - Hours	.47	.11	.04	.27	.39	.41	.21	.17	.15	.14	.08	.20	.22
	(.10)	(.02)	(.04)	(.07)	(.04)	(.05)	(.03)	(.03)	(.03)	(.03)	(.01)	(.01)	(.04)
Wage elasticity - Participation	.42	.09	.04	.27	.32	.33	.20	.14	.14	.13	.07	.17	.20
	(.09)	(.01)	(.03)	(.06)	(.04)	(.04)	(.02)	(.01)	(.03)	(.03)	(.01)	(.01)	(.03)
Income elasticity - Hours	.03	.00	.00	-.01	-.01	.00	.00	.01	.00	.06	.00	.00	.01
	(.02)	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)	(.01)	(.00)	(.01)	(.00)	(.00)	(.00)
Saez (2002)'s elasticities													
Intensive margin:													
Mean	**.28**	**.12**	**.08**	**.12**	**.44**	**.06**	**.07**	**.06**	**.07**	**.07**	**.04**	**.18**	**.13**
Group 1	.70	.16	.11	.25	.87	.10	.13	.11	.10	.11	.09	.33	.26
	(.14)	(.04)	(.26)	(.10)	(.12)	(.02)	(.02)	(.03)	(.03)	(.04)	(.01)	(.01)	(.07)
Group 2	.47	.19	.07	.11	.50	.07	.05	.12	.02	.06	.03	.09	.17
	(.10)	(.04)	(.15)	(.04)	(.06)	(.01)	(.01)	(.02)	(.01)	(.03)	(.01)	(.01)	(.04)
Group 3	.14	.04	.05	.03	.37	.01	.01	.04	.05	.09	.03	.13	.06
	(.03)	(.01)	(.06)	(.01)	(.04)	(.01)	(.01)	(.01)	(.01)	(.02)	(.01)	(.01)	(.01)
Group 4	.08	.05	.07	.08	.11	.03	.04	.02	.07	.05	.03	.12	.05
	(.02)	(.01)	(.05)	(.02)	(.01)	(.01)	(.01)	(.01)	(.02)	(.02)	(.01)	(.01)	(.01)
Group 5	.03	.15	.09	.12	.33	.06	.11	.04	.10	.04	.05	.20	.10
	(.01)	(.16)	(.04)	(.04)	(.12)	(.01)	(.07)	(.03)	(.05)	(.01)	(.01)	(.01)	(.01)
Extensive margin:													
Mean	**.59**	**.11**	**.06**	**.32**	**.43**	**.21**	**.18**	**.17**	**.12**	**.06**	**.09**	**.28**	**.24**
Group 1	.70	.16	.11	.25	.87	.10	.13	.11	.10	.11	.09	.33	.26
	(.11)	(.02)	(.03)	(.07)	(.12)	(.01)	(.01)	(.01)	(.03)	(.03)	(.01)	(.01)	(.04)
Group 2	.67	.13	.13	.50	.62	.21	.20	.21	.08	.03	.09	.34	.30
	(.11)	(.02)	(.04)	(.13)	(.07)	(.02)	(.02)	(.01)	(.02)	(.01)	(.01)	(.01)	(.05)
Group 3	.50	.14	.07	.25	.36	.17	.21	.14	.11	.08	.07	.33	.24
	(.09)	(.01)	(.02)	(.06)	(.03)	(.02)	(.02)	(.01)	(.02)	(.02)	(.01)	(.01)	(.04)
Group 4	.64	.09	.01	.32	.17	.23	.19	.21	.14	.03	.10	.25	.22
	(.11)	(.01)	(.02)	(.05)	(.02)	(.02)	(.02)	(.01)	(.02)	(.01)	(.01)	(.01)	(.03)
Group 5	.46	.04	.01	.26	.12	.34	.18	.17	.17	.05	.09	.13	.17
	(.09)	(.01)	(.02)	(.04)	(.02)	(.04)	(.04)	(.03)	(.03)	(.01)	(.01)	(.00)	(.04)

Note: standard elasticities are computed numerically by simulation of responses to a 1% uniform increase in wage rates or unearned income. Saez elasticities are obtained by simulated increases corresponding to 1% of the difference in mean disposable incomes between a given income group and the closest lower group (mobility) or the group of nonworkers (participation). Bootstrapped standard errors in brackets.

Table A.6: Taxes, Social Contributions and Transfers of Childless Singles

	Austria	Belgium	Denmark	Estonia	Finland	France
Income Tax System						
No of tax bands	4	5	3	1	6	6
Lowest/highest tax band limit * §	17 / 231	24 / 318	12 / 100	21	35 / 223	30 / 336
Lowest/highest tax rate £	.21 / .50	.25 / .55	.40 / .59	.24 / .24	.235 / .557	.185 / .62
Main tax credit*	5					PPE (in 2001)
Employee Social Security Contributions						
SSC exemption below earnings*	13	some SSC rebates				
Lower/upper contrib. limit **	no / 145					
Starting/finishing rate (%)	18.06	13.07	8 + lump sum charge (3% of AW) 3	3	6.6	21.36 / 8.61 (4 rates)
Maximum contribution**	26.1					
Tax deductible	yes	yes	yes		yes	yes
Social Assistance (not taxable, except Denmark)						
Max. amount*	32	39	34 + housing allowance	9 + housing supplements	18 + reasonable housing costs	24
Disregard*		9	up to 9			
Withdrawal rate	1	1	1		1	1
Housing Benefit						
Max. amount*			3	see Social Assistance	17	15
Withdrawal rate			.75		.80	.34
Unemployment Benefits (shown for initial phase of unempl., after waiting period if applicable, for persons aged 30+. Insurance to some extent voluntary in DK and FI)						
Floor*	7	31 (if previously full-time)	56 (if previously full-time)		22	30
Payment Rate**	55% of net	42-60% of gross	90% of gross minus SSC	40-50% of gross	up to 42% of net > 22 (basic benefit)	57-75% of gross, downward scaling factor
Duration	4.5-12 months (dep. on age and contribution)	no limit in general	1+3 years (partly dep. on program participation)	6-12 months (dep. on contribution period)	max. 16.5 months (renewable under conditions)	4-60 months (dep. on age and contribution)
Ceiling*	min(56, 80% of net)	48 (if previously full-time)	68			313
Taxable @	IT: no, SSC: no	IT: reduced, SSC: no	IT: yes, SSC: partly	IT: no, SSC: no	IT: no, SSC: no	IT: yes, SSC: yes

Source: EUROMOD country reports, OECD Benefit and Wages, MISSOC 1998.

Notes: We focus here on taxation and transfers to childless singles (all benefit and tax rates above are for this demographic group) for the year 1998 except PL, HU, EE and US (year 2005/6).

* All monetary levels in % of median gross employment income (not including employer social security contributions)

** All monetary level in % of Average Worker Wage (AWW)

§ The lowest bound accounts for std tax-free allowances/deductions/exemptions for single employees, i.e. represents the upper bound of the zero-tax income range

£ Rates include special social security tax. In France, CSG: 7.5% and CRDS: 0.5%. They combine flat-tax municipal taxation and progressive national taxation for Finland and Denmark (municipal tax rates differ between municipalities and we count here the average: 17.5% in Finland, 32.4% in Denmark). In Denmark, a "tax shield" of 59% is applied as the top rate.

@ IT = income tax; SSC = social security contributions

Table A.7: Taxes, Social Contributions and Transfers of Childless Singles (cont.)

	Germany	Greece	Hungary	Ireland	Italy	Netherlands
Income Tax System						
No of tax bands	3 £	3	2	2	5	4
Lowest/highest tax band limit * §	30 / 252	56 / 478	0 / 82	25 / 80	0 / 118	20 / 212
Lowest/highest tax rate £	.273 / .557	.05 / .45	.18 / .36	.24 / .46	.185 / .455	.36 / .60
Main tax credit * &		max. 15% of accepted expenditure			up to 6	
Employee Social Security Contributions						
Lower/upper contrib. limit **	12 / 150	no / 285		51 / no	no / 371	
Starting/finishing rate [%]	20.85 / 13 (2 rates)	16	8.5 / 5 (2 rates)	4 / 2 (2 rates)	9.19 / 10.19 (2 rates)	32.6 / 5.85 (4 rates) + lump sum charge
Maximum contribution**	27.4	45.6			36.1	32.2
Tax deductible	yes	yes	no	no	yes	partly
Special features	phase-in; +0.25%					extra payments for some employees
Social Assistance (not taxable)						
Max. amount*	13		11	29 + housing supp.	none at the national level	24
Disregard*	4			19 for partner's income		
Withdrawal rate	.75 - 1		1	1		1
Housing Benefit						
Max. amount*	25		2	see Social Assistance	none at the national level	6 (for low rents)
Withdrawal rate	.40					0.54
Unemployment Benefits (shown for initial phase of unempl., after waiting period if applicable, for persons aged 30+)						
Floor*		28				41 (if previous job full-time)
Payment Rate**	60% of net	40-70% of gross	65% of gross	flat-rate: 16 (EUR 96/week)	30% of gross	70% of gross
Duration	6-32 months (dep. on age and contribution)	5-12 months (dep. on employment period)	up to 9 months (dep. on contribution)	13 months	6 months	9-60 months (dep. on employment period)
Ceiling*	125	min. of 126 or 70% of gross	2x the bottom limit, i.e, 90% of minimum old-age pension		66	156
Taxable @	no	IT: reduced, SSC: no	IT: yes, SSC: partly	IT: reduced, SSC: no	IT: yes, SSC: no	IT: yes, SSC: yes

£: In Germany: MTR increases progressively between lower and middle / middle and top tax bands; rates include solidarity surplus tax of 5.5%

&: Employment-related benefits exist in Ireland (FIS) and Italy but do not concern childless single households

Table A.8: Taxes, Social Contributions and Transfers of Childless Singles (cont.)

	Poland	Portugal	Spain	Sweden	United Kingdom	United States
Income Tax System						
No of tax bands	3	6	8	2	3	6
Lowest/highest tax band limit * §	5 / 259	0 / 490	22 / 492	4 / 92	29 / 220	26 / 1066
Lowest/highest tax rate	.19 / .40	.05 / .40	.20 / .56	.30 / .55	.20 / .40	10 / 35
Main tax credit *		3	3		WFTC (not for childless)	EITC (not for childless)
Employee Social Security Contributions						
SSC exemption below earnings threshold *			35	5		
Lower/upper contrib. limit **			no / 165	no / 110	17 / no	
Starting/finishing rate [%]	25.62	11	6.35	7	11 / 1 (2 rates)	7.65 / 1.45 (2 rates)
Maximum contribution**			10.5	7.7		
Tax deductible	partly	yes	yes	yes	no	no
Special features			lump-sum charge below threshold	87.5% can be claimed as tax credit, rest is tax deductible	rebate for some employees	
Social Assistance (not taxable)						
Max. amount*	20	20	none at the national level	15 + reasonable housing cost	18	4
Disregard*					2 - 4	occasional income up to USD 120
Withdrawal rate	1	0.8		1	1	1
Housing Benefit						
Max. amount*	15	none at the national level	none at the national level	6 (only if aged <30)	100% of recognised rent; 100% of council tax	
Withdrawal rate				33% (disregard of 18)	65% (housing benefit); 20% (council tax benefit)	
Unemployment Benefits (shown for initial phase of unempl., after waiting period if applicable, for persons aged 30+. Insurance to some extent voluntary in SW)						
Floor*		49 (if previous job full-time)	33	28		
Payment Rate**	flat-rate: 26 (EUR 35/week)	65% of gross	70% of gross for 6 months then 60%	80% of gross	flat-rate: 11-14 (EUR 65-83 / week)	53% of gross (average over all States)
Duration	max. 18 months	10-30 months (dep. on age)	dep. on contribution period	10-15 months (dep. on age)	max. 6 months	max. 6 months
Ceiling*		146	75	66	18%	61% of average worker
Taxable @		IT: no, SSC: no	IT: yes, SSC: reduced	IT: yes, SSC: yes	IT: yes, SSC: no	

B Appendix B: Robustness Checks

The inverted optimal tax characterization suggested in the present study has relied on some assumptions concerning income group definition and the treatment of unemployment benefits in particular. We suggest here a robustness check on these two issues.

The Treatment of Replacement Incomes In our baseline, contributory benefits, essentially unemployment benefits, were treated as a replacement income derived from a pure insurance mechanism.[31] In some countries, however, unemployment insurance payments are detached from contributions and hence can be interpreted as a form of redistribution. We suggest here a variant that takes an alternative and slightly longer-term perspective by treating all non-workers as if they had exhausted their rights to social security (this may indeed take several months or years, as indicated in Tables A.6, A.7 and A.8). That is, unemployment benefits are set to zero for job seekers, and they receive (simulated) social assistance, when available. The size of group 0 is then necessarily larger in this scenario. Results are presented in the left panel of Figure B.1. Some countries like Denmark appear to favor redistribution slightly less in this case, but the international ranking is broadly preserved. It is reassuring that previous interpretations of our results survive this alternative, reasonable treatment.

Income Groups The definition of the $I + 1$ groups in Saez' model necessarily bears some arbitrariness in the way the population is partitioned. This issue is hardly discussed in previous related studies, but the problem is maybe more acute and apparent in our context, as we aim to compare social welfare weights in different countries. Firstly, we have opted for a small number of income groups ($I+1 = 6$) to ease comparisons across countries. In fact, a thinner partitioning of the population produces similar results (available from the authors). Secondly, the choice of cut-off points might be critical when attempting to make group definitions comparable across countries. By construction, group 0 is identified as the population with zero market income. In our baseline the other groups were simply income quintiles among the workers. An alternative group definition should place particular focus on the crucial role of group 1 and the tension occurring in the optimal tax model between workless poor (0), working poor (1) and tax payers ($i > 1$). Since "working poor" is a ill-defined concept, and rather than fixing an arbitrary poverty line, we suggest simply taking $(1 + X\%)$ multiplied by the minimum wage (full-time equivalent income) as the income upper bound for that group. Interestingly, this can be used to adopt institutional definitions of working poverty (e.g., , individualized earned income tax credits targeted at the working poor in the early 2000s in France and Belgium relied on such a

[31] In their baseline, Immervoll et al. (2007) assign UB recipients to group 0, i.e., treat UB as pure redistribution, but recognize that this is a relatively conservative approach. Alternatively, they replace UB by social assistance for job seekers in group 0, which is the same variant presented here. More generally, note that the differences in the extent of social security programs among developed countries, along with the substitution between public and private insurance, have driven the literature to limit redistributive analyses to non-contributive social benefits and taxes.

definition with $X = 30$). We use official or implicit national minimum wages as reported by the OECD (Immervoll, 2007). Groups 2 to 5 are then defined in proportion of the median income in order to account consistently for the income distributions of each country. Group 2 is upper bound by the median income, group 3 by 1.5 times the median income and group 4 by twice the median. We find that results are mostly insensitive to income group definition (the right panel of Figure B.1 depicts the situation with $X = 30$). We explain this as follows: (i) with reasonable definitions of group 1, we always capture, to some extent, the gap between groups 0 and 1/2; (ii) the rest of the social welfare weight distribution is relatively flat, so that alternative definitions of higher income groups have little impact.

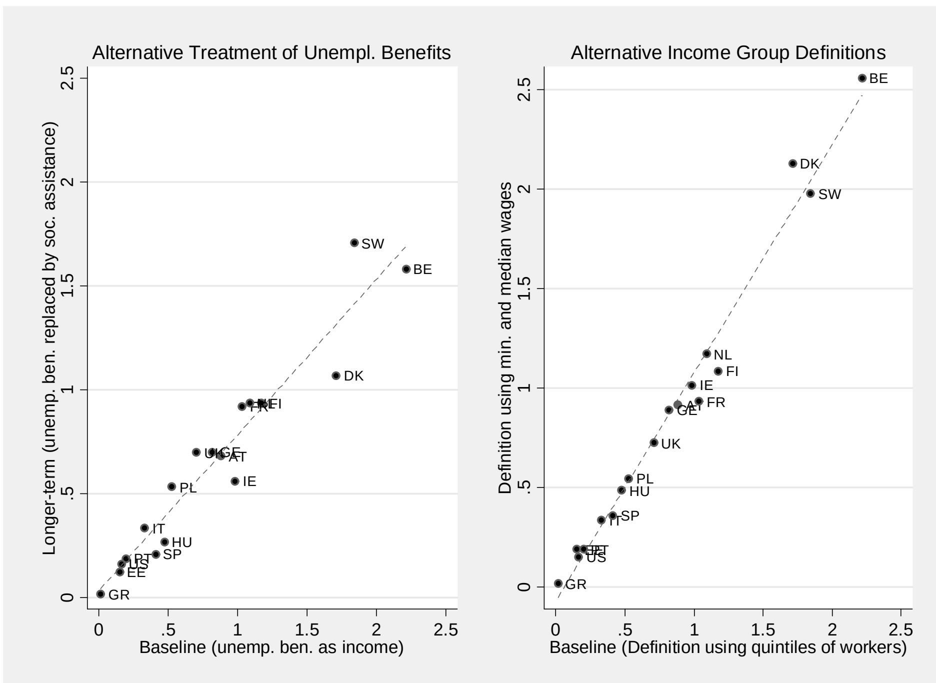


Figure B.1: Revealed Social Inequality Aversion: Robustness Checks

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