Comparing Inequality Aversion across Countries When Labor Supply Responses Differ

Olivier Bargain, Mathias Dolls, Dirk Neumann, Andreas Peichl, Sebastian Siegloch

aix marseille school of economics

Working Papers / Documents de travail

Comparing Inequality Aversion across Countries When Labor Supply Responses Differ

Olivier Bargain
Mathias Dolls
Dirk Neumann
Andreas Peichl
Sebastian Siegloch

WP 2013 - Nr 23

Comparing Inequality Aversion across Countries When Labor Supply Responses Differ*

Olivier Bargain, Mathias Dolls, Dirk Neumann,
Andreas Peichl, Sebastian Siegloch

Submitted in May 2012, accepted in March 2013,
forthcoming in *International Tax and Public Finance*

Abstract

We analyze to which extent social inequality aversion differs across nations when controlling for actual country differences in labor supply responses. Towards this aim, we estimate labor supply elasticities at both extensive and intensive margins for 17 EU countries and the US. Using the same data, inequality aversion is measured as the degree of redistribution implicit in current tax-benefit systems, when these systems are deemed optimal. We find relatively small differences in labor supply elasticities across countries. However, this changes the cross-country ranking in inequality aversion compared to scenarios following the standard approach of using uniform elasticities. Differences in redistributive views are significant between three groups of nations. Labor supply responses are systematically larger at the extensive margin and often larger for the lowest earnings groups, exacerbating the implicit Rawlsian views for countries with traditional social assistance programs. Given the possibility that labor supply responsiveness was underestimated at the time these programs were implemented, we show that such wrong perceptions would lead to less pronounced and much more similar levels of inequality aversion.

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

JEL Classification: H11, H21, D63, C63

***Acknowledgement:** Bargain is affiliated to Aix-Marseille University (Aix-Marseille School of Economics), CNRS & EHESS, and IZA. Peichl is affiliated to IZA, University of Cologne and ISER. Neumann, Dolls and Siegloch are affiliated to IZA and the University of Cologne. We thank Dhammika Dharmapala (the editor) and three anonymous referees as well as discussants & participants at ZEW (Mannheim), the NTA conference 2010 (Chicago) and several seminars (IZA, FU Berlin, UCD) for helpful comments and suggestions. We are indebted to all past and current members of the EUROMOD consortium for the construction and development of EUROMOD, and to the NBER for access to TAXSIM. The ECHP and EU-SILC were made available by Eurostat; the Austrian version of the ECHP by Statistik Austria; the PSBH by the University of Liège and the University of Antwerp; the Estonian HBS by Statistics Estonia; the IDS by Statistics Finland; the EBF by INSEE; the GSOEP by DIW Berlin; the Greek HBS by the National Statistical Service of Greece; the Living in Ireland Survey by the ESRI; the SHIW by the Bank of Italy; the SEP by Statistics Netherlands; the Polish HBS by the University of Warsaw; the IDS by Statistics Sweden; and the FES by the UK ONS through the Data Archive. Material from the FES is Crown Copyright and is used by permission. None of the institutions cited above bear any responsibility for the analysis or interpretation of the data reported here. The usual disclaimer applies.

1 Introduction

The level of redistribution through taxes and transfers differs greatly between countries. In the empirical literature, standard characterizations of these differences rely on the effect of tax-benefit systems on inequality and poverty. However, most studies ignore labor supply behavior when evaluating the level of redistribution, thus ignoring important constraints faced by governments when setting taxes. More comprehensive approaches, which account for the equity-efficiency trade-off underlying tax-benefit policy design, make use of "plausible" elasticities taken from the literature. For instance, Immervoll et al. (2007) compare the efficiency costs of redistribution across European countries by assuming "reasonable" uniform elasticities. The fact that some countries are willing to accept larger efficiency losses from redistribution reflects either highly redistributive views or – redistributive tastes being equal – larger labor supply responsiveness to taxation. Hence, to go one step further, it is necessary to estimate labor supply elasticities on the same data used for optimal tax characterization. In this way, country differences in social preferences can be disentangled from differences in individual consumption-leisure preferences.

This present paper addresses this issue by analyzing the extent to which social inequality aversion differs across nations when controlling for actual differences in labor supply responses. Using a common empirical approach, we estimate labor supply elasticities at both the extensive and intensive margin for 17 EU countries and the US. Applying the same estimation method and model specification provides estimates that can be consistently compared across countries. We focus on a homogenous group, namely childless single individuals, with individual responses aggregated to obtain elasticities at income group levels consistent with the discrete optimal tax model formulated by Saez (2002). As suggested by Bourguignon and Spadaro (2012) in the case of France, we invert Saez's optimal tax model to retrieve parameters for the degree of social inequality aversion (implicitly) embodied in actual tax-benefit systems. Importantly, given the optimality of the observed systems and existing level of redistribution, social inequality aversion must be higher when labor supply is more responsive, i.e. efficiency losses from redistribution are higher.

Our results are as follows. We find relatively small differences in labor supply elasticities across countries. However, this changes the cross-country ranking in inequality aversion compared to scenarios following the standard approach of using uniform elasticities. Differences in redistributive views are significant between three groups of nations.[1] The revealed social inequality aversion parameters range from utilitarian preferences in Southern Europe and the US to Rawlsian[2]

[1] That is, we obtain partial orderings. For instance, we can say that the French, Irish and UK systems are significantly "more Rawlsian" than the US system and less redistributive than the Swedish one. Yet we cannot conclude that inequality aversion is higher in France than in the UK or Ireland.

[2] Note that like many, we improperly use the term "Rawlsian" throughout the paper. Maximizing utility of the worst off person in the society is not the original version of Rawls (1972) but a kind of welfarist version of Rawls, as explained in Kanbur et al. (2006).

views in Nordic and some Continental European countries. We find that labor supply responses are systematically larger at the extensive margin – generalizing previous results for the US to a large group of Western countries – and often larger for the lowest earnings groups. This result necessarily exacerbates the implicit Rawlsian views revealed for Continental European countries with traditional social assistance programs. However, revealed redistributive tastes become less pronounced and much more similar across countries if we impose zero labor supply responses (for instance, reflecting that policymakers may have ignored efficiency constraints at the time these welfare programs were implemented). This finding highlights the importance of accounting for efficiency constraints when assessing social inequality aversion.

The paper is structured as follows. Section 2 briefly reviews the related literature. Section 3 presents the optimal tax model and the inversion procedure. Section 4 describes the main elements of the empirical implementation (data, tax-benefit calculations and income concepts), while Section 5 presents the labor supply estimations. Inequality aversion results are reported and discussed in Section 6. Section 7 concludes. Descriptive statistics and labor supply elasticities are reported in an Appendix to this paper (Sections I and II). An additional Appendix (A–F) gathers additional material and robustness checks.

2 Related Literature

The increasing availability of representative household datasets has allowed bringing optimal tax theory to the data (see the survey of Piketty and Saez, 2013). However, empirical applications remain scarce and limited in policy relevance because two fundamental primitives of the model are difficult to obtain, in particular using consistent data, i.e. labor supply behavior and social preferences. While most applications assume "plausible" values for both of them (as discussed below), we estimate these individual and social preference parameters from the same data.

First, in terms of labor supply elasticities, most optimal tax applications have drawn estimates from the literature. However, the size of elasticities varies greatly across studies, even for the same country, due to different empirical approaches, data sources, data selection and time periods (see Blundell and MaCurdy, 1999; Bargain et al., 2012). Therefore, it is not clear which estimates to retain for cross-country comparisons. In our case, it is important to capture genuine differences in labor supply preferences across countries in order to retrieve tax-benefit implicit social preferences. The present study suggests a harmonized approach that nets out the main methodological differences (estimation method, model specification, type of data). Another important aspect is the distinction between intensive and extensive responses. The crucial role of the extensive margin has been acknowledged in the optimal tax literature since Diamond (1980). Our estimates on single individuals show the major role of the extensive margin to be a consistent result across all countries, with the largest responses found in the low income groups. This result necessarily impacts on normative analyses (see Eissa et al., 2008). Precisely, as explained by Immervoll et al. (2007), the prevalence of large participation responses particularly affects the debate on whether redistribution should be directed to the workless poor (through traditional demogrant policies) or working poor (via in-work support). Countries choosing traditional social assistance programs despite large participation responses in low income groups must therefore have very high redistributive tastes.

Second, available studies typically choose reasonable levels of inequality aversion to characterize optimal tax schedules. Inversely, a country's redistributive preferences at a certain point in time can be explicitly retrieved by inverting the underlying optimal tax model. This approach was first suggested in the context of optimal commodity taxation (Christiansen and Jansen, 1978, Stern, 1977, Ahmad and Stern, 1984, Decoster and Schokkaert, 1989, Madden, 1996) and regulation of utilities (Ross, 1984). It has been extended to the Mirrlees' income tax problem by Bourguignon and Spadaro (2012), who characterize the properties of the tax-revealed social welfare function and provide an illustration on French data, making assumptions regarding the level of labor supply elasticities. These elasticties are estimated on data for the UK and Germany in Blundell et al. (2009), who retrieve the implicit social welfare functions for the two countries, focusing on single mothers. The present study adopts the optimal tax inversion approach to systematically compare redistributive tastes between European countries and the US.[3] In a similar vein, Gordon and Cullen (2011) recover the implicit degree of redistribution between federal and state taxation in the US.

Our analysis follows the standard welfarist approach with the social planner maximizing a weighted sum of (increasing transformations of) individual utilities. In this way, optimal tax formulas can be expressed in terms of the social marginal welfare weights attached to each individual (or income group), which measure the social value of an extra dollar of consumption to each individual (group). This framework has recently been generalized by Saez and Stantcheva (2012) in considering endogenous social marginal welfare weights. On the one hand, in a normative approach, these weights can be ex-ante specified to fit some principle of justice. On the other hand, in a positive approach, implicit welfare weights can be derived empirically, namely by retrieving actual social preferences. Our tax-transfer revealed approach belongs to this second stream of research, which also includes attempts to directly elicit social preferences.[4]

Further to a mere measure of social preferences, it is also necessary to understand the mechanisms

[3] The present paper differs from its ancestor, Bargain and Spadaro (2008), and a follow-up available as Spadaro (2008), in several ways. Importantly, the present study integrates optimal tax analysis with labor supply estimation and we cover a much larger set of countries. Therefore, conclusions are simply different.

[4] Some studies elicit people's attitude towards inequality using survey data (see e.g. Fong, 2001, Corneo and Grüner, 2002, or Isaksson and Lindskog, 2009). Tax preferences obtained in surveys have also be compared with actual tax schedules (Singhal, 2008). In behavioral economics, experiments are often used to assess preferences of a group (see for instance Fehr and Schmidt, 1999). With the well-known 'leaky bucket' experiment, respondents are able to transfer money from a rich individual to a poor one but incur a loss of money in the process, so that the equity-efficiency trade-off is taken into account in measuring tastes for redistribution (see for instance Amiel et al., 1999); in recent experiments, participants have voted for alternative tax structures (e.g. Ackert et al., 2007). Finally, in the public economic literature, implicit value judgments may be drawn from inequality measures, assuming a natural rate of subjective inequality (see Lambert et al., 2003, Duclos, 2000).

shaping them (cf. Piketty, 1995) and investigate the political economy channel through which policies are designed and implemented. Real world tax-benefit schedules result from historical and political economy forces. Nonetheless, the fiction of a social planner can be seen as a proxy for a more complex political process. Probabilistic voting models suggest that particular social welfare functions are maximized in political equilibrium (cf. Coughlin, 1992).[5] Saez and Stantcheva (2012) also show that the median voter optimal tax rate is a particular case of the optimal (linear) tax rate where social welfare weights are concentrated at the median. This clarifies the close connection between optimal tax theory and political economy. In the latter, social welfare weights that result from the political process are used rather than being derived from marginal utility of consumption as in the standard utilitarian tax theory. Nonetheless, the structure of resulting tax formulas is the same. Finally, another way to approach the problem is to take political economy forces as distortions in the optimal tax design (see Acemoglu et al., 2010). However, accounting for political economy considerations is beyond the scope of the present paper. Hence, as discussed in the next section, we assume the observed system to be optimal while being agnostic about the underlying political process and using the most simplistic political economy model: the fiction of a social planner.

3 Optimal Tax Model and its Inversion

We adopt the discrete version of the optimal tax model by Saez (2002), assuming the population to be partitioned into $I+1$ income groups comprising I groups of individuals who work, ranked by increasing market income levels Y_i ($i = 1, ..., I$), and a group $i = 0$ of non-workers. Disposable income is defined as $C_i = Y_i - T_i$, where T_i is the effective tax paid by group i (it is *effective* given that it includes all taxes and social contributions minus all transfers). Non-workers 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 derives the following formula for the optimal tax rates:

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

[5] It would certainly be interesting to extend the present approach to some explicit political economy model (see Castanheira et al., 2012, for a survey and empirical assessment), despite basic representations such as the median voter hypothesis being of limited applicability (cf. Alesina and Giuliano, 2011). Many dimensions are involved in the case of tax-benefit policy design in the real world, including other institutions (e.g. labor market policies, as noted above), various actors (workers, unions, lobbies), and the role of expert and international influences (cf. Banks et al., 2005), which are often not accounted for by theory. Furthermore, social choice models in presence of endogenous labor supply are rare.

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 $i = 0, ..., I$.[6] The elasticities are defined as:

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

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

Responses are restricted to only occur from one group to the neighboring group, and vice versa. Social preferences are summarized by the set of welfare weights g_i. These weights can be interpreted as the *(per capita) marginal social welfare of transferring one euro to an individual in group i, expressed in terms of public funds*. The only assumption made on individual preferences is that there is no income effect, a traditional restriction in this literature, supported by our empirical results as discussed below.[7] When income effects are ruled out, an additional constraint emerges from Saez's model, normalizing welfare weights as follows:

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

The inverse optimal tax problem is relatively straightforward. A system consisting of I equations (1) and equation (4) can be inverted to retrieve the $I+1$ marginal social welfare weights g_i given appropriate values for (observed) income levels Y_i, (simulated) net tax levels T_i and (estimated) elasticities ζ_i, η_i. The complete demonstration of the inversion procedure is documented by Bourguignon and Spadaro (2012).[8] To summarize redistributive tastes in each country by a single-valued index, we use the parameterization suggested by Saez (2002) to relate weights and net incomes, i.e.:

$$g_i = 1/(p \cdot C_i)^\gamma \quad \text{for all } i = 0, ..., I. \tag{5}$$

[6] Note that $\frac{T_i - T_{i-1}}{C_i - C_{i-1}}$ corresponds to $\frac{T_i'}{1-T_i'}$ 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.

[7] Utility functions are not directly specified in Saez's model. Yet, the weights g_i comprise the derivative of the implicit social welfare function (integrated over all the workers within group i) and the individuals' marginal utility of income. Utility functions are, however, necessary for the estimation of elasticities. For this, we choose a flexible functional form (see section 4). The condition of zero income effects is not imposed a priori, but rather checked a posteriori. We find small or insignificant effects, therefore this assumption is acceptable as a first approximation (see Appendix II).

[8] Due to the inversion procedure above we do not need to calculate elasticities for group 0 – there is no such elasticity according to definitions in equations (2),(3). In fact, the definition of the extensive/intensive elasticity for group 1 η_1 ($= \zeta_1$) can be interpreted as the decrease in h_1 due to a move to group 0 by workers when $C_1 - C_0$ decreases, or alternatively as the response by non-workers (a move to group 1) when $C_1 - C_0$ increases. This reverse response is entirely determined by normalization (4), i.e. simple algebra leads to:

$$\frac{C_1 - C_0}{h_0} \frac{\partial h_0}{\partial(C_1 - C_0)} = -\frac{h_1 g_1}{h_0 g_0} \eta_1.$$

It does not mean that groups 0 and 1 are similar in terms of labor supply preferences, simply that only one Saez elasticity (here η_1) is required to capture inter-group moves for these two groups.

In this expression, p denotes the marginal value of public funds and γ is a scalar parameter reflecting the social aversion to inequality.[9] The higher γ, the more pro-redistributive the social preferences, from $\gamma = 0$ (utilitarian preferences) to $\gamma = +\infty$ (the Rawlsian maximin case). For each country separately, we first obtain the values of g_i by the inversion of the optimal tax model, then we estimate the log of expression (5) to recover the structural parameter γ.[10]

Note that both the behavioral elasticities η_i and ς_i and group sizes h_i are endogenous to the tax-benefit system (as explained by Saez, 2002 and discussed in Bargain et al., 2012) or other institutions affecting labor supply behavior (such as child care arrangements). Hence, they depend on the social planner's redistributive views (represented here by the set of welfare weights g_i and summarized by the inequality aversion parameter γ). This source of endogeneity can be a serious problem for the standard optimal tax approach, i.e. when using observed data on population weights and estimated elasticities to derive the optimal tax-benefit schedule. However, it is, by construction, not an issue in the inversion approach: The key identifying assumption for this procedure to work is that the social planner has optimally chosen policies such that the resulting income distribution (taking into account behavioral responses) corresponds to the planner's redistributive preferences. This optimality assumption necessarily incorporates elasticities and populations weights as well. Without the assumption, agents would respond to any 'optimal' policy set by the planner so that elasticities and group sizes would change. This would invalidate equation (1), i.e., actual tax levels would be no longer optimal (given the new values for elasticities and population weights), and the optimal tax rule should be applied again, generating further responses, etc. Therefore, it must be assumed that at least one fixed point exists in which the left and right-hand sides of equation (1) are consistent. This is only the case when the observed system corresponds to the optimal one. Only under this assumption, we are able to recover the underlying inequality aversion of the planner in the given optimal tax framework.

[9] Of course, there are different views on what social inequality aversion really is - as , e.g., discussed by Lambert et al. (2003). We rely here on a parameter γ capturing the concavity of the social welfare function, as parameterized by Saez (2002, p. 1058).

[10] The present characterization could be based on alternative social objective functions. Kanbur and Tuomala (2011) have recently clarified the interrelationships between various types of social objectives, including some with sharp discontinuity at the poverty line (charitable conservatism and poverty radicalism) and less angular versions such as usual constant elasticity inequality aversion (as the measure γ used here) and the "slow, quick, slow" empirical property of the Gini weights. Notice, however, that it follows from the discrete form of the social welfare function used in the Saez optimal tax model that we do not impose any restriction on the shape of the marginal social welfare weights (and hence allow for any discontinuities, as those present in charitable conservatism, for instance). We only impose a constant elasticity inequality aversion in equation (5), i.e. to derive a single-valued approximation of redistributive tastes in each country for the purpose of international comparisons. It could be interesting to replicate our analysis with non-welfarist objectives (e.g. Kanbur et al., 2006) or welfare measures that preserve individual heterogeneity (see Fleurbaey, 2008).

4 Empirical Implementation

We now present the data and tax-benefit simulations used to calculate Y_i and C_i as well as the income group definition. We use datasets for the US, 14 members of the EU prior to May 1, 2004 (the so-called EU-15, except Luxembourg) and 3 new member states (NMS), namely Estonia, Hungary and Poland. The different data sources fulfill the basic requirements for our exercise, i.e. they provide a representative sample of the population (and in particular the income distribution), are comparable across countries (the definition of the key variables has been harmonized), and contain the necessary information to estimate labor supply behavior.

The fundamental information required by the optimal tax model is the effective tax $T_i = Y_i - C_i$ for each income group $i = 0, ..., I$. Household gross income is aggregated to obtain Y_i. We simulate taxes, social contributions and benefits in order to obtain household disposable income, which can be aggregated at the group level to obtain C_i.[11] Tax-benefit simulations are performed using two calculators: EUROMOD for EU countries and TAXSIM for the US. EUROMOD is designed to simulate the redistributive systems of EU-15 countries and NMS. This unique tool provides a complete picture of the redistributive and incentive potential of European welfare regimes.[12] The datasets associated to EUROMOD are presented in Tables I.1 and I.2 (Appendix I).[13] We cover the policy years 1998 and/or 2001 for EU-15 countries and 2005 for NMS.[14] TAXSIM (version v9) is the NBER calculator presented in Feenberg and Coutts (1993), augmented here by simulations of social transfers. As in several contributions (e.g, Eissa et al., 2008, or Eissa and Hoynes, 2011), we use it in combination with the IPUMS version (Integrated Public Use Microdata Series) of the Current Population Survey (CPS) data. We use the 2006 data, which contains information on 2005 incomes.

Our selection focuses on potential salary workers in the age range $18 - 64$ (thus excluding pensioners, students, farmers and the self-employed). We exclude all households where capital income represents more than 25% of the total gross income, as their labor supply differs from our target group. Most importantly, as with Blundell et al. (2009) we must focus on a homogenous demographic group, since aggregating across different household types within a social welfare function poses fundamental difficulties in terms of household comparisons and implicit equivalence scales. Furthermore, Saez's model is formulated for single individuals; deriving optimal

[11] Simulated disposable incomes are used in place of self-reported incomes for two reasons. First, they give a better rending of the redistributive intention of the social planner. Indeed, actual (and self-reported) levels of taxes or benefits are affected by non-intended behavior such as the low take-up rate of some benefits. Second, simulated incomes are also consistent with the need to simulate counterfactual disposable incomes for all options of hours worked in order to estimate the labor supply model.

[12] An introduction to EUROMOD, a descriptive analysis of taxes and transfers in the EU countries and robustness checks are provided by Sutherland (2001). EUROMOD has been used in several empirical studies, notably in the comparison of European welfare regimes by Immervoll et al. (2007).

[13] Note that Appendices with roman numbers are directly attached to this document while Appendices starting with capital letters are part of an independent document.

[14] Note that we make use of those policy years available in EUROMOD at the time of writing (1998, 2001 or 2005). For comparison, we use TAXSIM simulations for the year 2005.

taxes for couple households with two potential earners is acknowledged as being much more difficult (see the survey of Piketty and Saez, 2013). For our analysis, we thus select *single men and single women without children.*[15] Remarkably, we show that international comparisons on single individuals reflect much of the differences in overall redistribution across countries (see Appendix E).

In order to ease cross-country comparisons, we partition the population of each country into a small number of groups, $I + 1 = 6$. In our baseline, group 0 is composed of inactive individuals who report neither labor nor replacement income. Contributory benefits are treated as replacement income derived from a pure insurance mechanism; in particular, unemployment benefits are interpreted as delayed income. However, in the case of the UK, Ireland and Poland, unemployment benefits (UB) are paid according to flat rates and have no strong link to past contributions. Hence, for these three countries UB are treated as redistribution. Next, groups $i = 1, ..., 5$ are simply calculated as income quintiles among workers. Descriptive statistics of our selected sample are reported in Tables I.1–I.2 of Appendix I.[16]

5 Labor Supply Estimation

5.1 Empirical Model

We estimate the behavioral elasticities from Saez's optimal tax model, η_i and ζ_i, using a homogenous estimation method. We rely on a common structural discrete-choice model as used in well-known labor supply studies for Europe (e.g. Blundell et al., 2000, van Soest, 1995) or the US (e.g. Hoynes, 1996), which enables us to calculate comparable elasticity measures for all countries under study. Given that the structural labor supply model has become a standard tool in the literature, we only present our main modeling assumptions (more information can be found in the aforementioned studies as well as Blundell and MaCurdy, 1999). For each country separately (surpressing the country index in the following), we specify consumption-leisure preferences using a quadratic utility function, i.e. the utility of household k choosing the discrete choice $j = 1, ..., J$ can be written as:

$$U_{kj} = V_{kj}(c_{kj}, h_{kj}) + \epsilon_{kj} \quad (6)$$

$$\text{with } V_{kj}(c_{kj}, h_{kj}) = \alpha_{ck}c_{kj} + \alpha_{cc}c_{kj}^2 + \alpha_{hk}h_{kj} + \alpha_{hh}(h_{kj})^2 + \alpha_{ch}c_{kj}h_{kj} - f_{kj} \quad (7)$$

with household consumption c_{kj} and hours worked h_{kj}. Coefficients on consumption and hours worked, α_{ck} and α_{hk}, vary linearly with several taste-shifters (gender, polynomial form of age,

[15] Blundell et al. (2009) focus instead on single mothers. In our case, samples of single parents in some countries are too small for meaningful results. Focusing on one homogenous group at a time implicitly assumes some separability in the social planner's program, with a first stage of redistribution between demographic groups and a second stage with vertical redistribution within homogenous groups (see Bourguignon and Spadaro, 2012).

[16] Non-contributory social transfers and contributory UB are described in the Appendix (part D and E). Appendix F provides an extensive sensitivity analysis on the treatment of UB recipients.

region) and a normally-distributed random term for unobserved heterogeneity. As in Blundell et al. (2000), we introduce fixed costs of work f_{kj}, equal to zero if $j = 1$ (inactivity) and non-zero for $j > 1$ (implictilcy accounting for differences in demand side constraints). We do not impose tangency conditions apart from increasing monotonicity in consumption, which is a minimum requirement for meaningful interpretation and policy analysis. The deterministic utility V_{kj} is complemented by i.i.d. error terms ϵ_{ij}. Tax-benefit simulations described in the previous section are used to evaluate disposable income $c_{kj} = d(w_k h_{kj}, m_k)$ for each hour choice j, as a function of labor income $w_k h_{kj}$ and non-labor income m_k. For wages w_k, we first calculate raw wages from data information on hours and income, proceed with an Heckman-corrected estimation and finally predict wages for all observations in order to reduce the problem of division bias (see Blundell and MaCurdy, 1999).

A common issue with the estimation of structural models of labor supply concerns the identification of behavioral parameters under the assumption of wage exogeneity. Accordingly, unobserved characteristics (e.g. being a hard-working person) may in fact influence both wages and work preferences and thus potentially bias estimates obtained from cross-sectional wage variation across individuals. Our detailed simulation of nonlinear tax-benefit schedules provides a parametric source of identification which is frequently used in the empirical labor supply literature (e.g. Van Soest, 1995; Blundell et al., 2000). In addition, we benefit from some time variation (two years of data for 7 countries) and spatial variation in tax-benefit rules within each country (for instance state-level tax rules in the US, as exploited in Hoynes, 1996). The role of these exogenous sources of variation is discussed and analyzed in Bargain et al. (2012).

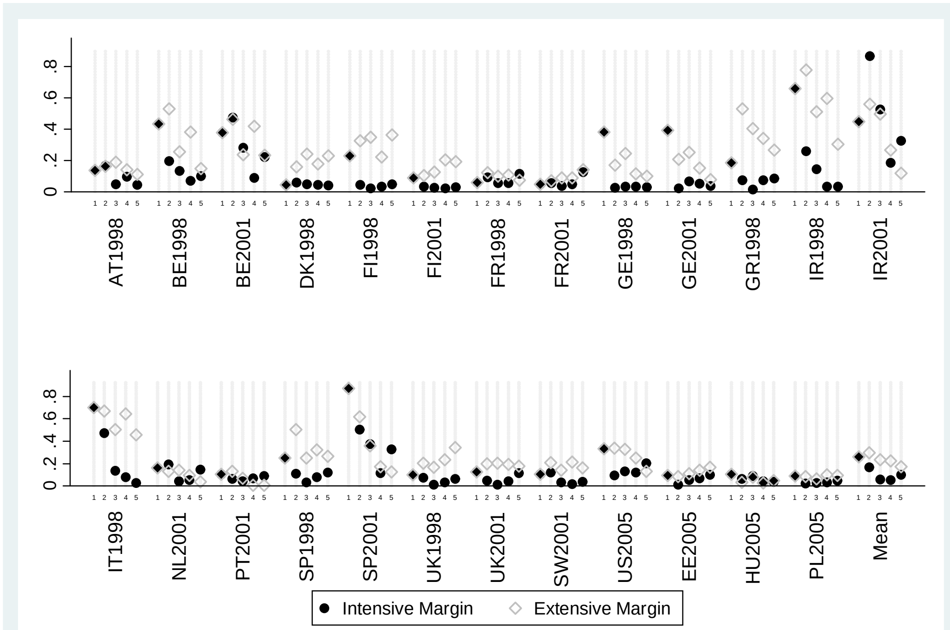
5.2 Labor Supply Elasticities

The labor supply model is estimated using $J = 7$ choices ranging from 0 to 60 hours/week with a step of 10 hours, which enables us to capture the country-specific variations in hours worked. Estimation results are reported and discussed in Appendix A (cf. Tables A.1-A.4), and goodness-of-fit measures and robustness checks in Appendix B (Table B.1). After the estimation of the labor supply model, we numerically simulate responses at the individual level and aggregate them at the income group level to calculate the elasticities specific to Saez's optimal tax model.[17] These results are reported in Tables II.1–II.2 (Appendix II).

For a more convenient comparison across countries, point estimates are shown in Figure 1 below for the different income groups. The first result is that responses at the extensive margin are systematically larger than at the intensive margin (except for group 1, for which both margins are identical by definition). This finding generalizes previous results for the US (e.g. Eissa and Liebman, 1996), Germany and the UK (Blundell et al., 2009).

A second result is that responses are usually larger for the lowest income groups of workers (groups 1 and 2). Despite this being expected for single individuals, there is currently very

[17] We calibrate uniform changes in disposable income at the individual level to obtain percent changes in income gaps, as defined in (2) and (3). Total responses, measured as a change in the population shares in each income group, are then obtained by aggregation to calculate η_i and ζ_i for $i = 1, ..., I$ (see also Blundell et al., 2009).



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).

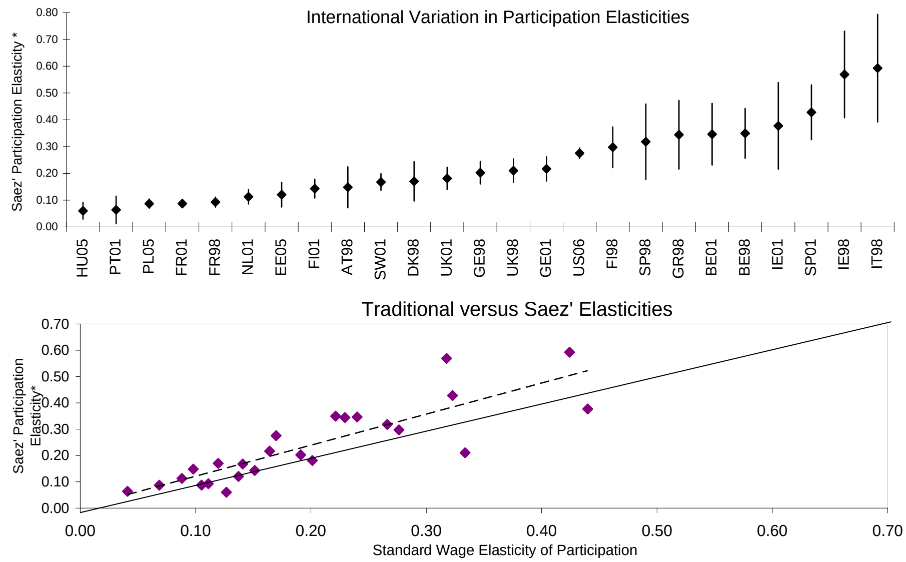
Figure 1: Saez' Elasticities at the Extensive/Intensive Margins

little evidence on this (see the discussion in Bargain et al., 2012). However, the implications are important for welfare analysis (see Eissa et al., 2008) and the optimality of in-work transfers versus demogrant transfers (see Immervoll et al., 2007).[18]

We also investigate international differences, providing a visual comparison of extensive margin elasticities across countries in the upper panel of Figure II.2, with mean elasticities for income groups $i \geq 1$ and confidence intervals based on bootstrapped standard errors.[19] Elasticities are especially large in Southern Europe, Ireland and Belgium, and particularly small in Eastern Europe, France and the Netherlands. However, it is important to notice that international differences are relatively small, with mean extensive margin elasticities mostly in a range $.1 - .3$. Nevertheless, we hereafter show that even such small variation affects international comparisons in revealed inequality aversion.

[18] Interesting exceptions are France, Finland and Denmark, i.e. countries where social assistance programs generated high effective marginal tax rates for the lowest income levels in the years under study. Marginal changes in income differentials $d(C_i - C_0)$ used to calculate elasticities therefore have a small impact on labor supply for them. As discussed in section 3, the fact that elasticities are endogenous to current tax-benefit systems is not an issue since these systems are deemed optimal in our characterization. That is, our characterization of social inequality aversion for these three countries incorporates confiscatory (implicit) taxation being imposed on the working poor.

[19] Estimates are generally relatively precise, yet 95% confidence bounds are as broad as $.4 - .8$ for Italy or $.2 - .5$ for Ireland. As shown below, this affects the international comparability of tax-benefit revealed social inequality aversion.



*Saez' extensive margin elasticities averaged over income groups i=1,…,I (point estimates) and 95% confidence intervals.

Figure 2: Extensive Margin Elasticities: Comparisons

We make two final remarks. First, despite their specific definition, elasticities used in Saez's model are highly correlated with "standard" wage-elasticities, i.e. intensive and extensive elasticities calculated as hour and participation responses to a 1% increase in wage rates. This is shown for the extensive margin in Figure II.2 (lower part). Second, as stated by Keane and Rogerson (2012), "*labor supply elasticities are neither a single number nor a primitive feature of preferences [... and] one important source of confusion in the literature is the idea that one can estimate a labor supply elasticity in one context and import this elasticity into other contexts.*" We have addressed this (Lucas) critique, firstly by using a fully structural labor supply model, which is secondly integrated with the optimal tax framework. The labor supply model allows disentangling the effect of tax-benefit systems from other components, most importantly preferences and demographic composition. The integration with the optimal tax framework ensures that those elasticities are perfectly consistent with the actual framework used for the analysis, namely the optimal tax model of Saez (2002). Bargain et al. (2012) decompose cross-country differences in elasticities to assess the relative contributions of tax-benefit systems, preferences and demographic composition. We present results for the specific sample under study in Appendix C. The findings convey that while tax-benefit systems explain part of the differences, there are also genuine differences in work preferences across countries.

6 Revealed Social Inequality Aversion

In this section, we estimate the revealed inequality aversion implict in the tax-benefit systems of the 17 European countries under study and the US. While some background information on international differences in tax-benefit policies are summarized in Tables D.1-D.3 in Appendix D, it is clear that the most important redistributive elements for single individuals are transfers and progressive taxes, with the latter of particular importance in countries where singles are not eligible for any income support (for instance, the US or Hungary).

6.1 Baseline results

We start our analysis by considering the effective marginal tax rates (EMTRs) and effective participation tax rates (EPTRs), which provide an indication of the redistributive and incentive effects of the different welfare regimes. Appendix E highlights a U-shaped distribution of EMTRs across income groups for most countries in Nordic and Continental Europe, which is well in line with the results of Immervoll et al. (2007). This pattern is due to progressive taxation at the top and means-tested social benefits at the bottom. Furthermore, the working poor (groups 1 and 2) have been rather excluded from redistribution for the years under consideration.[20] In the US and Southern Europe, the overall level of net taxation is usually lower and the distribution of EMTRs generally flatter. There are exceptions, notably fairly high levels of effective taxation in upper income groups in Poland, Hungary, Ireland and Italy, as well as more pronounced progressivity in Greece and Portugal.
Next, we report and discuss the distribution of revealed marginal social welfare weights g_i underlying our measure of inequality aversion, as derived from inverting the optimal tax formula (see Table 1). A necessary condition for the implicit social welfare function to be Paretian, i.e. non-decreasing at all productivity levels, is that weights g_i are positive at all income levels. Our results show that this is broadly the case for all countries and income groups. Marginal social welfare weights for group 0 are much larger than for the rest of the population in Nordic and Continental Europe, Ireland and the UK, which target non-marginal transfers towards the bottom of the distribution. As found by considering EMTR, the welfare weights pattern is much flatter in countries characterized by little redistribution through social transfers (Southern and Eastern Europe, the US). However, for this group of countries smaller weights on top incomes reflect higher tax progressivity (Portugal and Greece), while uniformly low weights on non-poor groups reflect high tax levels (Italy). Weights on group 1 (and sometimes 2) are smallest in countries with generous social assistance schemes, reflecting distortions imposed on the working poor as discussed in the EMTR analysis.

We estimate our main indicator of social inequality aversion, i.e. the single-value index of γ, according to equation (5) based on the dsitributions of marginal social welfare weights. Figure

[20] International heterogeneity in the degree of redistribution is not affected by the treatment of unemployment benefits (UB), i.e. whether they are counted as part of the redistribution function or market income (according to a pure insurance mechanism). Countries that do not redistribute much among childless single individuals do not redistribute much in general (see Figure E.2. in Appendix E). This suggests that redistribution among this group is representative of overall international differences in tastes for vertical equity, confirming that we can conduct the analysis on single individuals.

	g_0	g_1	g_2	g_3	g_4	g_5
AT	7.3	0.8	0.7	0.6	0.7	0.7
BE	4.3	0.0	0.1	0.3	0.2	0.3
DK	4.3	0.2	0.2	0.2	0.2	0.2
FI	1.9	0.7	0.8	0.8	0.8	0.7
FR	2.9	0.5	0.8	0.8	0.8	0.7
GE	4.7	0.0	0.6	0.6	0.7	0.7
GR	1.2	1.0	0.9	0.9	0.9	0.8
IE	3.3	0.6	0.4	0.9	0.8	0.8
IT	2.5	1.6	0.4	0.5	0.4	0.5
NL	4.3	0.2	0.6	0.8	0.8	0.8
PT	1.6	0.8	0.9	1.0	1.1	0.9
SP	2.8	0.9	0.7	0.9	0.8	0.8
UK	2.3	0.2	0.8	1.0	1.0	0.9
SW	6.1	0.0	0.2	0.6	0.5	0.6
EE	1.4	0.9	1.0	0.9	0.9	0.9
HU	2.5	0.8	0.9	0.9	0.8	0.8
PL	3.5	0.5	-0.1	0.4	0.6	0.6
US	1.6	1.0	1.0	1.0	1.0	0.9

Table 1: Marginal Social Welfare Weights g_i

3 reports the tax-benefit revealed inequality aversion obtained under different elasticity scenarios.[21] The left panel shows inequality aversion when assuming that labor supply responses are uniform across countries – in fact, this is how inequality aversion has been analyzed in the literature to date. We apply the mean extensive margin elasticity over all countries to each country. First, we find that inequality aversion is in line with general perceptions, reflecting utilitarian preferences in Southern Europe and the US up to large levels close to Rawlsian views in Nordic and some Continental European countries. Values are actually very close to those used for calibration in previous empirical applications: Saez (2002) states that γ values around .25 (resp. 1) imply a reasonably low (resp. high) taste for redistribution, while a value of 4 is high enough to proxy the Rawlsian benchmark. Our estimated parameters span this range, from around .25 (US, Spain, Italy) or below (Greece) to above 1 in Nordic countries, France and Belgium, up to 3 in Denmark. Second, instead of the uniform mean elasticity estimated from our data, we apply the uniform elasticities used in Immervoll et al. (2007), i.e. from .4 in group 1 to 0 in group 5 with step .1. It turns out that the elasticities used in Immervoll et al. (2007) provide a good benchmark, as the distribution of inequality aversion parameters is hardly affected.

[21] We focus on the extensive margin because results for the key groups 0 and 1 depend less crucially on the intensive margin (cf. Saez, 2002). Note also that we take the mean inequality aversion over the two periods when two years of data are available, in order not to overload the graphs.

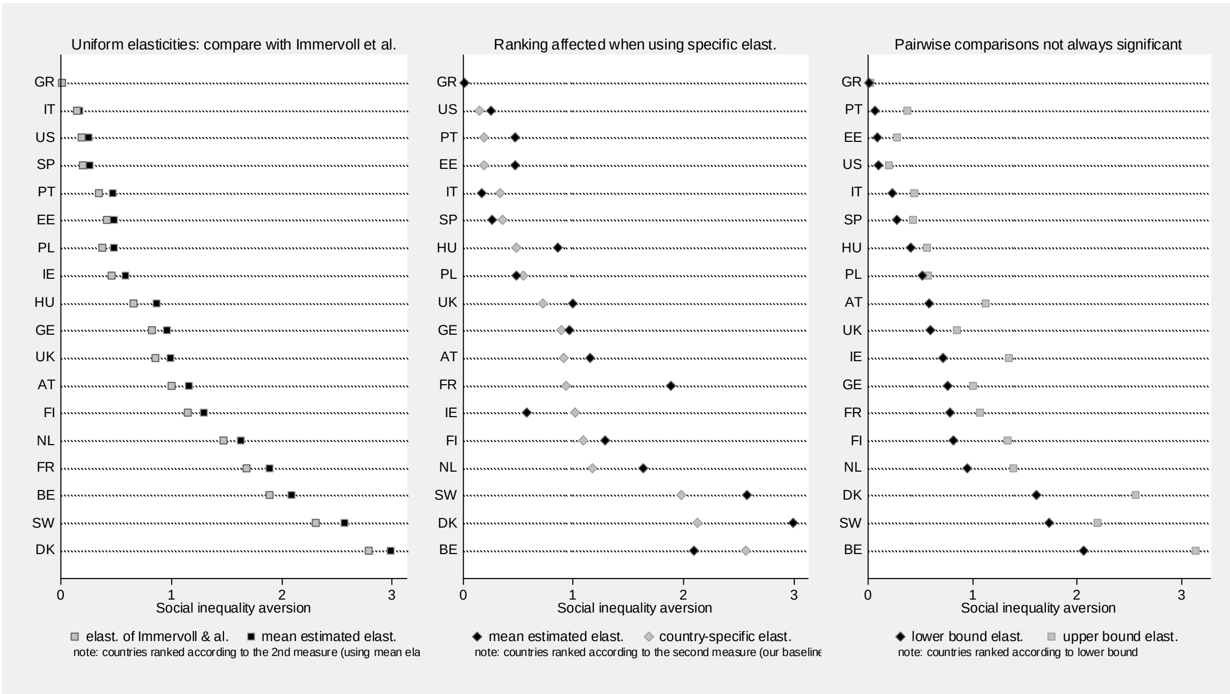


Figure 3: Tax-benefit Revealed Social Inequality Aversion γ

The central contribution of this paper is to assess inequality aversion when labor supply responses differ across countries. Thus, in the middle graph of Figure 3, we confront the uniform "mean elasticity" scenario with our baseline, i.e. inequality aversion parameters obtained under country-specific elasticity estimates. Some reranking occurs for the 18 countries under study. Countries with below-average elasticities automatically appear less Rawlsian than when using mean elasticities, because the efficiency constraint is not as tight. Considering France, for instance, we find very low labor supply elasticities. Assigning France a mean elasticity would thus imply overestimating the efficiency constraints and consequently overestimating the inequality aversion. Conversely, large elasticities in Ireland push up the level of true inequality aversion. We can cluster countries according to three broad groups. First, for Continental Europe, the UK, Ireland and Finland we find a γ value around 1. Importantly, the large weight on group 0 (workless poor) drives the result of high inequality aversion for these countries, and is rationalized by the fact that the extensive margin dominates. As discussed above, if participation responses were small, traditional social assistance programs could be in place without efficiency costs. However, as the extensive margin is large, the policy choice in these countries must be interpreted by very high redistributive views. Second, our results for Southern/Eastern Europe and the US suggest rather low levels of inequality aversion (smaller than 1), reflecting a low weight on group 0 while the weight on group 1 (working poor) is higher on average. Last, Scandinavian countries and Belgium reveal inequality aversion parameters far above 1, which reflects an even higher weight on group 0 than observed for the first group of countries (see Table 1). Finally, we provide 95% confidence bands for the inequality aversion parameter, accounting for the standard errors of the estimated participation elasticities (see the right panel of Figure 3). Some comparisons are unambiguous (e.g. redistributive views in Sweden are more Rawlsian than in the US). However, differences are not significant for all pairs of countries, i.e. the ordering of countries' redistributive tastes is incomplete (for instance, differences between Sweden and Denmark). However, reassuringly, we can distinguish the same three groups of countries as delineated above.

6.2 Sensitivity Analyses

Our baseline results characterize the redistributive preferences embodied in actual tax-benefit systems given *estimated elasticities* and reasonable *income group* definitions. Despite it being plausible to assume that observed tax-benefit systems are optimal for the governments who implemented them, they may have actually had completely different priors about these two key parameters of the model.

Elasticities. We first discuss what would happen if we use "wrong" labor supply elasticities. In fact, it is possible that potential labor supply responses were underestimated or ignored by policymakers in continental Europe when generous demogrant policies were designed and implemented. It was only in the late 1990s that numerous policy reports released in Europe highlighted the possibility that safety nets designed to prevent extreme poverty caused work disincentives and "inactivity traps". The same concern that welfare programs had pushed part of the population into a state of welfare dependency had previously led to the 1996 welfare reform in the US (see Piketty and Saez, 2013).[22]

Therefore, we suggest a polar case where extensive margin responses are set to zero, i.e. 'simulating' the case that politicians completely ignored behavioral responses. The left panel of Figure 4 shows that the international ranking is broadly preserved. However, absolute inequality aversion mechanically decreases: preferences are less Rawlsian if participation responses, i.e. mobility between the workless poor and the working poor, are ignored. Consequently, most of the differences between countries vanish. However, Belgium, Sweden, Denmark, and to some

[22] In the context of the US and the UK, Piketty and Saez (2013) argue that governments retargeted transfers from groups unable to work to beneficiaries who were potentially able to work. This trend has led to a shift from traditional means-tested social assistance programs toward in-work benefits. This policy adjustment to the moral hazard problem attached to traditional demogrant policies can be seen as a revision of beliefs about labor supply responses and/or a change in social preferences (social welfare weights on non-workers fall relative to those on low income workers, as society believes that a majority of the former can actually work). It is probably impossible to differentiate between these two aspects (i.e. it is equivalent to say that the society reassesses labor supply responses upwards or increasingly favors desert-sensitive policies). As discussed in section 2, we do not attempt to explain how social preferences are formed and why they change – yet it is interesting to underscore the political economy forces at play and the possible role of international influence, with some noticeable convergence across countries on the principle of "making work pay" (see Banks et al., 2005).

extent the Netherlands, still exhibit a high taste for redistribution under the extreme assumption of a zero participation elasticity.

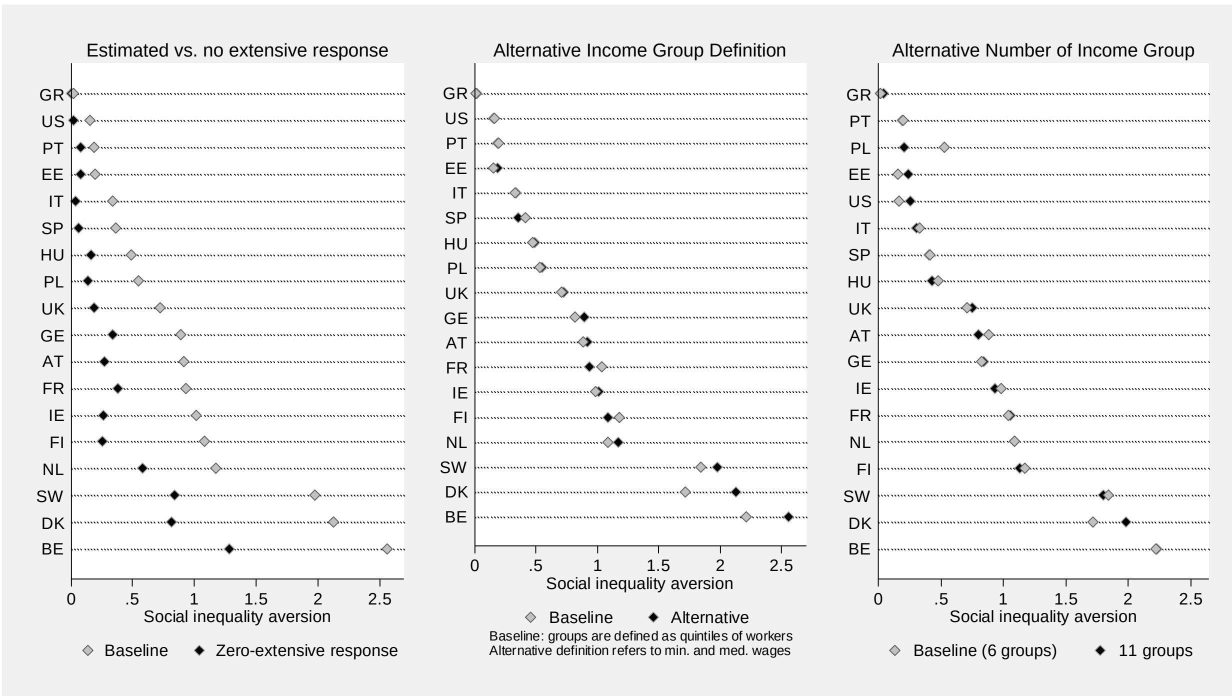


Figure 4: Revealed Social Inequality Aversion: Sensitivity Checks

Income groups. Secondly, the definition of the $I + 1$ groups in Saez's model necessarily bears some arbitrariness in how the population is partitioned. We analyze how results are affected by alternative definitions of the cut-off points for the income groups. They might be critical when trying to make group definitions comparable across countries. By construction, group 0 (workless poor) is identified as the population with zero market income. In our baseline, the other groups were simply determined by income quintiles among the workers. We suggest an alternative group definition that places particular focus on the crucial role of group 1 (the working poor).[23] The middle panel of Figure 4 shows that results are mostly insensitive to the income group definition. We explain this finding as follows: (i) with reasonable definitions of

[23] Since "working poor" is a imprecisely-defined concept, we suggest simply taking $(1+x)$ times the minimum wage (full-time equivalent income) as the upper bound for the income of that group, rather than fixing an arbitrary poverty line. We are thus able to adopt institutional definitions of working poverty (e.g. individualized earned income tax credits targeted at the working poor in France and Belgium in the early 2000s relied on such a definition with $x = 30\%$, which we adopt here). We use official or implicit national minimum wages as reported by the OECD (Immervoll, 2007). Groups 2 to 5 are then defined in proportion to the median income, in order to consistently account for the income distributions of each country. The upper income bounds for groups 2-4 are 1, 1.5 and 4 times the median income, respectively.

group 1, we always capture the income gap between groups 0, 1 and 2 to some extent; (ii) the rest of the social welfare weight distribution is relatively flat, so alternative definitions of higher income groups have little impact.

Finally, we provide a sensitivity analysis with regard to the number of income groups. To ease comparisons across countries, we have initially opted for a small number of income groups ($I + 1 = 6$), checking results obtained with $I = 11$ groups (10 groups of workers and the unemployed). The right panel of Figure 4 shows very few changes compared to the baseline.

7 Conclusion

This paper retrieves social inequality aversion parameters consistent with current tax-benefit systems in 18 Western countries under the assumption of optimality, while controlling for differences in labor supply responsiveness. Labor supply elasticities have been estimated on the same data used for the optimal tax inversion. We find relatively small differences in labor supply elasticities across countries, yet resulting redistributive views are significantly different between three groups of nations. Social inequality aversion is highest in Nordic and some Continental European countries, pointing to Rawlsian preferences, while Southern Europe and the US reflect a very low inequality aversion close to utilitarian views. Furthermore, countries with Rawlsian preferences only appear so because responses at the extensive margin – the dominant margin – are taken into account. If we impose zero labor supply responses, reflecting the possibility that policymakers ignored efficiency constraints at the time traditional social transfers were put in place, revealed redistributive tastes become less pronounced and much more similar. This highlights the importance of accounting for efficiency constraints when assessing social inequality aversion.

Future research should extend the scope of the policies under consideration. Indeed, we have considered a partial optimization problem by looking at direct taxes and transfers. Some other policies may well have redistributive effects, including non-cash benefits and public goods. Another limit to our work is the assumption of only one type of behavioral response, namely labor supply. This appears acceptable as a first approximation, especially as we focus on workers (thus excluding capitalists). Despite estimates being difficult to obtain, more general analyses could explore elasticities of other margins, e.g. migration, tax evasion or long-run behavioral responses such as educational and career choices. In addition, it might be worthwhile to extent the political economy perspective by accounting for the political process that generated the observed tax benefit systems in the analysis. For instance, political economy forces could be modelled as distortions in the optimal tax design before the inversion procedure is applied.

References

[1] Acemoglu, D., M. Golosov and A. Tsyvinski (2010): "Dynamic Mirrlees taxation under political economy constraints", *Review of Economic Studies,* 77 (3), 841–881.

[2] Ackert, L.F., J. Martinez-Vazquez and M. Rider (2007): "Social preferences and tax policy design: some experimental evidence", *Economic Inquiry*, 45 (3), 487–501.

[3] Ahmad, E. and N. Stern (1984): "The theory of reform and Indian indirect taxes", *Journal of Public Economics*, 25, 259-298.

[4] Alesina, A. and P. Giuliano (2011): "Preferences for Redistribution" in J. Benhabib, M.O. Jackson and A. Bisin, *Handbook of Social Economics*, 1B, Amsterdam: Elsevier, 93-132.

[5] Amiel, Y., J. Creedy, and S. Hurn (1999): "Measuring attitudes towards inequality", *Scandinavian Journal of Economics*, 101, 83-96.

[6] Banks, J., R. Disney, A. Duncan and J. Van Reenen (2005): "The Internationalisation of Public Welfare Policy", *Economic Journal*, 115, C62-C8.

[7] Bargain, O. and A. Spadaro (2008): "Optimal taxation, social contract and the four worlds of welfare capitalism", UCD School Of Economics, Working Papers No. 200816.

[8] Bargain, O., K. Orsini and A. Peichl (2012): "Comparing Labor Supply Elasticities in Europe and the US: New Results", *IZA Discussion Paper 6735.*

[9] Blundell, R. and T. MaCurdy (1999): "Labor Supply: A Review of Alternative Approaches", in O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics*, 3A, Amsterdam: Elsevier, 1559-1695.

[10] Blundell, R.W., A. Duncan, J. McCrae and C. Meghir (2000): "The Labour Market Impact of the Working Families' Tax Credit", *Fiscal Studies*, 21, 1, 75-103.

[11] Blundell, R., M. Brewer, P. Haan and A. Shephard (2009): "Optimal income taxation of lone mothers: an empirical comparison of the UK and Germany", *Economic Journal*, 119 (535), F101-F121.

[12] Bourguignon, F. and A. Spadaro (2012): "Tax-benefit revealed social preferences", *Journal of Economic Inequality*, 10(1), 75-108.

[13] Castanheira, M., G. Nicodème and P. Profeta (2012): "On the political economics of tax reforms: survey and empirical assessment", *International Tax and Public Finance*,19, 598–624.

[14] Christiansen, V. and E.S. Jansen (1978): "Implicit Social Preferences in the Norwegian System of Indirect Taxation", *Journal of Public Economics*, 10 , 217-245.

[15] Coughlin, P.J. (1992), *Probabilistic Voting Theory*, Cambridge University Press.

[16] Corneo, G. and H.P. Grüner (2002): "Individual preferences for political redistribution", *Journal of Public Economics*, 83(1), 83-107.

[17] Decoster, A. and E. Schokkaert (1989): "Equity and efficiency of a reform of Belgian indirect taxes", *Recherches Economiques de Louvain*, 55(2), 155-176.

[18] Diamond, P. (1980): "Income taxation with fixed hours of work", *Journal of Public Economics*, 13(1), 101-110.

[19] Duclos, J.-Y. (2000): "Gini Indices and the Redistribution of Income", *International Tax and Public Finance*, 7, 141-162.

[20] Eissa, N. and J.B. Liebman (1996): "Labor supply response to the earned income tax credit", *Quarterly Journal of Economics*, 111(2), 605–37.

[21] Eissa, N. and H. Hoynes (2011): "Redistribution and Tax Expenditures: The Earned Income Tax Credit", *National Tax Journal*, 64 (2, Part 2), 689–730.

[22] Eissa, N., H. J. Kleven and C.T. Kreiner (2008): "Evaluation of Four Tax Reforms in the United States: Labor Supply and Welfare Effects for Single Mothers", *Journal of Public Economics,* 92, 795–816.

[23] Feenberg, D. and E. Coutts (1993): "An introduction to the TAXSIM model", *Journal of Policy Analysis and Management*, 12 (1), 189–194.

[24] Fehr E. and K.M. Schmidt (1999): "A theory of fairness, competition and cooperation", *Quarterly Journal of Economics,* 114, 817-868.

[25] Fleurbaey, M. (2008), *Fairness, responsibility and welfare*. Oxford University Press, Oxford.

[26] Fong, C. (2001): "Social Preferences, Self-interest, and the Demand for Redistribution", *Journal of Public Economics,* 82(2), 225-246.

[27] Gordon, R.H. and J.B. Cullen (2011): "Income Redistribution in a Federal System of Governments", *Journal of Public Economics*, forthcoming.

[28] Hoynes, H. W. (1996): "Welfare transfers in two-parent families: Labor supply and welfare participation under AFDC-UP", *Econometrica*, 64(29), 295-332.

[29] Immervoll H., H. J. Kleven, C.T. Kreiner and E. Saez (2007): "Welfare reform in European countries: A microsimulation analysis", *Economic Journal*, 117(516), 1-44.

[30] Isaksson, A.-S. and A. Lindskog (2009): "Preferences for redistribution: A country comparison of fairness judgements", *Journal of Economic Behavior and Organization* 72(3), 884–902.

[31] Kanbur, R. and M. Tuomala (2011): "Charitable Conservatism, Poverty Radicalism and Inequality Aversion", *Journal of Economic Inequality*, Vol. 9(3), 417-431.

[32] Kanbur, R., J. Pirttilä and M. Tuomala (2006): "Non-welfarist optimal taxation and behavioural public economics", *Journal of Economic Surveys*, 20(5), 849-868.

[33] Keane, M. and R. Rogerson (2012): "Reconciling Micro and Macro Labor Supply Elasticities: A Structural Perspective", *Journal of Economic Literature,* 50(2), 464-476.

[34] Lambert P..J., Millimet D.L. and Slottje D. (2003) 'Inequality aversion and the natural rate of subjective inequality', *Journal of Public Economics*, 87(5): 1061-1090(30).

[35] Madden, D. (1996): "An analysis of indirect tax reform in Ireland in the 1980s", *Fiscal Studies*, 16: 18-37.

[36] Piketty, T. (1995): "Social Mobility and Redistributive Politics," *Quarterly Journal of Economics*, 110(3), 551-584.

[37] Piketty, T. and E. Saez (2013): "Optimal Labor Income Taxation", *Handbook of Public Economics*, Vol. 5, (Amsterdam: North Holland), forthcoming.

[38] Ross T.W. (1984): "Uncovering Regulator's Social Welfare Weights", *Rand Journal of Economics* 15, 152–155.

[39] Saez, E. (2002): "Optimal income transfer programs: Intensive versus extensive labor supply responses", *Quarterly Journal of Economics*, 117(3), 1039-1073.

[40] Saez, E. and S. Stantcheva (2012): "Endogenous Social Welfare Weights for Optimal Tax Theory", mimeo.

[41] Singhal, M. (2008): "Quantifying preferences for redistribution", paper presented at the AEA Annual Meeting January 2009.

[42] Spadaro A. (2008): "Optimal taxation, social contract and the four worlds of welfare capitalism". PSE Working Paper n^o 38-2008.

[43] Stern, N. (1977): "Welfare Weights and the Elasticity of the Marginal Valuation of Income", in M. Artis and R. Nobay, eds., Studies in Modern Economic Analysis, (Oxford: Basil Blackwell Publishers).

[44] Sutherland, H. (2001): "Final report EUROMOD: an integrated European benefit-tax model", EUROMOD Working Paper No. EM9/01, ISER.

[45] van Soest, A. (1995): "Structural models of family labor supply: a discrete choice approach", *Journal of Human Resources*, 30(1), 63-88.

I Descriptive Statistics

Since the selected population is relatively homogenous, Tables I.1 and I.2 essentially focus on the characteristics of the discretized income groups, i.e., the main ingredients of the optimal tax model. This includes income group shares h_i, average levels of gross income Y_i and disposable income C_i for each group $i = 0, ...5$ .We also report effective "marginal" tax rates $T_i' = \frac{T_i - T_{i-1}}{Y_i - Y_{i-1}}$ and effective participation tax rates $\frac{T_i - T_0}{Y_i - Y_0}$.

Table I.1: Description of the Discretized Population of Childless Singles

Country	AT	BE	BE	DK	FI	FI	FR	FR	GE	GE	GR	IE	IE
Year	98	98	01	95	98	01	95	01	98	01	95	95	00
Data	ECHP	PSB	PSB	ECHP	IDS	IDS	HBS	HBS	SOEP	SOEP	HBS	LIS	LIS
Gross income Yi (note: Y0 = 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 Ci													
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 hi (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

This table reports information on income groups for the selected samples. Policy years are 1998, 2001 or 2005. Countries are: AT=Austria, BE=Belgium, DK=Denmark, FI=Finland, FR=France, GE=Germany, GR=Greece, IE=Ireland. Datasets are: ECHP=European Community Household Panel, PSB=Panel Survey on Belgian Households, HBS=Household Budget Survey, IDS=Income Distribution Survey, SOEP=German Socio-Economic Panel, LIS=Living in Ireland Survey. 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 I.2: Description of the Discretized Population of Childless Singles (cont.)

Country	IT	NL	PT	SP	SP	UK	UK	SW	EE	HU	PL	US
Year	95	00	01	96	01	95	01	01	05	05	05	06
Data	SHIW	SOEP	ECHP	ECHP	ECHP	FES	FES	IDS	HBS	HBS	HBS	CPS
Gross income Yi (note: Y0 = 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 Ci												
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 hi (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

This table reports information on income groups for the selected sample. Policy years are 1998, 2001 or 2005. Countries are: IT=Italy, NL=the Netherlands, PT=Portugal, SP=Spain, UK=the United Kingdom, SW=Sweden, EE=Estonia, HU=Hungary, PL=Poland, US=the United States. Datasets are: ECHP=European Community Household Panel, HBS=Household Budget Survey, IDS=Income Distribution Survey, SOEP=Dutch Socio-Economic Panel, SHIW=Survey of Households Income and Wealth, FES=Family Expenditure Survey, CPS=Current Population Survey. 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.

II Standard and Saez Elasticities

Once the labor supply model is estimated, we numerically simulate elasticities at the individual level by predicting the labor supply effect of a change in income. For a comparison with the literature, we first calculate "standard" wage (resp. non-labor income) elasticities for each worker, defined as the increase in working time or participation rate when wage rates increase by 1%. Standard errors are obtained by repeated random draws of the preference parameters from their estimated distributions and, for each draw, by recalculating elasticities.
In fact, despite the large increase in the number of childless single individuals over the last few decades, their labor supply behavior has received little attention. Part of it is due to the fact that recent evidence on labor supply responsiveness stems from natural experiments based on changes in tax and welfare policies, mainly in the US and the UK, and that these policies are usually confined to families with children (e.g., Eissa and Liebman, 1996). Mean wage elasticities together with bootstrapped standard errors are reported in the upper panels of Tables II.1–II.2. They are in line with limited available evidence as surveyed in Bargain et al. (2012). Elasticities are especially large in Spain, Ireland and Italy, as supported by Callan et al. (2009) and Aaberge et al. (2002). Other countries show intermediary values, which correspond to small elasticities around $.1 - .2$, for instance in Germany (see Haan and Steiner, 2000). Hour elasticities, which incorporate both change in hours for those in work and participation effects, are close to participation elasticity. This supports that most of the total hour adjustment occurs at the extensive margin. 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. Ignoring income effects in the theoretical model and for the selected population is therefore a reasonable approximation.

For the particular elasticities used in Saez' optimal tax model, we calibrate uniform changes in disposable income at the individual levels to obtain percent changes in income gaps as defined in equations (2) and (3) in the paper. Total responses, measured as a change in the population shares in each income group, are then obtained by aggregation to calculate the extensive and intensive margins, i.e., η_i and ζ_i, for income groups $i = 1, ..., I$ (see also Blundell et al., 2009). These elasticities are reported in the lower part of Tables II.1–II.2 and discussed in the main part of the paper.

Table II.1: Labor Supply Elasticities

	AT	BE	BE	DK	FI	FI	FR	FR	GE	GE	GR	IE	IE
	98	98	01	95	98	01	95	01	98	01	95	95	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 II.2: 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.