Tax-Transfer Systems in Europe:

Between Efficiency, Redistribution and Stabilization

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Chapter 1

Introduction

1.1 Motivation and key questions

According to Musgrave (1959), the three main objectives of state tax-transfer systems are an efficient resource allocation, income redistribution and macroeconomic stabilization. All three functions issued a challenge particularly to European welfare systems in the last few decades and, with view to the latter aspect, especially during the economic crisis 2008-09. One the one hand, the tax reforms that took place in many industrialized countries including Europe during the 1980's until 2000's involved a movement away from highly progressive schedules, emanating from the believe that existing tax systems provide large disincentives to work, and hence decrease economic efficiency through high costs of redistribution.[1] On the other hand, the rising growth in income inequality which can be observed since then is seen to be a result of those policy changes at least to some extent[2] and re-initiated a debate about how to design a 'fairer' tax system that better meets the concern for equality.[3] Lastly, European tax-transfer systems were partly confronted with the fact that they were unable to sufficiently cushion the consequences

[1]These reforms were accompanied by similarly motivated reforms of labor market institutions, among other things implying a reduction in generous unemployment benefits (see e.g. Nickell (1997); Nickell, Nunziata and Ochel (2005)).

[2]For a documentation of those trends in policies and inequality, see e.g. OECD (2008, 2011).

[3]See e.g. Atkinson (2013). This is even more true for the US than Europe, where the tremendous growth in the income share of the top 1% has led to a particular claim of taxing more the rich (cf. Piketty and Saez (2003)).

of the recent economic crisis. However, despite the common trends, European tax-transfer systems still differ significantly in achieving more equality through redistribution and in providing insurance against asymmetric shocks. Thus, assessing and understanding those differences is of crucial importance to properly characterize tax-transfer systems and to subsequently show possible paths for better-designed policies. This thesis contains five essays that aim at contributing to this end.

In the second chapter we start by investigating the redistributive tastes being implicit in the European tax-transfer systems. While a large part of the empirical literature simply focusses on the extent of redistribution for that purpose, they ignore labor supply behavior, and hence important constraints faced by governments when setting taxes. More comprehensive approaches account for the 'equity-efficiency trade-off' underlying tax-benefit policy design, but only make use of "plausible" and mostly uniform elasticities taken from the literature. Thus, to go one step further, it is first necessary to quantify potential cross-country differences in labor supply behavior, and then to reassess the redistributive objectives of different tax-transfer designs. This is the contribution of Chapter 2 which addresses the following key question: *"To what extent do redistributive preferences – revealed through the tax-transfer system – differ across countries when accounting for actual differences in labor supply responses to taxation?"* We also include the US in our study which is of particular interest in comparison to Europe, given a literature pointing to the differences in terms of redistributive tastes on the one hand, and the differences in terms of work-leisure preferences between both continents on the other hand.[4] The redistributive preferences are derived in form of the inequality aversion parameter of a social welfare function based on an optimal tax model that allows for agents' participation as well as hours decision in labor supply (Saez (2002)).

The third chapter is concerned with a more fundamental question, namely how individual welfare should be derived that eventually will be the ingredient to a social welfare function used to determine redistribution. Most of the optimal tax literature in the tradition of Mirrlees (1971) assumes that individuals have the same deterministic preferences over consumption and leisure and only differ with

[4]See e.g. Alesina and Glaeser (2004), Alesina and Angeletos (2005); Blanchard (2004), Alesina, Glaeser and Sacerdote (2005).

respect to skills and (hence) wages. In contrast, more recent approaches recognize that individual outcomes not only result from skills, which to some extent can be seen as endowed circumstances, but also from individual preferences. Furthermore, while Mirrleesian approaches assume cardinality of utilities in order to compare individual welfare levels, those approaches limit the analysis to the original concept of ordinal utility. Rather, individual comparability to answer the question who should eventually redistribute towards whom is introduced by certain 'fairness considerations' based on a general principle, namely that individuals should be held responsible for their preferences but not for endowed circumstances (see for an overview Fleurbaey (2008); Fleurbaey and Maniquet (2010)).[5] As a result, not all inequalities in outcomes might legitimate redistribution. However, the same literature has also precisely shown that, even if likely to be in conflict with this main principle, it might not always be possible to remove ethical priors about individual preferences. Yet, these priors are made explicit in the analysis. This is of special interest with respect to taxation because the identification of the individuals that deserve compensation might differ depending on the specific individual welfare metric at use – and not (only) on the inequality aversion parameter of the social welfare function. This is fundamentally different from the model of Saez (2002) used in Chapter 2 which actually allows for heterogeneity in consumption-leisure preferences of the individuals but where the treatment of this heterogeneity still remains implicit and thus unclear. While new models of optimal, 'fair' taxation have accordingly been derived (e.g. Fleurbaey and Maniquet (2006, 2007, 2011)), it is beyond the scope of the chapter to develop an accordant empirical framework that could characterize countries' tax-benefit systems similarly to Chapter 2. Rather, as a first step, we provide individual welfare comparisons in a European context when allowing for differences in consumption-leisure preferences.[6] This is also motivated by a literature that emerged around a 'beyond-GDP' debate, which

[5]The philosophical roots of this so-called 'fair allocation' literature go back to a very fundamental debate in contemporary political philosophy about what should determine the desirability of different social states (for an overview, see Kymlicka (2002)). It was initiated by Rawls (1971) who criticized utilitarianism for only allowing individual utilities fulfilling this function. However, if we do not want to redistribute to individuals who, e.g., have a very high preference for leisure and therefore earn less income, then we need an argument that has to be based on non-utility factors, hence implying a rejection of utilitarianism.

[6]As in Chapter 2, we again include the US in the analysis for comparison.

emphasizes the respect for the different dimensions of individual well-being (e.g. health or leisure besides income) but also individual preferences over those dimensions (for an overview, see Blanchet and Fleurbaey (2013)). The contribution of Chapter 3 is a first empirical illustration into that direction by asking: *"To what extent do cross-country comparisons of individual welfare differ when accounting for possible heterogeneity in consumption-leisure preferences?"*

In Chapter 4, we analyze if redistributive policies in European countries reduce inequality in opportunities. In recent years, in research but also in the public and political debate, there has been a shift of focus from inequalities in income to inequality of opportunities by arguing that a society should guarantee its members equal access to opportunities for income acquisition rather than to equalize outcomes. This view allows to differentiate between inequalities that are due to circumstances (e.g. family background in form of parental education), and inequalities that arise due to the application of different effort levels. It is therefore closely related to the 'normative background' of Chapter 3. However, the specific economic approach considered here goes back to Roemer (1993, 1998) and is somewhat different as one does not need direct information about individual preferences. Rather, from a viewpoint of empirical application, it might appear to be more attractive as it only requires to know the distribution of income or well-being for each circumstance class (and the position of individuals within), and hence can be applied even when circumstances only are observable but not the 'responsibility characteristics' themselves.[7] Yet, the impact of tax-benefit policies on inequality of opportunity is still rarely addressed in the existing literature and in Chapter 4 we contribute by asking: *"Are tax-transfer systems in Europe reducing inequality of opportunity and, if yes, how does its extent compare to the reduction in income inequality?"*

In Chapters 5 and 6, we additionally turn to the stabilizing function of European tax-transfer systems. In the aftermath of the economic crisis 2008-09, this has gained particular importance given the accumulation of debt in many countries and the resulting inability especially of some Southern European countries

[7]For recent overviews on empirical approaches to the "equality of opportunity" concept, see Pignataro (2012) or Ramos and Van de gaer (2012). For the philosophical differences between Roemer's approach and the literature cited with respect to Chapter 3, see e.g. Fleurbaey (2008, Ch. 8) and a recent discussion between Fleurbaey (2013) and Roemer (2013).

to provide insurance against asymmetric income shocks (see e.g. Bertola (2013)). This experience initiated a debate about more fiscal integration in the euro area. Besides more effective rules for fiscal policies or the introduction of specific crisis mechanisms[8], the discussion also included more fundamental and ambitious proposals as that of van Rompuy (2012), arguing for a 'fiscal capacity' for Europe. Yet, as in the nature of things, little is known in the literature about the possible economic effects of deeper fiscal integration in Europe from an empirical viewpoint. In Chapter 5, we therefore set up an hypothetical scenario and analyze the economic effects of two key elements of existing fiscal federations, if they had been introduced together with the euro area in 2001. Precisely, we ask: *"What would have been the economic effects in terms of income redistribution and macroeconomic stabilization, if i) a European tax-transfer system or ii) a European fiscal equalization mechanism would have been introduced together with the monetary union?"*.[9]

Chapter 6 is a direct extension to the fifth chapter. In Chapter 5, redistributive effects are analyzed separately (at the micro level) from stabilizing effects (at the macro level). This might not allow for a comprehensive conclusion whether a country would really gain or lose from more fiscal integration. As a consequence, this could be an obstacle to political feasibility, assuming that unanimity of all EU member states would be required as is currently the case in the Council of the European Union for tax matters. Using recent data before the crisis, we therefore apply an explicit theoretical approach based on individual equivalent variations derived from an expected utility model. This allows to assess the interesting question whether a reform would be Pareto improving in the sense that at least one country gains while no one loses. Focussing on different compositions of fiscal federations as well as varying crisis scenarios, the additional key questions we ask in Chapter 6 are therefore: *"What would be the integrated individual value in terms of redistributive and stabilizing effects when introducing a European tax-transfer system and what are the preconditions for a Pareto improving introduction?"*

[8]For an overview on current fiscal policies in the EMU and its state of integration, see European Commission (2012).

[9]For detailed overviews on the structure of existing tax systems of the EU member states, see EUROSTAT (2013) or OECD (2013).

1.2 Methodology: counterfactual simulations and labor supply estimation

The central methodological approach that is subsequently applied to identify the parameters of interest is the technique of counterfactual simulations. Simulation analysis allows to conduct a controlled experiment where some parameters are changed while holding everything else constant. This ensures a clear identification of the simulated effect and, by construction, removes the issue of any endogeneity or the influence of confounding factors. This especially applies to the method of microsimulation using tax-transfer calculators. Such models usually simulate direct taxes, social insurance contributions and cash benefits for representative microdata samples of households which serve as the model input. By changing one or several of those policy parameters hypothetically, the distributional effects to the tax system can precisely be assessed (cf. Bourguignon and Spadaro (2006)).

These models are static in the sense that they only consider immediate 'first round' effects in terms of direct distributional consequences. However 'second round' effects can be incorporated by extending the static model with a behavioral component. For tax-transfer calculators, this is classically a labor supply model. The key identification here comes from an estimation of labor supply elasticities based on a counterfactual wage change and is usually performed using a structural model, i.e. all behavioral parameters are fully specified. Standard in the literature on tax reforms is the use of discrete choice models (cf. e.g. van Soest (1995); Hoynes (1996); Blundell, Duncan, McCrae and Meghir (2000)). In this framework, labor supply decisions are reduced to choosing among a discrete set of possibilities including non-participation as one of the options in order to directly estimate both the extensive (participation) and intensive margin (working hours) decision. Thereby, a discrete choice model allows to account for the non-linear effect of tax-benefit systems on household budgets as net income needs to be determined at each discrete point. Furthermore, discrete choice models are estimated via a direct specification of individual utility functions which facilitates welfare evaluations. Finally, in context of the present analyses, relying on structural models is also an important approach to obtain comparable estimates across countries as it seems indeed difficult to find natural experiments that would allow performing this task.

In Chapters 2, 3, 5 and 6 we use EUROMOD, a static tax-benefit model for the EU and in Chapters 2 and 3 additionally TAXSIM, the NBER's model for US federal and state income taxes and benefits.[10] In these two chapters, counterfactual wage changes are performed to estimate labor supply elasticities and individual utility functions respectively, using a harmonized specification across all countries under analysis to ensure comparability. While in Chapter 2, we additionally estimate elasticities specific to the optimal tax model of Saez (2002) in order to derive inequality aversion parameters via an inversion procedure, estimated utility functions are directly used in Chapter 3 to compute a range of individual welfare measures. In both chapters, we apply the model developed by Bargain, Orsini and Peichl (2012), however, in Chapter 3, we estimate a different specification of the utility function.

Bargain et al. (2012)'s model is also used in Chapter 5 to assess potential labor supply reactions to a European fiscal federation. However, while using EUROMOD's database as an input in Chapters 5 and 6, we adopt a regression approach for the counterfactual introduction of a European tax-transfer system. Tax regressions can be seen as a 'short-cut' to tax-transfer simulation where given net taxes are predicted based on a very flexible specification estimated by use of higher order polynomials in gross income and all socio-demographic characteristics relevant for tax-benefit assignment. Therefore, the regression approach is a more flexible way to estimate a net tax function on a pooled sample, which is of key interest here. Furthermore, in order to assess automatic stabilization in these two chapters, we manipulate the input data by simulating shocks to individual gross income. This can be seen as a controlled experiment that enables us to identify the shock absorption of the tax-transfer system in form of net tax adjustment. Importantly, this approach is not at risk to be biased by discretionary fiscal policy or behavioral

[10] EUROMOD was originally created in the late 1990's, by a consortium of research institutes with members from each EU15 country. The tax-benefit systems included in the model have been validated against aggregated administrative statistics as well as national tax-benefit models, and the robustness has been checked through numerous applications (see e.g. Bargain (2007)). EUROMOD is constantly updated and the most recent version allows for a simulation of policy systems up to 2010 for all current 27 EU member countries.For a current introduction to EUROMOD and information on the underlying input data, see Sutherland and Figari (2013). There are also country reports available with detailed information on the modeling and validation of each tax-benefit system, see http://www.iser.essex.ac.uk/research/euromod. For more information on TAXSIM see Feenberg and Coutts (1993) and http://www.nber.org/taxsim/.

reactions of economic agents which would be the case for ex-post analyses based on macroeconomic aggregates.

Chapter 4 is an exception in the sense that it does not make use of tax-transfer calculators. Yet, it also uses household microdata but conducts a purely descriptive analysis corresponding to the standard accounting approach to measure effective redistribution, where the identification simply follows from adding or subtracting different income components as e.g. factor income, taxes or benefits.

1.3 Summary of results

Chapter 2: Tax-benefit revealed social preferences

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. Our main 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. 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.[11]

Chapter 3: Welfare, labor supply and heterogeneous preferences

In this chapter, we suggest an international comparison of individual welfare rankings that fully retain preference heterogeneity. Focusing on the consumption-

[11] This chapter is based on coauthored work, see Bargain, Dolls, Neumann, Peichl and Siegloch (2013c).

leisure trade-off, we estimate discrete choice labor supply models using harmonized microdata for 11 European countries (and the US). We retrieve preference heterogeneity within and across countries and analyze several welfare criteria which take into account that differences in income are partly due to differences in tastes. Our results indicate that the resulting welfare rankings clearly depend on the normative treatment of preference heterogeneity with alternative metrics. We show that these differences can indeed be explained by estimated preference heterogeneity across countries – rather than demographic composition.[12]

Chapter 4: Equality of opportunity and redistribution

We first investigate how family background influences income acquisition in 17 European countries. Second, we particularly scrutinize how governments affect equality of opportunity (EOp) through redistributive policies. We apply two different methods in order to measure EOp and effective redistribution is measured via income concepts at different stages of the tax-transfer schemes. Our results reveal that both methods yield rather robust country rankings for various circumstance sets. We find clear country clustering in terms of EOp for Nordic, Continental European, and Anglo-Saxon countries. By examining the impact of redistributive policies in the countries under analysis, we conclude that both taxes and transfers reduce inequality of opportunity (IOp), with social benefits typically playing a key role. Furthermore, the equalizing impacts of the tax-benefit system on IOp differ substantially from the ones observed in the traditional notion of inequality of outcomes.[13]

Chapter 5: Economic effects of a European tax-benefit system and fiscal equalization mechanism

We study the economic effects of European fiscal integration focussing on two key elements of existing fiscal federations: the introduction of an EU-wide tax and transfer system and of a fiscal equalization mechanism. We exploit representative household micro data from 11 eurozone countries to simulate these policy reforms

[12] This chapter is based on coauthored work, see Bargain, Decoster, Dolls, Neumann, Peichl and Siegloch (2013a).

[13] This chapter is based on coauthored work, see Dunnzlaff, Neumann, Niehues and Peichl (2011).

and study their effects on the income distribution and automatic stabilizers. Our main results are as follows: First, we find that replacing one third of the national tax-benefit systems with a European system would lead to significant redistributive effects both within and across countries. These effects depend on income levels and the structures of existing national systems. Second, the EU system would particularly improve fiscal stabilization in credit constrained countries absorbing 10 to 15 per cent of a macroeconomic income shock. Third, introducing a fiscal equalization mechanism would redistribute revenues from high to low income countries. However, the stabilization properties of this system are ambiguous.[14]

Chapter 6: Benefiting from a European fiscal union? Redistribution vs. stabilization

In Chapter 6 we build on the framework presented in Chapter 5 but use an explicit theoretical approach to analyze redistributive and stabilizing effects of European fiscal integration in an integrated way. Precisely, using an expected utility model, we calculate the individual equivalent variation of an integrated EU tax-transfer system relative to the baseline with national systems and provide a decomposition into a redistributive and a stabilization component. Our main results are as follows. We find that a majority of the current 27 EU member states, represented by their median voters, would gain from such a reform, which is mainly driven by the redistributive component. Effects across gross income deciles within countries differ and depend on income levels and the structures of existing national systems. Moving towards smaller fiscal unions, e.g. for the current eurozone or subgroups of even more similar countries, generally reduces redistributive and increases the stabilizing effects. However, Pareto improving reforms where at least one country gains while no one loses seem to be possible only for rather severe crisis scenarios with substantial shocks to gross income, or for high levels of individual risk aversion.[15]

[14]This chapter is based on coauthored work, see Bargain, Dolls, Fuest, Neumann, Peichl, Pestel and Siegloch (2013b).

[15]This chapter is based on Neumann (2013).

Chapter 2

Tax-benefit revealed social preferences

2.1 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, Kleven, Kreiner and Saez (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 chapter 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] 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

[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 chapter. Maximizing utility of the worst off person in the society is not the original version of Rawls (1971) but a kind of welfarist version of Rawls, as explained in Kanbur, Pirttilä and Tuomala (2006).

at the time these welfare programs were implemented). This finding highlights the importance of accounting for efficiency constraints when assessing social inequality aversion.

The chapter is structured as follows. Section 2.2 briefly reviews the related literature. Section 2.3 presents the optimal tax model and the inversion procedure. Section 2.4 describes the main elements of the empirical implementation (data, tax-benefit calculations and income concepts), while Section 2.5 presents the labor supply estimations. Inequality aversion results are reported and discussed in Section 2.6. Section 2.7 concludes. Descriptive statistics and labor supply elasticities are reported in the appendix.[3]

2.2 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

[3] Bargain et al. (2013c) includes an additional appendix (online version), gathering further material and robustness checks. Including it here would go beyond the scope of this thesis and the focus of this chapter.

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, Kleven and Kreiner (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 elasticities are estimated on data for the UK and Germany in Blundell, Brewer, Haan and Shephard (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. 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 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

[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, Creedy and Hurn (1999)); in recent experiments, participants have voted for alternative tax structures (e.g. Ackert, Martinez-Vazquez and Rider (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, Millimet and Slottje (2003), Duclos (2000)).

[5]It would certainly be interesting to extend the present approach to some explicit political economy model (see Castanheira, Nicodème and Profeta (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, Disney, Duncan and Van Reenen (2005)), which are often not accounted for by theory. Furthermore, social choice models in presence of endogenous labor supply are rare.

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, Golosov and Tsyvinski (2010)). However, accounting for political economy considerations is beyond the scope of the present chapter. 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.

2.3 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:

$$\frac{T_i - T_{i-1}}{C_i - C_{i-1}} = \frac{1}{\zeta_i h_i} \sum_{j=i}^{I} h_j \left[1 - g_j - \eta_j \frac{T_j - T_0}{C_j - C_0} \right] \; for \, i = 1, ..., I, \qquad (2.1)$$

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

[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.

$$\zeta_i = \frac{C_i - C_{i-1}}{h_i} \frac{\partial h_i}{\partial (C_i - C_{i-1})}, \tag{2.2}$$

$$\eta_i = \frac{C_i - C_0}{h_i} \frac{\partial h_i}{\partial (C_i - C_0)}. \tag{2.3}$$

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:

$$\sum_i h_i g_i = 1. \tag{2.4}$$

The inverse optimal tax problem is relatively straightforward. A system consisting of I equations (2.1) and equation (2.4) 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 parametrization suggested by Saez (2002) to relate

[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 2.6). 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 in the appendix).

[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 (2.2),(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

weights and net incomes, i.e.:

$$g_i = 1/(p \cdot C_i)^{\gamma} \; for \, all \, i = 0, ..., I. \tag{2.5}$$

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 (2.5) 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

determined by normalization (2.4), 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.

[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 (2.5), 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) and Chapter 3 of this thesis).

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 (2.1), 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 (2.1) 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.

2.4 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 2.2 and 2.3 (appendix). We cover the policy years 1998 and/or 2001 for EU-15 countries and 2005 for NMS.[13] 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 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.*[14]

[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 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.

[14] 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

Remarkably, we show that international comparisons on single individuals reflect much of the differences in overall redistribution across countries (see in the online appendix to Bargain et al. (2013c)).

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 2.2–2.3 in the appendix.[15]

2.5 Labor supply estimation

2.5.1 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 (suppressing the country index in the following), we specify

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)).

[15] A description of non-contributory social transfers and contributory UB as well as an extensive sensitivity analysis on the treatment of UB recipients is provided in the online appendix to Bargain et al. (2013c).

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:

$$U_{kj} = V_{kj}(c_{kj}, h_{kj}) + \epsilon_{kj} \tag{2.6}$$

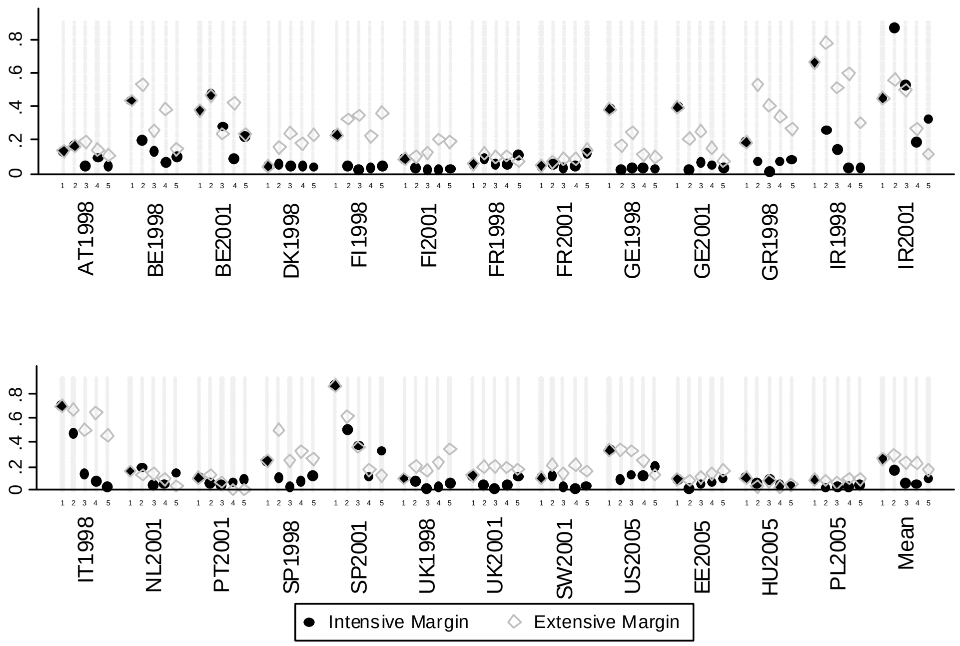
$$with \qquad V_{kj}(c_{kj}, h_{kj}) = \alpha_{ck}c_{kj} + \alpha_{cc}c_{kj}^2 + \alpha_{hk}h_{kj} + \alpha_{hh}(h_{kj})^2 + \alpha_{ch}c_{kj}h_{kj} - f_{kj} \tag{2.7}$$

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, 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 $j > 1$ (implicitly 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_{kj}. 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).

2.5.2 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. 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.[16] Results are reported in Tables 2.4–2.5 (appendix).[17]



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 2.1: Saez' elasticities at the extensive/intensive margins

For a more convenient comparison across countries, point estimates are shown

[16]We calibrate uniform changes in disposable income at the individual level to obtain percent changes in income gaps, as defined in equations (2.2) and (2.3). 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)).

[17]Detailed estimation results, goodness-of-fit measures and robustness checks are reported and discussed in the online appendix to Bargain et al. (2013c).

in Figure 2.1 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 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 2.2, 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.

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 2.2 (lower part). Second, as stated by Keane and Rogerson (2012), "*labor supply*

[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 2.3, 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.

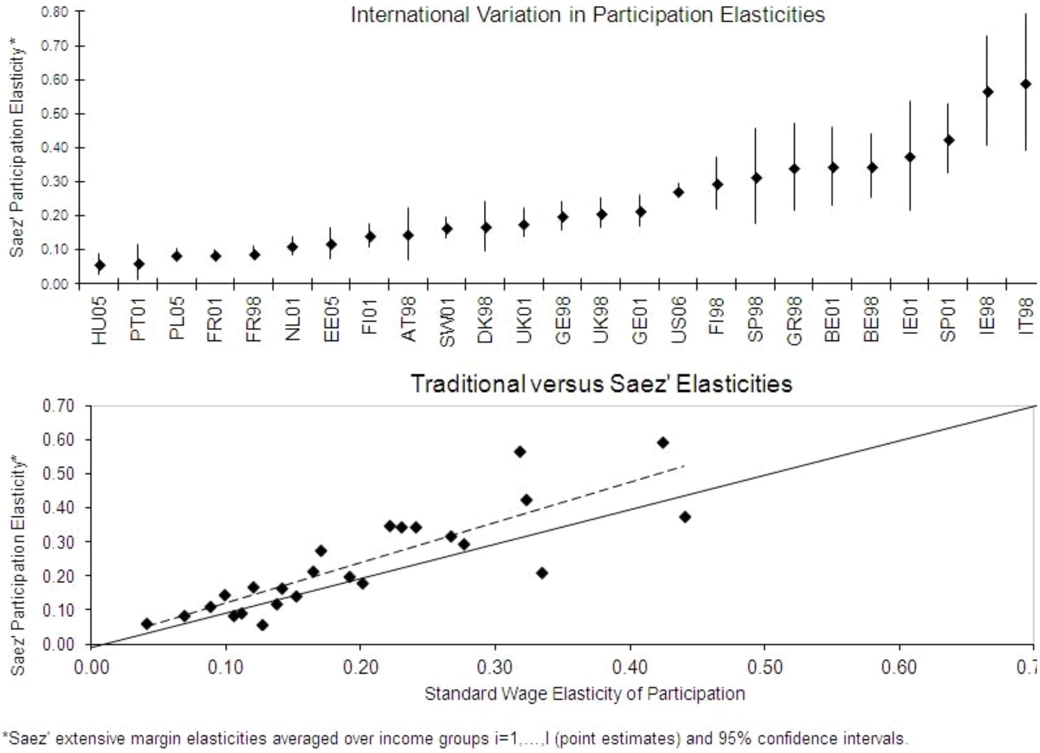


Figure 2.2: Extensive margin elasticities: comparisons

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. Results for the specific sample under study are reported in the online appendix to Bargain et al. (2013c).

The findings convey that while tax-benefit systems explain part of the differences, there are also genuine differences in work preferences across countries (cf. also Chapter 3 of this thesis).

2.6 Revealed social inequality aversion

In this section, we estimate the revealed inequality aversion implicit 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 the online appendix to Bargain et al. (2013c), 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).

2.6.1 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. In their online appendix, Bargain et al. (2013c) show 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

[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 (cf. online appendix to Bargain et al. (2013c)). 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.

income groups in Poland, Hungary, Ireland and Italy, as well as more pronounced progressivity in Greece and Portugal.

	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 2.1: Marginal social welfare weights g_i

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 2.1). 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 (2.5) based on the distributions of marginal social welfare weights. Figure 2.3 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.

The central contribution of this chapter is to assess inequality aversion when labor supply responses differ across countries. Thus, in the middle graph of Figure 2.3, we confront the uniform "mean elasticity" scenario with our baseline, i.e. inequality aversion parameters obtained under country-specific elasticity estimates. Some re-ranking 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

[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.

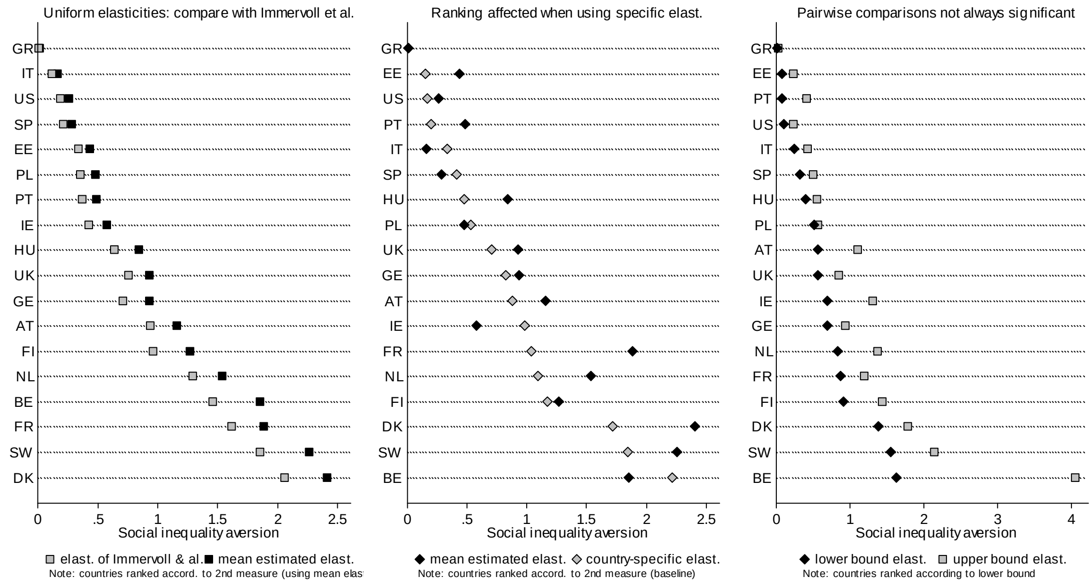


Figure 2.3: Tax-benefit revealed social inequality aversion γ

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 2.1). 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 2.3). 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.

2.6.2 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 1990's 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]

[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 2.2, we do not attempt to explain how social

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

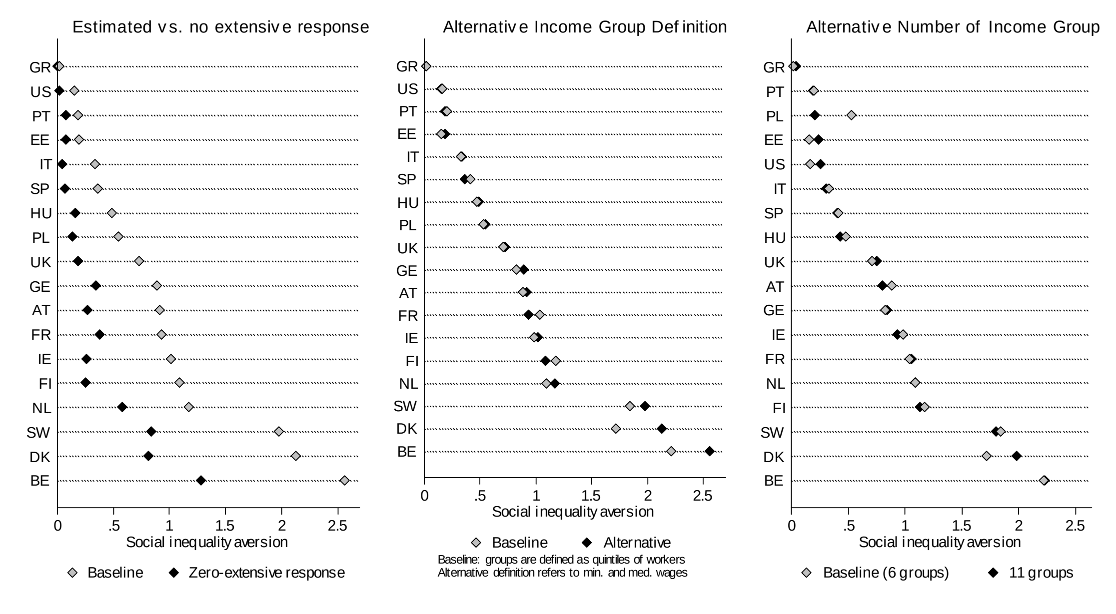


Figure 2.4: Revealed social inequality aversion: sensitivity checks

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

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)).

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 2.4 shows that results are mostly insensitive to the income group definition. We explain this finding as follows: (i) with reasonable definitions of 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 2.4 shows very few changes compared to the baseline.

2.7 Conclusion

This chapter 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

[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 2000's 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.

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 modeled as distortions in the optimal tax design before the inversion procedure is applied.

2.8 Appendix

2.8.1 Descriptive statistics

Since the selected population is relatively homogenous, Tables 2.2 and 2.3 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 2.2: 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 2.3: Description of the discretized population of childless singles (ctd.)

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.

2.8.2 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 2.4–2.5. 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, van Soest and Walsh (2009) and Aaberge, Colombino and Wennemo (2002). Other countries show intermediary values, which correspond to small elasticities around .1 – .2, for instance in Germany (see Haan and Steiner (2006)). 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 (2.2) and (2.3) in the chapter. 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 2.4–2.5 and discussed in the main part of the chapter.

Table 2.4: 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 2.5: Labor supply elasticities (ctd.)

	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.

Chapter 3

Welfare, labor supply and heterogeneous preferences

3.1 Introduction

Following the report of the Stiglitz commission (Stiglitz, Sen and Fitoussi (2009)), there has been a recurrent interest in measuring and comparing well-being within and especially across countries (see e.g. Jones and Klenow (2010)). One main motivation of the report was to move 'beyond GDP' by recognizing the multi-dimensional character of welfare. In addition, recent contributions in the theory of social choice and fair allocation shed new light on how to reasonably measure and consistently compare individual well-being when individuals have different preferences over the various dimensions of life (see e.g. Fleurbaey (2011)). In the economic literature, individual welfare at least depends on consumption and leisure, resulting in the consumption-leisure trade-off in, e.g., labor supply modeling. However, while there has been substantial progress in the development of positive labor supply models in terms of (structurally) estimating individual consumption-leisure preferences, the heterogeneity in preferences is usually neglected in the normative part of the analysis concerned with welfare evaluation. This is due to the difficulties related to interpersonal welfare comparisons. One way to solve this issue is to use preferences of a reference household (see King (1983), and, more recently, Aaberge, Colombino and Strøm (2004); Aaberge and Colombino (2013)). Clearly, this makes individual well-being comparable, but the heterogeneity in preferences is assumed away. In this chapter, we contrast this approach to welfare measures that fully account for different individual consumption-leisure preferences (Fleurbaey (2006, 2008)) and suggest an international comparison based on pure orderings of individual well-being. Then, we illustrate that the choice of how to treat heterogeneity in preferences may substantially affect the evaluation of welfare across different countries.

The empirical application starts with the estimation of labor supply models, separately for 11 European countries[1] and the US. Focusing on married women, the group most studied in the literature, we rely on 12 representative micro-datasets (on household net income, hours worked and various socio-demographics) and a harmonized econometric approach for all countries in order to obtain comparable estimates of consumption-leisure preferences. We make use of a common structural discrete choice model for labor supply, as used in well-known contributions for Europe (van Soest (1995)) or the US (e.g. Eissa and Hoynes (2004)). This allows us to account for the comprehensive and usually non-linear effect of tax-benefit systems on household budgets, which contributes to the identification of the preference parameters. As the labor supply model is identified via a direct parametrization of the utility function, we are then able to obtain indifference curves for all individuals of all countries - and take only this ordinal information on well-being to derive an international ranking of individual situations for each of the alternative welfare metrics. These rankings are simple index orderings reflecting interpersonal comparisons of individual utilities and are not based on any kind of a social aggregator function.

The main results go as follows. First, we contrast the standard approaches of using pure income or classic money metric utilities based on a reference household to that of taking preference heterogeneity into account. Second, once heterogeneity in tastes is accounted for, our findings suggest that the resulting ranking of individuals across countries remarkably depends on the normative choice related to the metric at use. Precisely, take the case, where – when two individuals have

[1]These are Austria (AT), Belgium (BE), Denmark (DK), Finland (FI), France (FR), Germany (DE), Ireland (IE), the Netherlands (NL), Portugal (PT), Sweden (SW) and the United Kingdom (UK).

different preferences and get the same consumption-leisure bundle – by use of the metric we make the normative choice to consider the agent with the relatively higher willingness-to-work to be better off compared to the agent with the relatively lower willingness-to-work. In that case, we find that households from countries where average female working hours are rather high (as in the US and the Nordic countries) are ranked relatively higher on average compared to a ranking based on income only. Inversely, with a metric that considers agents with a relatively lower willingness-to-work as better off, we attribute a higher welfare level to households from countries where average working hours are rather low (as in most Continental European countries, Ireland and the UK). This leads to substantial re-ranking across nations when moving from the former to the latter type of criteria – with remarkable changes in average individual percentile positions of at least 15 percentage points for 7 out of 12 countries. Third, we decompose marginal rates of substitution (MRS) to extract the role of different sources of heterogeneity for this result. We find that different rankings across welfare metrics are mainly due to heterogeneous work preferences across countries – rather than demographic composition. Thus, the analysis clearly shows that respecting preference heterogeneity may have substantial influences when comparing well-being in an international context. We believe that these concerns should precede any attempts to compare countries on the basis of social welfare functions (SWF) or other forms of aggregated indices.

The rest of this chapter is structured as follows. Section 3.2 gives an overview of the related literature. In Section 3.3 we review the welfare criteria and their normative interpretation. Section 3.4 describes the empirical implementation, including the labor supply model, the data and descriptive information. In Section 3.5 we present and discuss the main results together with some robustness checks. Section 3.6 concludes.

3.2 Related literature

Related to the present chapter, several studies have recently attempted to provide international comparisons of welfare levels relying on an equivalent income approach when accounting for non-material aspects of well-being.[2] Becker, Philipson and Soares (2005) correct growth rates for life expectancy (as an indicator for quality of life). Fleurbaey and Gaulier (2009) consider leisure, risk of unemployment, health and household composition besides GDP in OECD countries. For a large set of 134 countries over time, Jones and Klenow (2010) focus on consumption rather than income when accounting for several other dimensions of well-being. Importantly, all these studies have in common that they compute equivalent incomes at the country level assuming identical preferences across individuals (i.e., relying on a representative agent approach). Aggregation and comparison across countries follows by use of a SWF. However, as already pointed out by Fleurbaey and Gaulier (2009), p. 620, for *"an accurate application of this methodology, one needs survey data on income and on the additional dimensions of consumption [...], as well as on preferences [...], at the individual level and for all the countries studied."* This is precisely the path we take in the present chapter.

As standard in the labor supply literature, we retrieve individual and cross-country specific preference heterogeneity relying on a structural discrete choice model. Naturally, such models respect individual differences in the taste for consumption versus leisure when estimating preference parameters. However, when it comes to welfare analyses, we typically observe that preference heterogeneity is neglected. The main reason is the well-known trade-off between ensuring interpersonal comparability and respecting individual preferences (see e.g. Fleurbaey and Trannoy (2003); Brun and Tungodden (2004)).[3] In empirical labor supply modeling, two main approaches emerged (besides the simple – but still prominent – use of income as a welfare index). One is to mention, but de facto neglect the comparability and aggregation problems in presence of preference heterogeneity and to report averages of individual equivalent or compensating variations (see e.g. Aaberge, Dagsvik and Strøm (1995); Aaberge, Colombino and Strøm (2000); Dagsvik, Locatelli and Strøm (2009)), or to aggregate them using a certain SWF

[2]For a comprehensive overview on general attempts to construct measures of social welfare alternative to GDP, see Fleurbaey (2009). Kassenboehmer and Schmidt (2011) critically assess the additional value of taking into account alternative components to GDP.

[3]A related, more practical reason might be that even if differences in individual preferences were accounted for, it could become a very complicated normative exercise to determine the weights assigned to individual utilities in order to aggregate them.

(e.g. Eissa et al. (2008); Fuest, Peichl and Schaefer (2008); Creedy and Hérault (2012)). In contrast, a second approach explicitly addresses the comparability issue using a reference household for welfare analyses. Following King (1983), classic individual money-metric utilities are derived by means of a fixed preference function at fixed reference prices (e.g. Aaberge et al. (2004); Ericson and Flood (2009); Aaberge and Colombino (2013)). However, with this approach, preferences of a certain reference household build the basis for comparing individual well-being, which are hence no longer individual specific but unified and determined by the social planner.[4]

In the present chapter we adopt an approach from the recent social choice literature that allows to fully respect individual preferences in welfare analyses (Fleurbaey (2006, 2008, 2011); Fleurbaey and Maniquet (2006)). In this approach, interpersonal comparisons are conceived directly in terms of subsets of the consumption-leisure space which are nested into each other. This allows deriving a welfare metric which will be clearly ordered for different preferences, making individual situations unambiguously comparable. In the consumption-leisure context, the derivation of comparable, nested subsets could e.g. be implemented by fixing a specific net wage rate or a certain amount of non-labor income. In that case, the chosen bundle on a given indifference curve is evaluated based on a subset that is tangent to the individual indifference surface. While this procedure is thus similar to the derivation of classic equivalent incomes, the choice of the reference values might be grounded on certain fairness considerations. This makes the normative priors of the interpersonal comparison more explicit – as, e.g., requested by Atkinson (2011).[5] So far, measures of this kind have not been implemented empirically except in Decoster and Haan (2010) and the present chapter. While those authors address preference heterogeneity within a country (Germany), we

[4]Then, welfare changes are usually evaluated using a certain SWF over individual money-metric utilities. This generated another stream of criticism, initiated by Blackorby and Donaldson (1988): a SWF over equivalent incomes usually fails to be quasi-concave in commodity consumptions which is incompatible with a minimal preference for equality.

[5]Choosing reference values based on certain fairness considerations is the actual novelty of the fair allocation approach compared to classical demand theory when deriving equivalent incomes. See Preston and Walker (1999), for instance, who derive a similar set of metrics in line with the latter. More popular, however, has been the alternative of exploring reference price independent comparisons of individual welfare (see e.g. Roberts (1980), Slesnick (1991), Blackorby, Laisney and Schmachtenberg (1993)).

compute equivalent incomes for individuals of 12 countries and analyze how international rankings vary with the use of alternative welfare metrics. In particular, we focus on the extent to which welfare evaluation is affected by that part of heterogeneous work preferences which is genuinely country-specific.[6] In addition, we assess the role of different sources of heterogeneity for the resulting differences in welfare rankings.

3.3 Theoretical framework

In order to respect preference heterogeneity in the consumption-leisure space, we follow Fleurbaey (2006, 2008) and look at individual welfare measures which specifically differ in the way they treat heterogeneity in tastes. In the following, we introduce these measures and their underlying normative rationales. We refer to Fleurbaey (2006, 2008) for the axiomatic derivation and to Decoster and Haan (2010) for a more detailed illustration.

The setup. Assume that agent i has individual preferences over consumption c_i and labor time h_i, denoted R_i, with $c_i \in \mathbb{R}_+$, $h_i \in [0, 1]$. By R_i, agent i weakly prefers bundle (c_i, h_i) over bundle $(c_i^{'}, h_i^{'})$. R_i is represented by a preference representation function u_i defined by the equivalence $(c_i, h_i)R_i(c_i^{'}, h_i^{'}) \Leftrightarrow u_i(c_i, h_i) \geq u_i(c_i^{'}, h_i^{'})$. Observed preference heterogeneity is introduced via an individual specific vector $\mathbf{z}_i$ (containing all characteristics determining individual preferences), $R_i = R(\mathbf{z}_i)$, and thus $u_i(c_i, h_i) = u(c_i, h_i; \mathbf{z}_i)$. The chosen bundle (c_i, h_i) results from a classic individual utility maximization problem. Let $f(.)$ represent the tax-transfer function that transforms gross non-labor income I_i and gross labor income $w_i h$ (with w_i denoting individual i's gross wage) into net income c, i.e. $(c_i, h_i) = \max\left[u(c, h; \mathbf{z}_i) | c \leq f(I_i, w_i h), h \leq 1\right]$. Hence, the observed bundle of con-

[6] This can also be motivated by a prominent debate about what determines differences in labor supply behavior across countries, particularly between Europe and the US. Prescott (2004) states that different labor supply elasticities are almost only due to differences in tax-transfer systems. This view has been criticized by Blanchard (2004) who – in line with Alesina et al. (2005) – argues that different preferences for leisure indeed play a role and are maybe due to cultural differences. Our findings, which control for country-specific consumption-leisure preferences, tend to support the latter view.

sumption and leisure results from individual choices subject to preferences and a budget constraint.

The welfare metrics. Assume the agent's utility function $u(c_i, h_i; \mathbf{z}_i)$ to be well-behaved, i.e. continuous and increasing in its arguments as well as quasiconcave in (c, h). Furthermore, assume tax-transfer rules $f(.)$ determining individual budget sets $c \leq f(I_i, w_i h)$ to be non-linear – as generally observed in reality. Then, for each chosen bundle (c_i, h_i) on a given individual indifference curve $IC_i = c_i(u, h_i) = \min[c_i | u_i(c_i, h_i) \geq u]$, an associated hypothetical, linear budget constraint that would leave the agent indifferent between choosing from this or her actual budget, can be derived as $c \leq \tilde{w}_i h + \mu_i$ with virtual non-labor income μ_i determined by virtual net wage $\tilde{w}_i$ - as illustrated for bundles a and b in the upper-left panel of Figure 3.1. For the definition of different metrics below we further define the indirect utility function $v_i(\tilde{w}_i, \mu_i) = \max[u_i(c_i, h_i) | c_i - \tilde{w}_i h_i \leq \mu_i]$ and the expenditure function $e_i(u, \tilde{w}_i) = \min[c_i - \tilde{w}_i h_i | u_i(c_i, h_i) \geq u]$, with a fixed level of utility u. The slope of the indifference curve in a given bundle (c, h) is defined as the MRS between consumption and hours worked, $MRS_{c,h} = -\frac{\partial u / \partial h}{\partial u / \partial c}$. Preference heterogeneity shows up by the fact that, in a given bundle (c, h), different agents are characterized by different MRS. More precisely, an agent i is characterized to be relatively more (less) work averse than an agent i', if, in a given bundle (c, h), her indifference curve IC_i is steeper (flatter) than the indifference curve of agent i', $IC_{i'}$, and thus, $MRS_{c,h;i} > (<)\ MRS_{c,h;i'}$ (where we also assume that the indifference curves cross at most once). In this setting, different metrics can be formulated by means of *hypothetical* budget constraints with specific choices of the virtual net wage rate or virtual non-labor income.

First, the **"wage"** metric is defined as the slope of the tangent through the origin at a given indifference curve IC_i, equaling the wage rate $\tilde{w}_i$ of agent i when the value of the virtual non-labor income is set to a reference value of 0, i.e. $\mu_i = \mu^r = 0$. The corresponding function might be called a wage equivalent as firstly introduced by Pencavel (1977). The upper-right picture of Figure 3.1 shows that, by use of the metric $\nu_i^W(u, \mu^r)$, the two agents can be unambiguously ordered

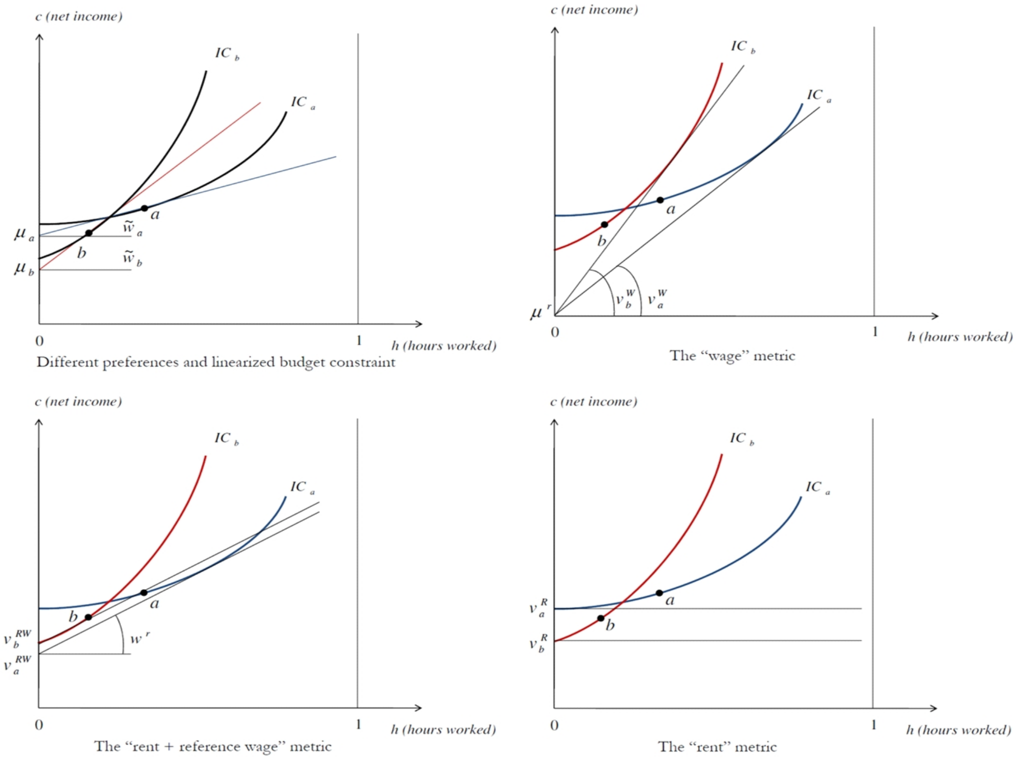


Figure 3.1: The different welfare metrics graphically

from better to worse off even though preferences differ:

$$\nu_i^W(u, \mu^r = 0) = \min_{\tilde{w}_i}[\tilde{w}_i | v_i(\tilde{w}_i, \mu^r = 0) \geq u]. \tag{3.1}$$

Second, the **“rent + reference wage”** criterion compares individual situations depending on a certain reference value for the virtual net wage rate, $\tilde{w}_i = w^r$. Then, the resulting welfare metric $\nu_i^{RW}(u, w^r)$ is the value of the corresponding virtual non-labor income given through the expenditure function (bottom-left panel of Figure 3.1):

$$\nu_i^{RW}(u, w^r) = e_i(u, w^r) = \min_{\mu_i}[c_i - w^r h_i | u_i(c_i, h_i) \geq u]. \tag{3.2}$$

Third, the **“rent”** metric directly emerges by setting $\tilde{w}_i = w^r = 0$. As far as we assume well-behaved utility functions, this is equivalent to hours worked being set to a reference value of $h_i = h^r = 0$. The resulting metric $\nu_i^R(u, h^r)$ hence is the value of the intersection of the indifference curve with the ordinate, equaling the corresponding virtual non-labor income (bottom-right panel of Figure 3.1):

$$\nu_i^R(u, h^r = 0) = c_i(u, 0) = \min_{c_i}[c_i | u_i(c_i, 0) \geq u]. \tag{3.3}$$

Normative interpretation. The key feature of the metrics introduced above is that they fully respect preferences: all metrics increase when the individual moves to a bundle on a higher indifference curve of her *own* preference ordering. However, once we allow for heterogenous preferences across individuals, the non-trivial issue of making well-founded *interpersonal* comparisons of well-being re-enters the scene. More specifically, one will want to use a specific fairness concept, i.e. a device to separate who is better, and who is worse off, and thus, to determine who should eventually redistribute towards whom – when taking into account that individual outcomes not only result from endowed circumstances, but also from individual preferences. The literature on *responsibility-sensitive egalitarianism* addresses this problem by keeping individuals responsible for the latter, but not for the former (Fleurbaey (2008)).

In order to operationalize this principle, two competing interpretations evolved in the economic literature, namely the *compensation* and the *(liberal) reward* principle. The compensation principle states that inequalities due to endowed circumstances (i.e. not due to responsibility factors) should be removed. In contrast, the principle of liberal reward states that inequalities due to individual preferences are legitimate. Although similar at a first glance, both principles are logically independent and to some extent even in conflict with each other.

The three measures defined above give priority to the compensation principle: individuals with poorer hypothetical circumstances are always ranked worse off (as can be seen from Figure 3.1) and – depending on social preferences to be specified when moving from the two-agent case to real populations – might deserve compensation. When individuals have identical preferences, they are ranked in exactly the same way by all three measures. However, when preferences differ (as shown in Figure 3.1 with crossing indifference curves), it becomes obvious that the metrics also introduce ethical priors about how to treat this preference heterogeneity. Thus, eventual compensation will also depend on the willingness-to-work of the individuals. This might lead to favoring either the industrious or the work averse – which obviously is in possible conflict with the reward principle.

In this chapter, we are especially interested in the differences between individual welfare metrics that result from giving priority to the compensation and compromising on the reward principle. That is, we study how the underlying ethical choices in a framework of respecting preference heterogeneity systematically alter *interpersonal comparisons* of well-being – in an international empirical context. Thereby, we focus on simple index orderings of individual well-being levels and do not consider any specific *social ordering function*. The latter would go beyond the question of "who is better and worse off" and additionally requires weighting individual utilities (for this distinction see also Fleurbaey (2007)).

In sum, what is relevant for interpersonal welfare comparisons is the fact that the three measures defined rank individuals with identical preferences in the same way (i.e. in accordance with how these individuals would themselves rank their bundles) – while their sole difference is in the way they treat heterogeneity in tastes. Then, once we accept the differential treatment of individual preferences, the ethical choice at hand is related to what generates this difference between the metrics, namely the choice of the references for interpersonal comparisons. In the following we explain how the metrics embody this ethical choice.

In a consumption-leisure space, individuals have different preferences for work (resulting in different levels of exhibited effort) while skill levels (as reflected in gross wages) and non-labor income are assumed to be exogenous endowments to the individuals. The welfare measures defined evaluate individual situations according to hypothetical reference amounts of those endowments such that they would allow individuals to reach their current utility level.

First, the "rent" metric asks for the amount of (hypothetical) net income which would be enough to remain equally well off compared to the initial situation if one did no longer have to earn it. The resulting metric is simply the level of consumption when working zero hours which corresponds to the level of virtual non-labor income at a reference wage of zero. The bottom-right picture of Figure 3.1 illustrates, that in this case, we judge the agent who gets bundle b, say Bob, with a relatively lower willingness-to-work to be worse off compared to the agent who has bundle a, and a higher willingness-to-work, say Ann. Thereby, redistribution would be granted from Ann to Bob and we might hold Bob only minimally responsible for his preferences.

Second, the "rent + reference wage" metric asks which amount of (virtual) non-labor income would make the individual equally well off compared to her actual situation when receiving a positive (hypothetical) reference wage equal to w^r. Clearly, the higher this reference wage is, the worse off relatively industrious individuals will be evaluated, i.e. the more they will be favored for receiving protection. This is illustrated in the bottom-left picture of Figure 3.1 where w^r is constructed such that the associated linear budget curve is tangent to IC_b in the intersection point with the ordinate. In this case, we evaluate Bob to be better off than Ann for any $w \geq w^r$.

Third, the "wage" metric asks which wage rate would leave the individual indifferent from her current utility level if she had zero (virtual) non-labor income. [7] Note, that this metric differs from the previous ones in the sense that its properties are less clear in terms of favoring the industrious or work averse. In the upper-right picture of Figure 3.1, work averse Bob is considered to be better off compared to industrious Ann and redistribution (in order to equalize hypothetical wage rates) would be justified from Bob to Ann. However, one might easily construct a situation where two agents with crossing preferences are evaluated in the opposite direction by means of the "wage" metric.[8]

[7] The underlying fairness criterion is developed in Fleurbaey and Maniquet (2006): in an hypothetical world with equal wage rates and zero non-labor income, differences in consumption-leisure bundles would not call for redistribution as they can only be due to differences in preferences and laisser-faire would be the best policy. The "wage" metric might thus be interpreted as holding individuals maximally responsible for their willingness-to-work. Hodler (2009) uses this metric to study the effect of redistribution on inequality in a highly stylized setting when a population is heterogeneous in abilities and work-leisure preferences. A variant of the metric is applied in Ooghe and Peichl (2011) to derive optimal taxes when agents only have partial control over certain effort variables.

[8] Thus, further research will be necessary to systematically determine how especially the wage metric treats agents with different preferences. In fact, in the empirical section it turns out that (on average) we are making more comparisons of the kind illustrated in Figure 3.1.

3.4 Empirical approach

The theoretical section presented three specific individual welfare measures that take into account that individuals might have different preferences for consumption versus leisure. In this section, we illustrate the empirical application of the metrics. We proceed as follows. First, we collect information about individuals' consumption and leisure in 12 countries. Second, we estimate individual preferences based on those revealed choices and various socio-demographic characteristics. Third, we calculate the welfare metrics based on individual consumption-leisure bundles and the estimated preferences (individual indifference curves).

Thereby, using data from different countries enables us to take into account cross-country differences in consumption-leisure preferences, i.e. preference profiles of different populations besides the heterogeneity in individual tastes within a country. Addressing these potential differences requires to keep other factors of the analysis (socio-demographic variation, differences in the tax-benefit systems etc.) as comparable as possible. We therefore make use of a unique setting and estimate household preferences in a harmonized way for all countries under analysis by using (a) comparable datasets with common variable definitions, (b) a common econometric approach to estimate labor supply models for each country and (c) a harmonized tax-benefit calculator to compute net incomes at different points of the household budget curves as required by the nature of the labor supply model and explained below. We also focus on a specific subgroup of the population, namely married women. First, married women is the group most studied in the labor supply literature as they show lots of variation in work duration and thus also relatively considerable differences in labor supply elasticities (see e.g. Blundell and MaCurdy (1999)). Since this variation partly is affected by differences in consumption-leisure preferences, it might also help to identify differences in the empirical welfare measures. Second, married women's labor supply is less likely to be contaminated by demand-side restrictions compared to single individuals or married men (Bargain, Caliendo, Haan and Orsini (2010)), a factor not explicitly considered with our approach (see below).

The empirical model is directly compatible with the theoretical framework presented in the previous section. The only difference is that we consider "unitary" households rather than individuals, i.e., couples are assumed to behave as a single decision maker regarding the trade-off between consumption and female labor supply (male labor supply is kept fixed).

Specification of preferences. In order to empirically derive the welfare metrics, we must retrieve indifference curves for each household in our sample and, hence, estimate utility functions. To do so, we specify a structural model of labor supply with discrete choices, which is standard in the literature on tax reforms (see e.g. Aaberge et al. (1995); van Soest (1995); Blundell et al. (2000)).[9] Agents are assumed to choose among a set of discrete hours alternatives rather than continuously distributed options which better corresponds to the observed distribution of available hours (non-participation and several part-time, full-time and over-time categories). Also, a discrete choice model better allows to account for the non-linear effect of tax-benefit systems on household budgets as net income needs to be determined at each discrete point. Consumption-leisure preferences are explicitly parameterized as follows while a common specification over all countries is applied for reasons of comparability. We denote c_{ij} the net income (or consumption, in a static framework) of household i and h_{ij} the wife's working hours at choice $j = 1, ..., J$ where the household is assumed to obtain a utility level:

$$V_{ij} = u_i(c_{ij}, (T - h_{ij})) + \epsilon_{ij}, \tag{3.4}$$

with $(T - h_i)$ the wife's "leisure time" (which may include time for domestic production), i.e., total time-endowment T minus formal hours of work. For the deterministic part of the utility function, we rely on a Box-Cox specification, that is:

$$u_i(c_{ij}, (T - h_{ij})) = \beta_c \frac{c_{ij}^{\alpha_c} - 1}{\alpha_c} + \beta_{li} \frac{(T - h_{ij})^{\alpha_l} - 1}{\alpha_l}. \tag{3.5}$$

This specification is frequently used for welfare assessments (see e.g. Aaberge et al. (1995, 2000, 2004); Decoster and Haan (2010); Blundell and Shephard (2012)). Importantly for our purpose, it is easy to check that monotonicity and concav-

[9]Relying on structural models is also the only way to obtain comparable preference estimates across countries. It seems indeed difficult to find natural experiments that would allow performing this task.

ity conditions on consumption and leisure are satisfied (respectively $\beta_c > 0$ and $\beta_{li} > 0$ for monotonicity and $\alpha_c < 1$ and $\alpha_l < 1$ for concavity). Indeed, tangency conditions are necessary for measuring and interpreting the welfare metrics in a straightforward way. The deterministic utility is completed by i.i.d. random terms ϵ_{ij} for each choice, leading to the individual random utility function $V_{ij}(u_i, \epsilon_{ij})$. By using a random utility concept, we especially account for the fact that there will always be characteristics of the household (influencing the hours choice) that are known by the household itself while being unobserved by the econometrician. This specifically includes that for a given household, tastes may vary across opportunities which will not be captured by estimating the deterministic part of the utility function (McFadden (1974)).[10] As a consequence, non-concavity of u_i would not be inconsistent with random utility theory (as long as V_i is quasi-concave). However, assuming quasi-concavity of u_i is necessary in order to empirically derive (well-behaved) welfare metrics in line with the theory laid out in Section 3.3. This is explained below where we suggest a way to empirically deal with this issue. In addition, in Section 3.5.4, we check robustness with respect to a different, more flexible specification of the utility function and to alternative ways to empirically compute the welfare metrics.

Under the (standard) assumption that random terms follow an extreme value type I (EV-I) distribution, the probability for each household of choosing a given alternative has an explicit logistic form, which is a function of deterministic utilities at all choices. Then, the likelihood of a sample of observed choices can be derived from these probabilities as a function of the preference parameters whose estimates are obtained by maximum likelihood techniques (see McFadden (1974)).

A crucial point for our analysis is the source of heterogeneity across households. The first obvious difference is that α and β parameters are country-specific, i.e., they are estimated separately for each country. The second source is household-specific heterogeneity through the leisure term, which is specified as follows:

$$\beta_{li} = \beta_{l0} + \beta_{l\mathbf{z}}\mathbf{z}_i, \tag{3.6}$$

[10] Besides, the random term might also capture possible observational errors, optimization errors or transitory situations.

with $\mathbf{z}_i$ a vector of taste shifters including the age of both spouses, education of the women, presence of children younger than 3, between 3-6 or 7-12 years old and regional information.

Note that we keep the labor supply model as simple as possible in order to ensure a straightforward implementation and clear interpretation of the welfare metrics. This particularly implies that we do not model potential demand side restrictions on the labor market nor fixed costs of work. This is further discussed in Section 3.6.

Data, selection and tax-benefit simulation. For our empirical application, we focus on a selection of 11 European countries and the US. For each country we use microdata based on standard household surveys which provide information on incomes and demographics. For EU countries, we rely on datasets combined with the simulation of national tax-benefit systems for years 1998 or 2001 as described in Bargain et al. (2012). For the US, we use 2006 IPUMS-CPS (Integrated Public Use Microdata Series; Current Population Survey) data containing information for the year 2005. As mentioned above, we focus on the subpopulation of married couples and estimate the labor supply of the women. Clearly, this assumes away potential cross effects between labor supply decisions of the spouses. However, given the illustrative purpose of the chapter, this assumption seems acceptable. To keep the sample relatively homogeneous and avoid too much variation in household's non-labor income (in this context especially including husbands' labor income), we select households where husbands at least work 30 hours/week and exclude those with extreme amounts of capital income. Furthermore, we keep households where women are aged between 18 and 59 and available for the labor market, i.e., neither disabled nor retired nor in education. In order to maintain a comparable framework while respecting possible variation in the hours distribution across countries, we adopt a discretization with $J = 7$ hours categories including non-participation, two part-time options, two full-time and two over-time categories (0 to 60 hours/week with a step of 10 hours). Net income at each discrete choice $j = 1, ..., J$ is calculated as a function $c_{ij} = f(w_i h_{ij}, I_i, \mathbf{x}_i)$ of female earnings $w_i h_{ij}$ and household non-labor income I_i (i.e., household capital income and husbands' earnings). Female wages w_i are predicted for all observations using calculated wage rates of the workers and estimated with the usual correction for selection bias. The function $f(.)$ represents how gross income is transformed into net income, i.e., the impact of taxes and benefits which also depends on certain household demographic characteristics $\mathbf{x}_i$.[11] It is calculated numerically using microsimulation models EUROMOD for EU countries and the NBER's TAXSIM for the US.[12]

Empirical welfare metrics. We empirically compute welfare measures based on individual preferences for each household in the sample. Importantly, the random utility framework leads to a frequency distribution of hours choices across the discrete alternatives rather than a perfect prediction of the observed choice. Therefore, we have to compute expected values for the metrics. Yet, one might argue that using a concept of expected measures contradicts the normative background of the individual welfare measures, which essentially relies on observed preferences (derived from observed choices). In order to bring the probabilistic nature of the empirical labor supply model and individual choices together, several approaches are possible. In the baseline, we compute expected metrics as described below and provide robustness checks on different methods in Section 3.5.4.

First, we generate a set of $r = 1, ..., R$ draws from the EV-I distributed random variable ϵ_j for the given fixed set of hours alternatives (including non-participation). For each draw r, we then compute each individual's utilities V for each alternative j (suppressing index i in the following). As explained above, the welfare metrics can only be empirically derived in a consistent way for well-behaved

[11] Using predicted wages for all observations helps to reduce some of the bias due to measurement errors on wages if calculated on basis of yearly income information (division bias). Also, accounting fully for existing tax-benefit rules completes the identification. Indeed, individuals face different effective tax-benefit schedules because of their different circumstances and socio-demographic characteristics (e.g. age, family compositions, region or levels of non-labor income). This creates variation in net wages between people with the same gross wage. Using nonlinearities and discontinuities generated by the tax-benefit system in this way is a frequent identification strategy in the empirical literature based on static discrete models and cross-sectional data (e.g. van Soest (1995); Blundell et al. (2000)). See Bargain et al. (2012) for a more thorough discussion on this point.

[12] For an introduction to EUROMOD, descriptive information of taxes and transfers in the EU and robustness checks for tax-benefit calculation, see Sutherland (2007). An introduction to TAXSIM is provided by Feenberg and Coutts (1993). Both calculators have been already used in several empirical studies (see e.g. Immervoll et al. (2007) for EUROMOD or Eissa et al. (2008) for TAXSIM).

indifference curves, i.e. based on the deterministic utility. Thus, the deterministic part of the utility of the chosen alternative (the one with highest V), u_r^{max}, will form the basis of the welfare metric for each draw. Subsequently, we average over the number of draws, i.e. $\bar{u} = \frac{1}{R}\sum_{r=1}^{R} u_r^{max}$. This "expected optimal utility" $\bar{u}$ is used to empirically derive individual indifference curves $IC_{\bar{u}}$, using the general function as introduced in Section 3.3 applied to the Box-Cox specification given in equation (3.5). Finally, equivalent incomes are computed as follows.[13] For the "rent" metric, an analytical solution is obtained by setting h to zero into the formula for $IC_{\bar{u}}$ and retrieving the corresponding level of consumption (hence, the intersection level of $IC_{\bar{u}}$ with the ordinate), see bottom-right panel of Figure 3.1. Due to the Box-Cox specification of the deterministic utility we are not able to derive analytical expressions for the other two metrics. Hence, we must apply numerical procedures. This basically requires searching for the relevant tangency point (c, h) of $IC_{\bar{u}}$ with the hypothetical budget line corresponding to the metric of interest - along the full shape of each individual indifference curve on the hours interval $[0, T]$ (while this point, again, usually will be different from the observed bundle). Once the tangency point (c, h) is found, the value for the metric is determined as well. More precisely, for the "rent + reference wage" metric, the tangency point is the point (c, h) on $IC_{\bar{u}}$ for which the $MRS_{c,h}$ equals the reference wage w^r. The virtual non-labor income μ corresponding to this tangency point is the value for the metric (see bottom-left panel of Figure 3.1). Finally, the "wage" metric is derived as the slope of $IC_{\bar{u}}$ for which the $MRS_{c,h}$, because of the zero virtual non-labor income, equals $\frac{c}{h}$ (see top-right panel of Figure 3.1). For the numerical derivation of the two last metrics, we rely on a precise iterative procedure by incrementing hours from 0 to T for each household in the sample using very small steps (0.01 hours/week). Note that this is different from moving across discrete categories $j = 1, ..., J$ as used for the labor supply estimation.

[13]We abstain from providing the relevant formulas for the concrete Box-Cox specification in order not to exacerbate the understanding of the main procedures with unnecessary technical issues (see for details Decoster and Haan (2010)). The reader may verify the proceeding directly via Figure 3.1 and the formulas introduced in Section 3.3.

Descriptive information. In Table 3.1, we present summary statistics for the sample under analysis. The first two columns show the average weekly household net and non-labor income by countries (recall that household non-labor income essentially includes husband's earnings). Next, female average wage rates, weekly working hours as well as participation rates are presented. Depending on the year of the data, incomes and wages are up- or downrated to the reference year 2001 and transferred into comparable Purchasing Power Parities (PPP)-USD.

Table 3.1: Income and employment statistics

	Data year	Net income per week (1)	Non-labor income per week (2)	Female wages per hour (3)	Female hours per week (4)	Female participation rates (5)
AT	1998	777	618	11.5	17.9	0.60
BE	2001	823	618	13.9	25.1	0.77
DK	1998	793	562	12.3	30.2	0.84
FI	1998	627	427	9.6	32.3	0.85
FR	2001	688	508	10.9	23.8	0.72
DE	1998	696	545	13.3	19.7	0.64
IE	2001	883	683	10.5	19.3	0.63
NL	2001	804	635	12.4	18.2	0.71
PT	2001	517	370	6.7	28.2	0.76
SW	2001	708	489	11.2	31.3	0.92
UK	1998	798	593	9.5	23.1	0.75
US	2005	1158	857	18.4	27.2	0.71

Note: The whole sample consists of 42975 households with the husband at least working 30 hours/week. By specification, household's non-labor income includes husband's earnings. Income and hours are averages/week, wages are averages/hour. Income and wages in 2001 PPP-USD. *Source*: Own calculations based on EUROMOD and TAXSIM.

Women from the US show the highest net wages per hour and clearly work more (27.2) than average weekly hours across countries (24.7). Together with husbands' earnings, this results in the highest household net income on average per week in the sample (1158 PPP-USD). However, females from the Nordic countries (Denmark, Finland, Sweden) show the highest inclination to work (all above 30 hours/week and participation rates larger than 80%). Also, Portuguese married women, the well-known exception out of the Southern European countries, tend to work more than US females - even though their wages are by far the lowest across countries. In contrast, women from Germany, Ireland, Austria and the Netherlands show relatively low participation rates and hours.

3.5 Results

This section presents results of the empirical analysis in four steps. First, we outline estimated household and country specific preference heterogeneity. Then, we present information on cross-country orderings for the different individual welfare measures. Next, a decomposition of total heterogeneity into estimated preferences and demographic composition is performed. Finally, we present some robustness checks.

3.5.1 Estimated preference heterogeneity

We first present estimation results for the utility function, separately retrieved for each country with the same empirical specification. For lack of space and to summarize preference heterogeneity across countries, we focus on average MRS between consumption and hours worked defined as the amount of net income in PPP-USD that is needed by an household to be compensated for an one hour increase in weekly labor time. Note that MRS are of key relevance in our analysis, rather than labor supply elasticities; while the latter are determined by individual preferences and budget constraints, the former solely represent consumption-leisure tastes in the given framework.[14] For all observations i, MRS_i are computed as the slope of individual indifference curves at a fixed consumption-labor bundle. By doing so, we exclusively capture the shape of different preferences rather than the impact of different actual locations (c, h) along individual indifference curves for a

[14]This should be distinguished from the fact that individual preferences and thus, MRS, might be also (indirectly) formed by the (country-specific) design of tax-benefit systems in the long run. However, this interesting topic can not be considered in the given static framework where preferences and constraints are clearly separated by construction of the labor supply model. What remains, of course, is the direct influence of tax-benefit systems in the estimation procedure which, however, is genuine as preferences are defined over leisure and net (rather than gross) income.

set of given estimates.[15] In Table 3.2, fixed (c, h)-bundles correspond to the average and to certain percentiles of the global hours distributions ($p10$-, $p50$ - and $p90$-values) with accordant net incomes. MRS substantially differ across countries. They are particularly large in Ireland, Germany, Austria and the Netherlands, countries known for low participation levels among married women (see Table 3.1). Inversely, Nordic countries, Portugal, Belgium and the US show the relatively lowest MRS on average. Given our focus on the role of heterogeneity in welfare evaluations, we shall decompose the variations of MRS with respect to country demographics and country preferences in Section 3.5.3.[16]

3.5.2 Cross-country welfare rankings

We first pool households from all countries into one sample and compare individual ranks for the different metrics by use of correlation plots. Moving closer to country comparisons, we then investigate how average positions of households by countries change by choice of the metric.

Rank correlations. For the pooled country sample, Figure 3.2 shows empirical rank correlations between individual positions in the percentile distribution of the different metrics. For the sake of comparison, the two upper panels show correlations when identical preferences are assumed (instead of allowing for heterogeneity in preferences). This corresponds to the prominent approach in empirical welfare analysis described above. Precisely, for all households in the pooled sample, we fix their preferences to that of the global median household (in terms of $MRS_{c(\bar{h}),\bar{h}}$) while retaining their actual (c, h)-choices and non-preference related characteris-

[15] As a preliminary check, we have verified that MRS are always positive and increasing as required from Section 3.3 – i.e., for all countries, we find that $\beta_c > 0$, $\alpha_c < 1$ and $\alpha_l < 1$; for the term β_{li} which incorporates heterogeneity, no more than 1% of the observations per country violates the monotonicity condition on leisure – these observations are excluded from the sample.

[16] The impact of taste shifters (age, children etc.) is reported in detail in the appendix. The compensation needed in income to outweigh one additional hour of work is clearly higher for women with young children or lowly educated females compared to the average. That is, MRS are declining in age of children and level of education. For instance, the average MRS for women with children younger than 3 years old is about 5 PPP-USD higher compared to the average MRS of the whole sample (13.7 versus 8.7 PPP-USD).

Table 3.2: Marginal rates of substitution (between consumption and labor) by countries

	MRS $\left(c(\bar{h}), \bar{h}\right)$ (1)	Standard error (2)	MRS $(c(h^{p10}), h^{p10})$ (3)	MRS $(c(h^{p50}), h^{p50})$ (4)	MRS $(c(h^{p90}), h^{p90})$ (5)
Full sample	8.7	(5.3)	7.0	9.6	12.0
AT	13.2	(5.3)	10.9	13.8	17.1
BE	7.1	(2.1)	5.8	7.7	9.5
DK	5.5	(0.6)	4.4	6.2	7.7
FI	3.8	(0.5)	2.9	4.3	5.5
FR	9.5	(3.1)	7.3	10.9	13.9
DE	13.2	(8.1)	10.7	14.7	17.9
IE	17.6	(7.4)	13.9	19.1	24.2
NL	13.2	(5.1)	10.3	14.8	18.8
PT	3.7	(1.0)	3.0	4.0	5.0
SW	5.3	(0.7)	3.9	6.4	8.4
UK	9.6	(4.5)	7.7	10.5	13.1
US	6.8	(3.2)	5.5	7.3	9.2

Note: $\left(c(\bar{h}), \bar{h}\right)$ is the bundle with global mean hours $\bar{h}$ and corresponding net income $c(\bar{h})$. $\left(c(h^{p10}), h^{p10}\right)$ contains the mean hours of the $10th$ percentile in the global hours distribution and the corresponding mean net income $c(h^{p10})$. For $p50$- and $p90$-values accordingly. c-values in 2001 PPP-USD. *Source*: Own calculations based on EUROMOD and TAXSIM.

tics (net wages and non-labor income). The metrics are recalculated under these conditions. As indicated in the upper-left panel of Figure 3.2, any metric can be used at this stage without altering the correlation (which is independent of the choice of the reference household and verified in the upper-right panel).[17] Note that, compared to the pure income measure, overall re-ranking due to the account of leisure in the money metrics is fairly modest when agents do not differ in preferences. This could of course vary with the choice of the reference household and is checked in the robustness analysis in Section 3.5.4.

The next four panels of Figure 3.2 compare rank distributions for two measures at a time when full heterogeneity in preferences is accounted for. We observe substantial re-ranking of individual positions between the metrics. While the center-left panel of Figure 3.2 still reveals a quite strong correlation between

[17] Indeed, this illustrates nothing else than what Roberts (1980) proved, namely, that individual welfare orderings are reference price independent when preferences are homogeneous across individuals.

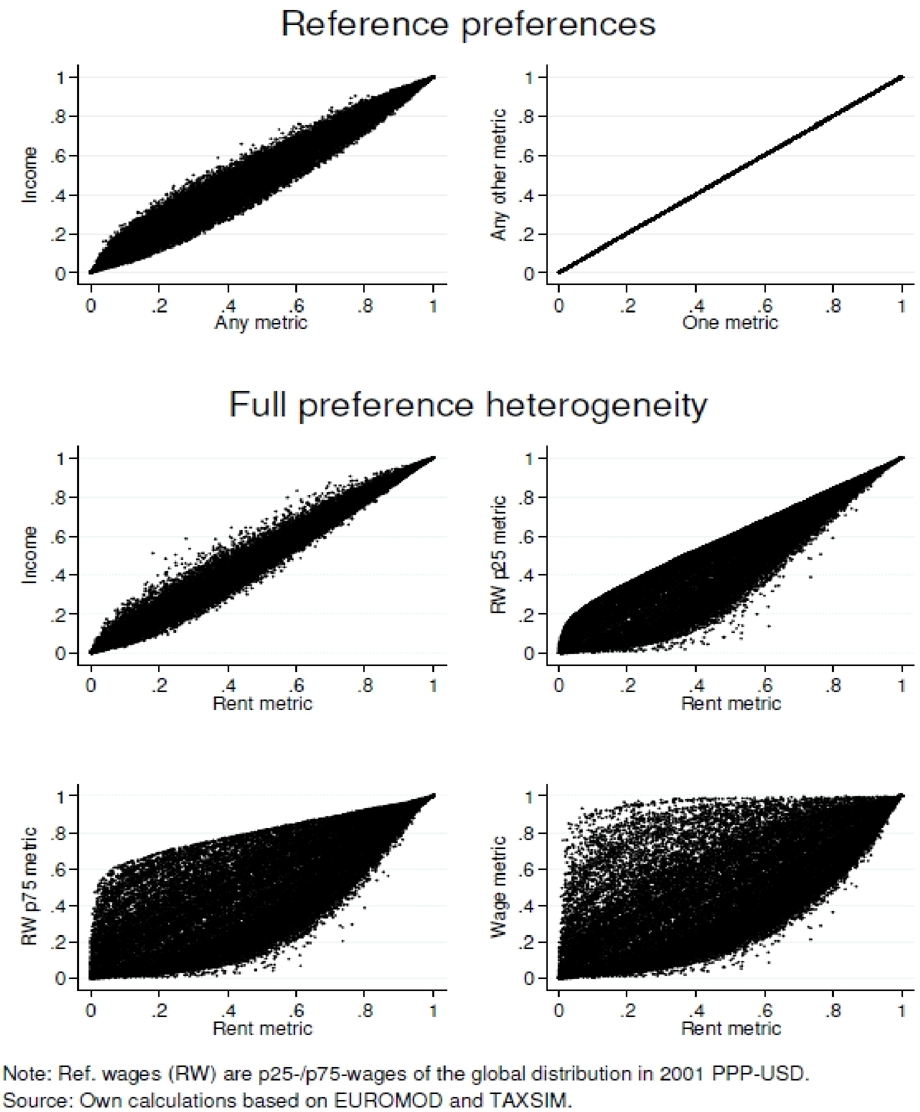
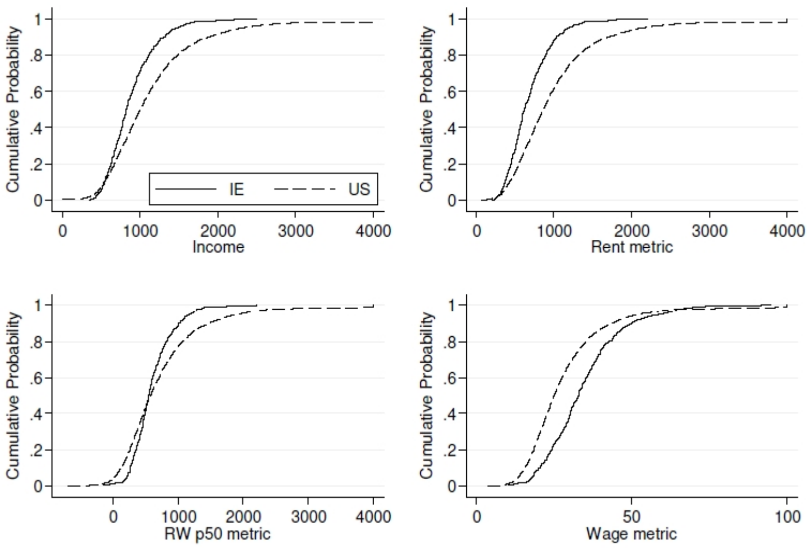


Figure 3.2: Rank correlations of empirical welfare metrics using reference preferences vs. full heterogeneity in preferences

the individual positions under pure income and the "rent" metric (similar to the upper-left picture), the correlation between the "rent" and the further metrics in the following three panels sequentially decreases when taking preferences for leisure increasingly into account. In the bottom-right panel, only a weak correlation remains between the "rent" and the "wage" metric, showing the relatively largest re-ranking between individual situations. The next paragraph analyzes to which extent these re-rankings affect cross-country orderings of individual welfare.

Welfare rankings. As a preliminary exercise, we compare cumulative distribution functions (CDF) of the different metrics for two illustrative countries, namely the US and Ireland. The upper-left panel of Figure 3.3 shows that US households are relatively better off in terms of income or under the "rent" criterion. However, moving to the "rent+reference wage" metric, CDFs start to cross and households from the US become worse off. For the "wage" criterion, Irish households are now clearly better off. In the following, we analyze for the pooled country sample how these differences in CDFs translate into different cross-country welfare rankings.



Note: Income, metrics and reference wage RW (p50-wage of the global distribution) in 2001 PPP-USD.
Source: Own calculations based on EUROMOD and TAXSIM.

Figure 3.3: Cumulative distribution functions (CDF) by metrics for 2 selected countries

In Table 3.3, we use the global distribution of individual ranks to compare countries on basis of the average percentile position of households for each measure. Our focus is on how the country ranking changes with the definition of the metric, i.e. with different normative rationales about how to treat heterogeneity in preferences. When using the pure income measure in column 1, consumption-leisure preferences are simply neglected. Here, US households clearly rank first on average (63rd percentile), due to high average working hours and wage rates.[18] In the second column, individual heterogeneity in consumption-leisure preferences is neglected and identical preferences are assumed (according to the reference household specified above). Recall that, corresponding to the previous paragraph, individual positions (and thus, also average percentile positions by countries) do not change by definition of the metric under these conditions. For instance, we see that Irish (US) households rank slightly better (worse) on average under the metrics than under pure income – simply, because a money metric accounts for leisure on top of income while Irish (US) women work relatively less (more) than the average.[19]

Table 3.3: Average percentile position of households in the global welfare ranking - by country and metrics

		Ref. preferences	*Full heterogeneity in preferences*					Δpp
	Income	Any metric	Rent	RW $p25$	RW $p50$	RW $p75$	Wage	Rent-Wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AT	43.6	47.4	41.3	49.1	54.4	58.1	61.0	19.7
BE	49.2	48.6	49.9	47.9	45.4	43.3	42.1	- 7.9
DK	47.2	42.5	48.0	39.9	35.2	32.2	31.3	- 16.7
FI	29.7	23.9	34.3	18.6	15.5	13.7	13.9	- 20.4
FR	34.4	34.5	34.1	35.5	36.1	37.1	37.3	3.2
DE	36.3	38.9	35.9	40.4	43.8	46.7	50.4	14.5
IE	53.1	56.2	46.5	53.8	60.6	66.5	73.9	27.4
NL	47.6	51.3	47.4	53.0	57.1	60.4	64.6	17.2
PT	19.1	17.8	21.8	15.4	13.9	12.8	12.3	- 9.5
SW	38.1	33.4	41.9	29.1	25.8	24.0	23.8	- 18.2
UK	45.0	45.7	44.2	46.2	47.1	47.7	48.4	4.2
US	63.3	62.2	63.4	61.7	60.1	58.5	56.7	- 6.7

Note: For each metric, we compute the percentile position of each household in the global ranking and average them across all households from the respective country. Reference wages for the "rent + reference wage" metrics (RW) are $p25$-, $p50$- and $p75$-wages of the global distribution in 2001 PPP-USD. *Source*: Own calculations based on EUROMOD and TAXSIM.

[18] Country rankings for net income are also broadly in line with respective GDP rankings, which we compared as a check.

[19] However, recall from the previous paragraph that this result is dependent on the specification of the reference household. "Extreme" reference preferences in terms of very large (small) MRS will affect absolute percentile values. See Section 3.5.4.

Once heterogeneous work preferences are fully respected, the rankings will change by choice of the metric. This is reflected by columns 3-7 in Table 3.3. For instance, US households also rank first under the "rent" metric while the average percentile is even slightly increased. That is, some US households are replaced at the bottom of the distribution by households from countries like Ireland, where a higher preference for leisure is observed (percentile 47 on average for the "rent" metric after 53 for income). The picture successively changes when moving to the "rent + reference wage" criteria and finally, to the "wage" metric. In the latter case, US households rank at the 57th percentile on average versus Irish households at the 74th. Changes in the same direction as for the US are even more pronounced among Nordic countries while changes in the opposite direction are particularly strong for Austria, Germany and the Netherlands. The difference between average ranks under the "rent" and the "wage" metric is presented in the last column, with remarkable changes of at least 15 percentage points for 7 out of 12 countries. The extent of rank reversals is all the more striking as our selection of countries is quite homogeneous, focusing on the relatively wealthy EU countries (Continental and Nordic Europe plus the two Anglo-Saxon countries) and the US.[20] Thus, this result suggests that heterogeneous consumption-leisure preferences are the driving factor for individual re-rankings across countries. In addition, note that international rankings are affected by population size, which may even limit the extent of rank reversals for large countries. The same is true for natural differences in household non-labor income (husband's earnings) and female wages across countries (given individual choices).[21]

[20]The case of Portugal is an exception. It is different from other Southern countries in the sense that female participation is very high. However, wage rates are extremely low (among the lowest in Europe). This explains why ranking differences between the metrics for Portuguese households themselves exist as expected while there are simply too few households changing their relative international position to push Portuguese households on average out of the bottom of the global distribution.

[21]Note that, given the ordinal framework, we do not need any information about the differences in the levels of the metrics to answer the question of who will be considered better or worse off. However, we also checked if the differences in the average ranks correspond to (economically) significant differences in the levels of the metrics. With view to column (8) in Table 3.3, displaying average changes in ranks, we also find considerable average differences in levels between the "rent" and the "wage" metric (defined as full-time equivalent for better comparison), ranging from 18 PPP-EUR per week for Finland to 695 PPP-EUR for Ireland. Also across countries - exemplarily comparing the US and Ireland (as in Figure 3.3) - we find that

Table 3.4: Average percentile position of the income poor (lowest quintile) in the global welfare ranking - by country and metrics

			Full heterogeneity in preferences				Δpp	ΔMRS
	Income	Rent	RW $p25$	RW $p50$	RW $p75$	Wage	Rent-Wage	$(c(\bar{h}), \bar{h})$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AT	11.8	9.2	20.9	29.6	36.8	41.3	32.1	1.3
BE	20.5	22.2	21.2	20.9	21.1	21.5	-0.7	1.0
DK	20.4	23.9	15.1	13.2	12.3	12.6	-11.3	0.6
FI	6.2	9.6	2.7	2.5	2.4	2.6	-7.0	0.3
FR	5.5	5.7	8.0	9.9	11.9	11.0	5.3	1.7
DE	9.0	10.1	15.2	20.4	25.1	29.4	19.3	0.5
IE	18.2	11.3	22.5	33.8	44.5	55.3	43.9	3.0
NL	15.8	17.4	25.0	31.0	36.5	41.4	24.0	1.5
PT	1.0	1.1	1.0	1.0	1.0	1.0	-0.1	-0.2
SW	13.4	18.0	5.9	5.3	5.1	5.4	-12.6	0.8
UK	10.7	10.4	14.1	17.6	20.8	22.3	11.9	1.3
US	18.6	18.3	18.0	19.1	20.6	21.2	2.9	1.6

Note: See Table 3.3. For each metric, we take the percentile position of each household of the lowest income quintile in the respective country and average. ΔMRS is the difference of $MRS_{c(\bar{h}),\bar{h}}$ for the income poor to the country average as reported in Table 3.2. *Source*: Own calculations based on EUROMOD and TAXSIM.

While Table 3.3 illustrates potential re-rankings of all households in a country on average across the different metrics, a similar analysis for the (income) poor might lead to different conclusions - especially, when preferences of a country's worst-off sufficiently differ from the average preferences in that country. Table 3.4 therefore shows how the poorest quintile of a country's households in terms of income on average is re-ranked across the different metrics in the global distribution.[22] For most countries, results show by and large the same direction as in Table 3.3, again summarized by the difference between average ranks under the "rent"

the absolute average differences across the metrics are substantial, ranging from 331 PPP-EUR for the "rent" metric to -245 PPP-EUR for the full-time "wage" equivalent.

[22]This should be distinguished from a feature of the metrics applied which has not been mentioned so far. In fact, it has been shown that the normative principles underlying the different metrics also single out a specific way of how to aggregate them, namely using a maximin (leximin) SWF with infinite aversion to inequality and thus, focusing on the worst-off (Fleurbaey (2008)). Again, as this chapter is about *interpersonal comparisons* and not about *social evaluation*, we do not consider any type of an aggregator function for our analysis. However, looking at how the poor of each country fare in the world distribution might be worth for answering the question of who will be better or worse off under which metric.

and the “wage” metric in the last column. The extent of re-rankings, however, differs. For instance, the income poor in Portugal find themselves in the lowest percentile of the global distribution and thus, unsurprisingly fare also worst under the remaining metrics, with a marginal improvement for the “rent” metric only. Contrary, re-rankings are even more significant for households from countries with a relatively lower preference for work, as e.g. Ireland. For Belgium, there is barely an effect and most interestingly, the ranking of the poor in the US changes in the opposite direction compared to Table 3.3. These effects might be somewhat explained with view to clearly higher MRS for this group in both countries compared to the average (column (8) in Table 3.4).

Interpretation. As explained in Section 3.3, the metrics applied differ only in the way they treat heterogeneity in consumption-leisure preferences. As a result, agents with different willingness-to-work might be evaluated very differently depending on the metric. Then, the first and most important question is, who will be considered better and worse off under the various criteria. Therefore, we focused on a pure index ordering for each metric based on individual percentile positions in the accordant global distribution. In terms of country comparisons, we may cluster households according to certain groups of countries. For instance, households from apparently “work-loving countries” (as Denmark and the US) are better off on average than households from apparently “work-averse nations” (e.g., Austria and Ireland) under the “rent” criterion. The reason is that with the “rent” metric, the policy maker tends to evaluate an agent with a higher willingness-to-work to be better off compared to another agent with a lower willingness-to-work (assigning low responsibility for work aversion). Thus, the latter would eventually be favored to receive redistribution from the former and on average, we more often conclude from our interpersonal comparisons that households from Ireland should be “favored” over those from the US. Contrary, under the “wage” metric, we obviously more often favor households from the US over those from Ireland (due to higher responsibility assigned to work aversion). However, these considerations are based on the average percentiles for all households while we might conclude differently when looking at subgroups (income quintiles) of a countries population, as additionally considered in the previous paragraph.

3.5.3 Assessing the differences in welfare rankings

Finally, we check what among the direct components of the labor supply model, i.e. estimated country-specific α and β parameters or country differences in socio-demographic household composition (taste shifters), can explain the differences in the welfare rankings. Recall from Section 3.4 that both factors determine overall heterogeneity in consumption-leisure preferences and are solely responsible for ranking differences between the metrics (Figure 3.2). We start with identical preferences imposed for each household in the sample, isolate all components related to the two factors and separately introduce heterogeneity based on the set of estimates as derived in Section 3.5.1 - while keeping individual budgets and observed choices (c, h) fixed. We thus do not re-estimate the models but perform a pure decomposition analysis with respect to observed heterogeneity. Under these conditions, we recalculate the metrics and check each time how international percentile distributions are affected. Results reported in Table 3.5 first show the coefficient of variation for MRS. Variation in MRS is taken as an indicator for the extent to which a certain factor contributes to overall taste differences. Columns 2 to 6 present how empirical rank correlations between the "rent" and the further metrics change for the different scenarios (equivalent to the correlation plots presented in Figure 3.2).

In the baseline scenario (first row), we assume reference preferences, i.e. preference parameters and characteristics are taken from the median MRS household as defined above.[23] The coefficient of variation for MRS equals zero by construction and the correlation between the "rent" metric and income equals 0.98, while being perfect for the other metrics (which corresponds to the aforementioned results in the top panels of Figure 3.2). Rows 2-5 introduce heterogeneity in socio-demographic characteristics. That is, all preference parameters are held constant according to the reference household but some characteristics are allowed to change across countries and households. In row 2, age differences are the only source of variation. Obviously, this cannot explain much of the variation in MRS and barely changes the empirical correlations across metrics. Education levels and especially

[23] Note that results will depend on the choice of the reference household, why they should also at this stage be considered as illustrative. However, we check for different specifications of the reference household in Section 3.5.4.

Table 3.5: Variation in MRS and correlation between metrics by different sources of preference heterogeneity

Source of preference heterogeneity:		Coeff. var.	Rank correlation of Rent metric with			
Pref. parameters	*Socio-demographics*	in MRS	Income	RW $p25$	RW $p75$	Wage
		(1)	(2)	(3)	(4)	(5)
Identical	Identical	0.00	0.98	1.00	1.00	1.00
Identical	Age only	0.04	0.98	0.99	0.99	0.99
Identical	Education only	0.20	0.97	0.99	0.95	0.94
Identical	Children only	0.31	0.98	0.97	0.90	0.88
Identical	All	0.35	0.98	0.96	0.86	0.82
Country-specific	Identical	0.40	0.96	0.95	0.82	0.77
Country-specific	Age only	0.40	0.97	0.95	0.84	0.79
Country-specific	Education only	0.40	0.96	0.95	0.81	0.75
Country-specific	Children only	0.65	0.98	0.92	0.72	0.60
Country-specific	All	0.60	0.99	0.91	0.70	0.59

Note: MRS are calculated for a fixed bundle $\left(c(\bar{h}), \bar{h}\right)$ with global mean hours $\bar{h}$ and corresponding net income $c(\bar{h})$ and averaged. c-values in 2001 PPP-USD. The median household in terms of this MRS serves as the reference household. *Source*: Own calculations based on EUROMOD and TAXSIM.

the presence of children seem to explain more of the variation in MRS (rows 3 and 4). As a result, rank correlations between income and the metrics become weaker when moving towards the "wage" metric. These effects cumulate when heterogeneity in all three characteristics is introduced (row 5).

In rows 6-9, country-specific differences in preferences are considered. First, all socio-demographic characteristics are kept constant and solely differences in estimated preference parameters determine heterogeneity in tastes. That is, α and β parameters are the only source of variation across countries while characteristics $\mathbf{z}_i$ are set according to the reference household. The magnitude of the effect is very similar to that of accounting for all socio-demographic characteristics in the case before. Thus, country-specific consumption-leisure preferences already explain a good deal of the observed variation in MRS and between the metrics. Second, country differences in socio-demographics are combined with variation in different characteristics in rows 7-9. Here, especially the presence of young children has a substantial impact on the variation across countries, which seems to account for most of the variation when allowing for full heterogeneity in characteristics and estimated preference parameters (last row). A standard variance decomposition (ANOVA) for MRS and differences in individual ranks across metrics supports these findings. That is, country-specific preferences as well as the correlation between country-specific preferences and family size (children) are most important and significant factors of variation.

While the results presented so far only give an indication about what affects overall correlation between the ordinal metrics, nothing is said yet about which factors actually drive the observed differences in individual cross-country rankings. Therefore, we additionally reproduce welfare rankings, again in terms of average percentiles, for the two main counterfactual scenarios reflecting the different sources of heterogeneity. Table 3.6(a) in the appendix only maintains differences in socio-demographic characteristics while in Table 3.6(b), only the heterogeneity in preference parameters is accounted for. As can be seen, the differences between metrics and across countries in Table 3.6(b) are by and large similar to the orderings in Table 3.3. In contrast, Table 3.6(a) only reveals a very small influence of demographics on average ranking positions. This suggests that the ranking of individuals across countries in Table 3.3 is indeed primarily affected by estimated country-specific preferences, rather than by demographic composition.[24]

3.5.4 Robustness checks

In this section, we perform robustness checks with respect to the labor supply specification, the calculation of the empirical welfare metrics and the decomposition analysis. Detailed results are presented in the appendix.

Labor supply model. For the illustrative purpose of this chapter, an interpretationally simple specification for the labor supply model has been used. A Box-Cox specification for the deterministic part of the utility function – as often used in the normative literature – seemed particularly suitable since monotonicity

[24]There are few exceptions. For France, the trend in Table 3.3 is more similar to Table 3.6(a), suggesting that the demographic composition drives the result for this country. Also Belgium shows a reverse influence of demographics, which, however, does not outweigh the impact of estimated preferences.

and concavity conditions are usually fulfilled which can easily be checked ex-post. Using a more flexible functional form (e.g. quadratic, see Bargain et al. (2012)) is more frequent in the empirical literature on labor supply and taxation. However, notice that the gains from flexibility are partly lost in the present context given that tangency conditions must be imposed (which can be done by adding monotonicity and concavity requirements as constraints directly into the likelihood maximization). This is checked for the countries under analysis using the same data. We find that MRS as defined in Table 3.2 turn out to be very similar for the Box-Cox and a (constrained) quadratic specification for the labor supply model (see Figure 3.4).[25]

Calculation of welfare metrics. We calculate welfare metrics by using indifference curves based on estimated preference parameters and corresponding to a certain level of utility. In the baseline, this level of welfare is taken as the expected value over a large number of draws for the EV-I random terms (while always taking the resulting optimal level of utility; method 1 in Figure 3.5). However, alternative ways of computation can be suggested, also consistent with the random nature of the labor supply model. First, metrics for each optimal utility level of each draw are computed while averaging then follows over all calculated metric values (for each individual) rather than utilities (method 2). Second, we compute the metrics for the utility level corresponding to each discrete hours category and directly take the weighted sum (by predicted probabilities using the expected random term) - rather then artificially drawing many random terms (method 3). While these alternative procedures necessarily change the levels of the metrics, we find that they do almost not affect the resulting orderings compared to the baseline results.

Specification of the reference household. For the decomposition analysis in Section 3.5.3, the reference household in the baseline scenario was specified according to the median $MRS_{c(\bar{h}),\bar{h}}$. However, variation in MRS and, hence, correlation between the metrics when partly introducing preference heterogeneity, might be

[25]Starting with 7 hours choices for both specifications as described above, we also find that estimation results are robust to choosing an even narrower choice set with 13 categories (0 to 60 hours/week with a step of 5 hours). See also Bargain et al. (2012).

sensitive to that specification. Thus, as a robustness check, further specifications for the reference household have been set with respect to $p10$-, ($p50$-) and $p90$-values in the global distribution of MRS (net income c), while checking that the reference households selected show sufficient heterogeneity, both in terms of the country they stem from and in terms of socio-demographic characteristics (Table 3.8). Average MRS, the coefficient of variation for MRS and correlation between the metrics of course change quantitatively with the specification. Yet, our core results do not change, i.e. the finding that estimated country-specific preference parameters (rather then socio-demographic differences) determine heterogeneity in the rankings across metrics and countries is confirmed (see Figures 3.6(a) and 3.6(b)).

3.6 Concluding discussion

The aim of this chapter was to contribute to the 'beyond GDP'-debate in terms of interpersonally comparing well-being in several dimensions and across different countries. We have departed from standard income rankings by the inclusion of leisure, hence, respecting one of the most primary specifications of welfare in the normative literature. Our main focus was to illustrate for the consumption-leisure space the use of welfare metrics that take preference heterogeneity into account. Our results suggest that differences in consumption-leisure preferences – and their normative treatment – might matter substantially when interpersonally evaluating welfare in an international context. Precisely, under criteria that tend to evaluate agents with a relatively higher willingness-to-work to be better off compared to agents with a lower willingness-to-work, households from apparently "work-loving countries" (e.g. the US or Denmark) rank higher on average. Inversely, with a metric that considers agents with a relatively lower willingness-to-work as better off, we on average attribute a higher welfare level to households from nations that appear to be more "work-averse"(e.g. Austria or Ireland). The re-ranking of households between nations when moving from the former to the latter types of welfare criteria is substantial, which is noticeable given that we consider a relatively homogeneous set of countries and since the welfare measures only add one dimension to income ("leisure"). A decomposition analysis shows that cross-country differences in consumption-leisure preferences are driving this result. The analysis is entirely performed in terms of interpersonal comparisons and our findings suggest that the respect for preference heterogeneity should precede any attempts to compare countries on the basis of a SWF or other forms of aggregated indices.

For the sake of illustration and implementation of the welfare metrics, we intended to keep the empirical framework of this chapter simple. Hence, a lot remains to be done to bring empirical estimations closer to the possibility of sound normative evaluations. In particular, the fit of labor supply models is often improved by the introduction of a term accounting for fixed costs of work. Thus it is possible to rationalize the non-participation of some people in terms of fixed costs rather than through steep indifference curves – and introducing fixed costs would certainly reduce some of the apparent differences in MRS across household types and countries. However, fixed costs of work are usually not identified from preferences, as shown by van Soest, Das and Gong (2002), but, if introduced in the model, they may in fact capture some elements of work disutility (or even work utility, i.e., negative fixed costs, if inactivity is a source of despair, as shown by Clark and Oswald (1994)). A similar logic applies to demand-side constraints which restrict the choice set available to the individual (Dagsvik (1994); Aaberge, Colombino and Strøm (1999); Dagsvik and Strøm (2006)) and could also result in involuntary unemployment (Peichl and Siegloch (2012)). Here, a specific and additionally demanding requirement in the present context would have been to determine country-specific choice opportunities. In addition, one limitation of the tax-transfer calculators we use is that in-kind benefits or public services more generally are not taken into account due to data limitations. As the levels of non-cash transfers differ across countries, this has implications for cross-country differences in welfare metrics. However, it is hard to assess ex-ante how accounting for public services would affect the estimation of consumption-leisure preferences and hence the different welfare rankings. Importantly, the construction and especially interpretation of welfare metrics as used in the present chapter is clearly more complicated when additionally accounting for the various factors mentioned, i.e., especially in presence of non-regular and possibly discontinuous indifference curves. We leave these considerations for further research. Finally, we have chosen to model married women's labor supply since variability in work hours of this group is more likely to reflect true choices in the consumption-leisure space (and responses to financial incentives) compared to other groups. Of course, a more complete welfare analysis across countries should first include other subgroups as well and second, consider further dimensions of individual well-being besides income and leisure. Then, comprehensive international welfare comparisons might also involve further aspects as the respect for different population sizes or intertemporal comparisons (Fleurbaey and Tadenuma (2009)).

3.7 Appendix

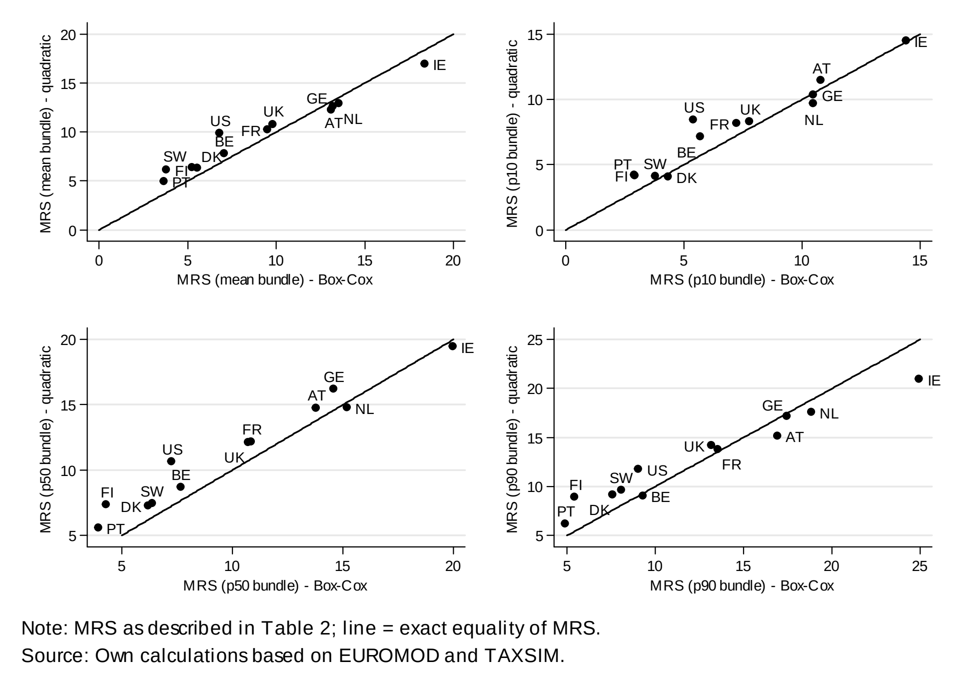


Figure 3.4: MRS for Box-Cox vs. quadratic specification of the utility function

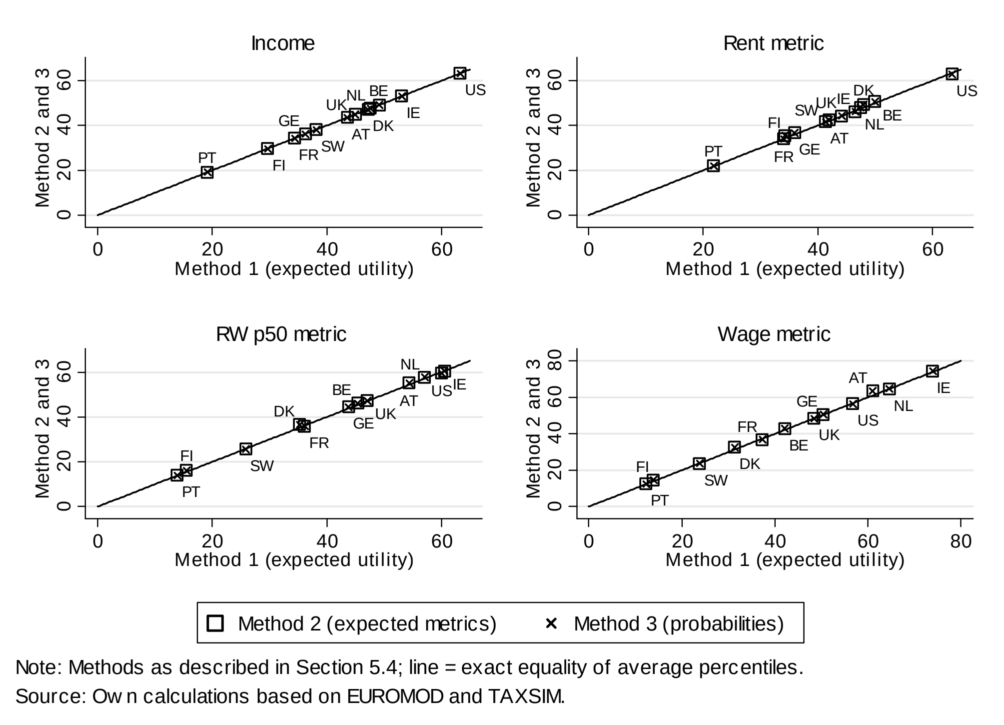


Figure 3.5: Average percentile positions by countries for different methods of metrics computation

Table 3.6: Average percentile positions for different sources of preference heterogeneity

(a) Source of preference heterogeneity: differences in socio-demographic composition

	Income (1)	Rent (2)	RW $p25$ (3)	RW $p50$ (4)	RW $p75$ (5)	Wage (6)
AT	43.6	47.7	47.4	47.2	47.1	47.3
BE	49.2	45.9	48.7	49.8	50.7	51.4
DK	47.2	41.1	41.1	41.0	41.1	41.5
FI	29.7	24.1	22.6	22.5	22.6	22.6
FR	34.4	33.7	35.1	35.9	36.6	37.0
DE	36.3	39.7	39.3	39.3	39.5	40.1
IE	53.1	55.5	56.5	57.1	57.5	58.2
NL	47.6	51.0	52.5	53.1	53.6	54.4
PT	19.1	17.2	18.2	18.8	19.5	18.8
SW	38.1	33.5	32.0	31.5	31.3	31.3
UK	45.0	45.8	45.9	45.8	45.8	45.8
US	63.3	62.4	61.9	61.6	61.2	60.9

(b) Source of preference heterogeneity: differences in estimated preference parameters

	Income (1)	Rent (2)	RW $p25$ (3)	RW $p50$ (4)	RW $p75$ (5)	Wage (6)
AT	43.6	41.6	50.7	55.1	57.9	59.3
BE	49.2	50.5	47.6	44.7	42.2	41.1
DK	47.2	50.4	38.4	33.3	29.8	29.3
FI	29.7	35.5	18.2	14.9	12.9	13.4
FR	34.4	36.8	33.9	32.8	32.3	32.2
DE	36.3	31.4	41.3	47.4	52.2	55.4
IE	53.1	42.7	52.9	62.2	69.9	78.6
NL	47.6	44.7	53.1	58.4	62.9	67.5
PT	19.1	21.2	16.1	14.7	13.6	13.4
SW	38.1	42.5	29.3	26.2	24.4	24.5
UK	45.0	43.4	47.1	47.9	48.6	48.6
US	63.3	64.4	61.6	59.5	57.8	56.2

Note: See Table 3.3. *Source*: Own calculations based on EUROMOD and TAXSIM.

Table 3.7: Marginal rates of substitution (between consumption and labor) by subgroups

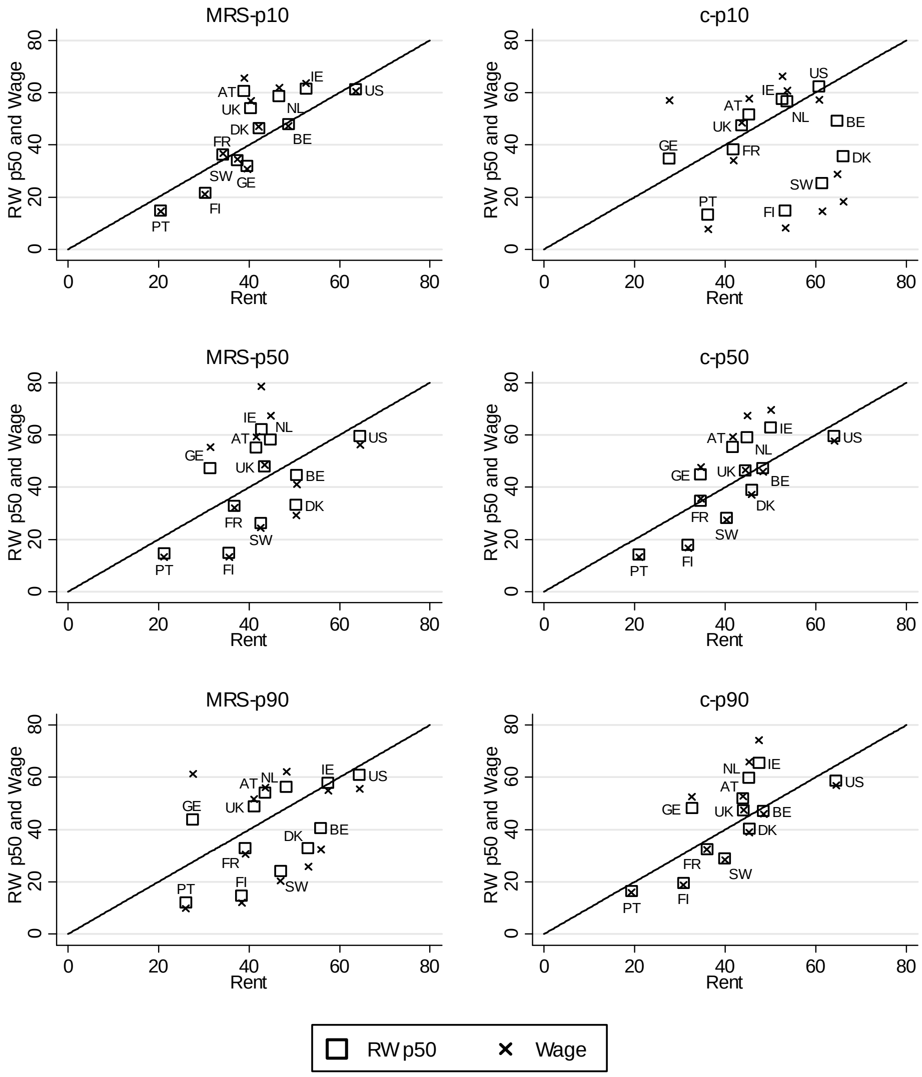
	MRS $(c(\bar{h}), \bar{h})$ (1)	Standard error (2)	MRS $(c(h^{p10}), h^{p10})$ (3)	MRS $(c(h^{p50}), h^{p50})$ (4)	MRS $(c(h^{p90}), h^{p90})$ (5)
Full sample	8.7	(5.3)	7.0	9.6	12.0
Children younger 3	13.7	(6.6)	10.9	15.0	18.8
Children between 3 and 6	13.5	(6.9)	10.8	14.8	18.5
Children between 7 and 12	10.8	(5.7)	8.6	11.8	14.8
No young children	6.3	(2.9)	5.0	6.9	8.6
Low education	12.5	(5.9)	10.0	13.9	17.3
Medium education	9.1	(5.0)	7.2	10.0	12.5
High education	7.3	(4.6)	5.8	8.0	10.0
Wife younger 25	7.4	(4.7)	5.9	8.1	10.1
Wife between 25 and 55	8.9	(5.3)	7.1	9.8	12.2
Wife older than 55	7.7	(4.3)	6.1	8.4	10.5
Husband younger 25	6.8	(3.9)	5.4	7.4	9.3
Husband between 25 and 55	8.9	(5.4)	7.1	9.8	12.2
Husband older than 55	7.7	(3.7)	6.2	8.5	10.6

Note: See Table 3.2. *Source*: Own calculations based on EUROMOD and TAXSIM.

Table 3.8: Descriptive statistics for reference households in decomposition analysis

Reference household	*Country* (1)	Age wife (2)	Age husband (3)	Child < 3 (4)	Child $3-6$ (5)	Child $7-12$ (6)	Low educ. (7)	Med. educ. (8)	MRS $(c(\bar{h}), \bar{h})$ (9)	Net inc. (10)
$MRS{-}p10$	US	37	35	–	–	–	✓	–	4.0	672
$MRS{-}p50$	FR	44	45	–	–	✓	–	–	7.4	862
$MRS{-}p90$	NL	39	30	–	✓	–	✓	–	14.5	965
$c{-}p10$	BE	28	30	✓	✓	–	–	✓	9.4	632
$c{-}p50$	UK	46	47	–	–	–	✓	–	7.3	789
$c{-}p90$	SW	48	47	–	–	–	–	–	4.6	1504

Note: $MRS{-}p10$ ($c{-}p10$) is the household with the $p10$-value for MRS (net income) in the global distribution. For $p50$- and $p90$-values accordingly. Income in 2001 PPP-USD. *Source*: Own calculations based on EUROMOD and TAXSIM.



Note: Line = exact equality of average percentiles.
Source: Own calculations based on EUROMOD and TAXSIM.

Figure 3.6: Average percentile positions when preference heterogeneity due to estimated preference parameters only - by different reference households

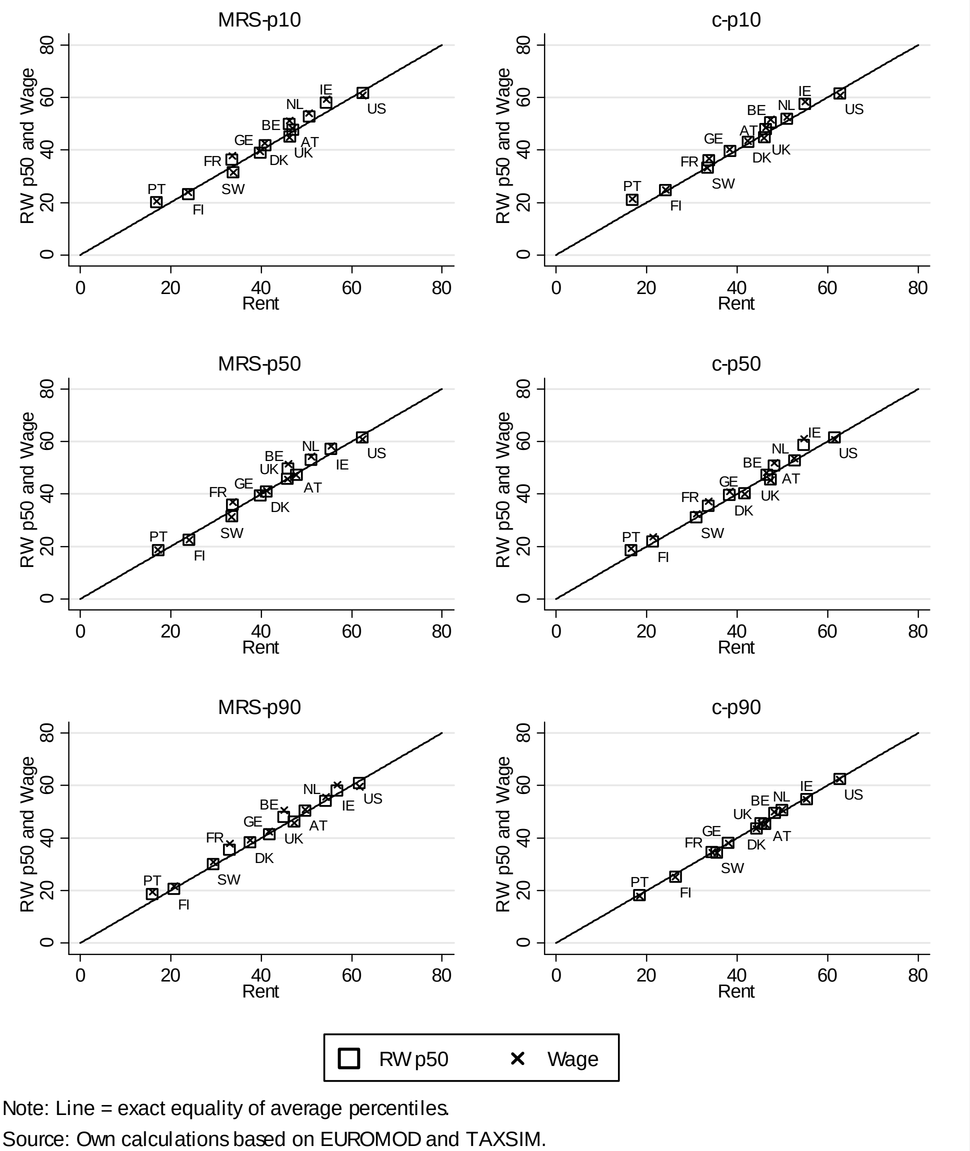


Figure 3.7: Average percentile positions when preference heterogeneity due to sociodemographics only - by different reference households

Chapter 4

Equality of opportunity and redistribution

4.1 Introduction

Socio-economic inequality is high on the political agenda in many European countries. In recent years there has been a shift of focus from inequality in incomes to inequality of opportunities (in income acquisition). The concept of equality of opportunity (EOp), proposed by Roemer (1993, 1998), represents a departure from the traditional notion of equality of outcomes (EO), which refers to an equal distribution of economic outcomes (e.g. income, consumption or well-being) across a population. The EOp theory, in contrast, separates the influences on the outcomes an individual experiences into circumstances and effort. Circumstances are defined as all factors outside individual control for which the society in question deems individuals should not be held accountable. These can be, for instance, social background, parental education, gender, age, place of birth or ethnic origin. Effort, on the other hand, is all actions and choices within individual responsibility for which a society holds the individual responsible, for example, schooling choices or labor supply decisions. An EOp policy thus aims at leveling the playing field by compensating individuals for any deficits due to circumstances and ensuring that only effort affects outcome achievement (Roemer (1993, 1998)).

The extensive body of work on EOp has largely focused on Latin America and on OECD countries.[1] Cross-European comparisons have only recently begun using microdata from the 2005 wave of the European Union Statistics on Income and Living Conditions (EU-SILC). For example, Checchi, Peragine and Serlenga (2010) and Marrero and Rodríguez (2010b) use the data to investigate inequality of opportunity (IOp) levels and their main determinants in Europe. Marrero and Rodríguez (2010b) find that in particular varying development levels, education and social protection expenditure are responsible for differences in IOp in Europe. The macroeconomic tax structure and the labor market, on the other hand, do not have a significant impact. Checchi et al. (2010) also distinguish the impact of such macroeconomic factors on ex ante and ex post IOp. To empirically assess IOp levels, both papers rely on inequality measures from the Generalized Entropy (GE) family and focus on a single income concept. Our study follows this line of research by using microdata from the EU-SILC to assess the extent of EO and EOp in several European countries.

Our contribution to the literature is twofold. First, we apply and compare two different measures – the Gini opportunity (GO) index developed by Lefranc et al. (2008) and a parametric estimation approach based on decomposable inequality measures of the GE family (Bourguignon et al. (2007a); Ferreira and Gignoux (2011)). Second, and more importantly, we investigate how the different tax-and-transfer systems affect outcome and opportunity inequality by comparing EOp levels for income concepts at different stages of redistribution. Since most modern theories of justice only defend compensation for inequalities due to circumstances, the empirical assessment of public policy effects on IOp seems to be the logical second step in comprehensive EOp analysis. However, the effective microeconomic impact of the tax-benefit system is rarely addressed in the existing EOp literature (see, e.g., Roemer et al. (2003) and Checchi et al. (2010)). Therefore, we analyze questions such as: are redistributive policies in Europe effective in promoting EOp? If so, is this primarily a result of income taxes and social contributions or do benefit

[1] Bourguignon, Ferreira and Menéndez (2007a), Ferreira and Gignoux (2011), and Paes de Barros, Ferreira, Molinas Vega and Saavedra Chanduvi (2009), for example, analyze EOp in Latin America. Roemer, Aaberge, Colombio, Fritzell, Jenkins, Lefranc and et al. (2003) and Lefranc, Pistolesi and Trannoy (2008) examine EOp in OECD countries. Lately, Africa has become an additional focus of research among less developed countries (see, for example, Cogneau and Mesplé-Somps (2008)).

schemes play the more important role? Moreover, are improvements in terms of EO associated with advances regarding opportunity equality? Answering these questions will help to identify the priorities of the different redistributive systems in the EU.

Throughout our study, outcomes are defined as equivalized income.[2] For the circumstances variable in our EOp analysis, we primarily consider parental background, proxied by the father's and mother's level of education. It has been established by many studies that in Western societies an individual's economic success is largely determined by the family background.[3] Parents may influence their children's income-generating capacity through various channels. These include the formation of preferences and aspirations, the genetic transmission of natural abilities and also the parents' social connections in the labor market. However, since no one can choose their parents, these factors are clearly outside individual control. In addition, we include an indicator of the activity status of the father and an indicator whether the respondent was born in a foreign country. Methodologically, we rank countries by applying the GO index developed by Lefranc et al. (2008). Then we compare the results to the parametric estimation approach introduced by Bourguignon et al. (2007a) and Ferreira and Gignoux (2011) which allows for the inclusion of more than one circumstance in the presence of small sample sizes.

Our results reveal that both methods and different circumstance sets yield rather robust country rankings for various circumstance sets. We also find a divide in Europe between the Continental and the Nordic states that provide their citizens with relatively high levels of EOp and the Anglo-Saxon and Eastern European countries where opportunities for income acquisition are relatively unequal distributed. With regard to redistribution in Europe, we find that tax- and benefit-schemes partially reduce IOp, with social benefits being the most important factor for reducing inequality in the majority of countries. The largest income- and opportunity-equalizing effects are found in Nordic and Continental European coun-

[2]We choose income as the dependent, or outcome, variable rather than, for example, consumption, because we believe that economic inequality is more about the access to, or control over, economic resources than about the actual exercise of this power (see Jenkins and Van Kerm (2009) for details).

[3]See Dustmann (2004), Roemer (2004), Björklund and Jäntti (2009), as well as Checchi and Peragine (2010). The sub-sequent description of the channels through which parental background influences their offspring's income acquisition closely follows Bowles and Gintis (2002).

tries. In Anglo-Saxon countries, taxes and benefits only lead to relatively small improvements in income and opportunity equality. We show that the equalizing effects of taxes and benefits on IOp substantially differ from the ones based on inequality of outcomes (IO).

The reminder of this chapter is organized as follows. In Section 4.2 we review the conceptual framework and introduce our methodology for measuring EOp. Section 4.3 presents the data set as well as the main variables of our study. Section 4.4 contains the results of our empirical analysis. In addition to a cross-country comparison of EOp, we contrast our results using different measurement techniques. Furthermore, we investigate the direct impact of redistributive policies. Our results are discussed further in Section 4.5, where we also analyze the relationship between economic performance and EOp. Section 4.6 concludes and identifies some directions for future research.

4.2 Methodology

4.2.1 Conceptual framework

Relying on the philosophical work by Rawls (1971), Sen (1985), Dworkin (1981a, 1981b), Cohen (1989), and Arneson (1989), it is Roemer (1993, 1998) who introduces the concept of equal opportunities in the economics literature. Roemer (1998) separates the influences on the outcome an individual experiences into circumstances and effort. Circumstances are defined as factors outside individual control. These can be, for instance, the individual's social background, parental education, gender, age, place of birth or ethnic origin. Effort, on the other hand, is all actions and choices within individual responsibility, for example, schooling choices and labor supply decisions or the degree to which one leads a healthy lifestyle (see Pistolesi (2009)).

Roemer (1998) argues that inequalities due to effort can be considered as equitable, since they are the result of individual freedom and choice, whilst inequalities due to differences of circumstances cannot be ethically acceptable. 'Equalizing opportunities' thus means correcting unequal circumstances while leaving differences due to effort unchanged. Accordingly, an 'equal opportunity society' is characterized by guaranteeing its members equal access to advantage regardless of their circumstances, but holding them responsible for turning that access into actual advantage by the application of effort (Roemer (1998), p. 24). Hence, leveling the playing field means guaranteeing that those who apply equal degrees of effort, i.e. those who are at the same rank of their respective type-effort distribution, end up with equal achievements.

In accordance with Roemer (1998), we only distinguish between two generic determinants of individual outcome: circumstances c , which are characteristics outside individual control, and effort e , representing all factors affecting earnings that are assumed to be the result of personal responsibility. We partition the population into a set of types, $T = \{1, 2, ..., t\}$, whereby a type t comprises a subset of the total population with similar circumstances.

The income y of individual i is defined as depending on both individual circumstances and personal effort:

$$y_i = f(c_i, e_i). \tag{4.1}$$

For our empirical application we have to deal with the informational constraint that only an individual's circumstances are observable, whereas the responsibility variable, i.e. effort, is non-observable. While Roemer's approach measures the degree of a person's effort by her rank in the effort distribution of her type[4], we follow Ferreira and Gignoux (2011) and – in line with Van de gaer (1993), Lefranc et al. (2008) and Bourguignon et al. (2007a), Checchi and Peragine (2010) – apply the ex-ante approach to EOp. Hence, we define the remaining differences in individual incomes, once the influence of circumstances has been identified, as a result of effort.[5] Hence, our effort variable, e, comprises all factors that have not been assigned to circumstances, including measurement errors and transitory departures from the permanent level of income, together with luck and innate abilities. Although talent and luck are not explicitly modeled[6], they are implicitly

[4]For a summary of the procedure Roemer (1998) uses to deal with this problem and how it is applied to the ranking of income distributions, see Peragine (2004).

[5]For a detailed distinction between an ex-ante and ex-post approach to EOp, see Fleurbaey and Peragine (2013).

[6]For a formalization that includes luck, see Lefranc, Pistolesi and Trannoy (2009).

classified as within the sphere of individual responsibility. This assumption leads to a lower-bound of IOp (Ferreira and Gignoux (2011)) and an overestimation of the fraction of inequality which is considered ethically acceptable.

We track the consequences of different social origins and denote opportunities as unequal as long as incomes are subject to this circumstance variable, i.e. $F(y|c) \neq F(y)$. Put differently, EOp is satisfied if, and only if, the distribution of income is independent of circumstance:

$$\forall(c, c')\forall e,\ F(y|c, e) = F(y|c', e). \tag{4.2}$$

To test for the existence of EOp, we rely on two different methodologies. First, we apply the GO index, which was developed by Lefranc et al. (2008). This IOp index allows us to rank countries according to Lorenz dominance. The drawback of this approach, however, is that it cannot take into account more than one circumstance variable when applying it to small sample surveys because of too small cell sizes. In a second step we also use a parametric estimation procedure introduced by Ferreira and Gignoux (2011). This approach allows circumstances to be controlled for, even with small sample and cell sizes.

4.2.2 The GO index

Inspired by Van de gaer (1993), Lefranc et al. (2008) develop an IOp index based on the Gini inequality measure. The GO index enables us to quantify the degree of IOp and to rank countries according to their degree of EOp.

According to Lefranc et al. (2008), the GO index must fulfill five properties. First, it has to meet the requirement of within-type anonymity, i.e. the index has to be invariant to any variation of two individuals with similar circumstances. Moreover, the between-type Pigou-Dalton transfer principle must also hold. Third, normalization implies that the index must be equal to zero if the cumulative distribution functions corresponding to all circumstances are identical. Finally, the principles of population and scale invariance mean that the index is invariant to a replication of the population and to a multiplication of all incomes by a positive scalar.

The proposition in Lefranc et al. (2008) concentrates on the opportunity sets to which people have access and attempts to make these sets as equal as possible. Hence, to comply with their approach, we first need to define a measure of the opportunities offered to the different types. In line with Lefranc et al. (2008), we measure the feasible opportunities of a given type by the area under its Generalized Lorenz (GL) curve. We then rank all circumstances according to twice this area, starting from the smallest one. For type t, whose population share is q, this area is equivalent to

$$\mu_t(1 - G_t) \tag{4.3}$$

where μ is the type-specific mean income and G denotes the type-specific Gini coefficient. The GO index for income x is then defined by:

$$GO(x) = \frac{1}{\mu} \sum_{i=1}^{k} \sum_{j>1} q_i q_j (\mu_j(1 - G_j) - \mu_i(1 - G_i)) \tag{4.4}$$

where i and j denote different types. It computes the weighted sum of all the differences between the areas of the opportunity sets and thus is, in essence, a Gini aggregator of the areas under the GL curves for each type (cf. Bourguignon, Ferreira and Walton (2007b)). As the GO index is divided by the mean income of the entire population μ, it is independent of the wealth of the society. It can be shown that if the number of circumstances, t, corresponds to the number of individuals, the GO index is equal to the Gini coefficient (cf. Lefranc et al. (2008)). It can therefore be seen as an extension of the traditional Gini index, which takes values between 0 and 1.

However, since estimation of GL curves requires a reasonable number of observations within each type, the partition of the population must be rather coarse. A consideration of more than one circumstance is difficult due to practical reasons in the presence of small cell sizes. We therefore introduce an alternative approach, which allows for a more inclusive treatment of EOp.

4.2.3 Parametric estimation

The parametric estimation procedure applied in this chapter is based on Bourguignon et al. (2007a) and Ferreira and Gignoux (2011). In contrast to Lefranc et al. (2008), they introduce a weaker criterion for the empirical identification of EOp. According to Ferreira and Gignoux (2011), EOp is achieved if the mean advantage levels are identical across types. If $\mu^k(y) = \int_0^\infty y dF^k(y)$, this weaker criterion for EOp can be written as:[7]

$$\mu^k(y) = \mu^l(y), \forall l, k | T_k \in \Pi, T_l \in \Pi. \tag{4.5}$$

Measuring IOp means capturing the extent to which $\mu^k(y) \neq \mu^l(y)$, for $k \neq l$. Their IOp index has to satisfy the same properties as the GO index, namely anonymity, the Pigou-Dalton transfer principle, normalization, population replication, and scale invariance. Moreover, the index has to be additively decomposable. All these properties are satisfied if we choose a positive multiple of a member of the GE class (E_α) as an inequality measure. Yet by introducing the further requirement of path-independent decomposability (see Foster and Shneyerov (2000)), the set of eligible indices reduces to a single inequality measure, the mean logarithmic deviation (Theil (0)), which is denoted by E_0, since it is a member of the GE class of measures if its parameter is set to zero.

Furthermore, their parametric approach allows for the consideration of different circumstances variables, since it also works for small sample sizes. Explicitly noting that circumstances are exogenous by definition, whereas effort variables can also be affected by circumstances, equation (4.1) is expressed as:

$$y = \phi(C, e(C)). \tag{4.6}$$

With OLS we can estimate a log-linearized version of (4.6):

$$\ln y = C\psi + \varepsilon \tag{4.7}$$

where ε represents a random term and ψ captures both the direct effect of circumstances on outcomes as well as the indirect effect through their impact on effort variables (Bourguignon et al. (2007a)). Following Ferreira and Gignoux (2011), we can then construct a parametric estimate of the smoothed distribution:

[7] For an in-depth discussion on this criterion and its relation to Roemer's original definition, see Ferreira and Gignoux (2011).

$$\tilde{\mu}_i = \exp[\hat{\psi} C_i] \tag{4.8}$$

where $\tilde{\mu}_i$ indicates the counterfactual advantage level of individual i and $\hat{\psi}$ the parameter estimate from the OLS regression. As we replace individual incomes by their predictions, all individuals with the same circumstances must have the same advantage levels. Thus, in the case of perfect EOp all predicted income levels would be identical. IOp can then be measured as the inequality of these counterfactual incomes, where differences are only due to circumstances. It can be computed as $IOp = E_0(\tilde{\mu})$ and the share of IOp in total inequality $E_0(\tilde{\mu})/E_0$.

4.3 Empirical strategy

In this section we introduce the EU-SILC data set, on which our empirical analysis is based. It constitutes the largest comparative survey of European income and living conditions. We depict the main variables of our analysis, income and individual circumstances, and explain how the income and circumstance variables are generated from the EU-SILC.

4.3.1 The EU-SILC

Our study relies on cross-sectional and multidimensional microdata from the EU-SILC, which is an annual survey conducted across European countries and collated by Eurostat. The EU-SILC was launched in 2004 and succeeds the European Community Household Panel (ECHP). Its comparative statistics are fast becoming the new reference source for income distribution, living conditions, and social exclusion at the European level.

The EU-SILC consists of two components: a household survey, which is answered by the household reference person, and an individual questionnaire for each household member aged 16 and over. At the household level the EU-SILC covers basic information on income, social exclusion and housing. At the individual level the EU-SILC provides information on demography, education, labor force status, health and income. In this manner, it provides both information on individual circumstances and data on individual income, which serves as the dependent variable in our analysis.

We utilize data from the 2005 wave of the EU-SILC because this is the only wave in which the cross-sectional component is supplemented with additional questions relating to the intergenerational transmission of poverty. Respondents aged 25 to 65 were questioned about parental and family attributes during their early teenage years (12-16 years of age). The questions cover, for instance, the occupational status of the respondents' parents, information on parental education and the presence of financial difficulties in the household. This information will serve as circumstance variables our analysis.

The 2005 data set covers 24 EU member states plus Norway and Iceland. It provides information on the income and living conditions of 422,400 individuals and 197,657 households. Our study, however, excludes Italy, France, Spain, Portugal, Greece, as well as Latvia and Lithuania because we have no suitable individual gross income data for these countries. We also exclude Cyprus because under our restrictions the Cypriot data does not yield a representative sample size. Due to its small size and obvious outlier position, we also remove Luxembourg from the analysis. Our cross-country comparison of EO and EOp thus includes 17 countries, focusing on Continental Europe (Austria, Belgium, Germany and the Netherlands) and Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) as well as on Anglo-Saxon countries (Ireland and the United Kingdom). A further six countries, found in Eastern Europe, comprise the Central Eastern European (CEE) countries of the Czech Republic, Hungary, Poland the Slovak Republic and Slovenia, as well as the Baltic state of Estonia. This database offers a high degree of heterogeneity in terms of economic features and public policy.

Since we want to confine our analysis to full-time workers, we only keep individuals who usually work 30 hours or more per week. We restrict our sample to working-age individuals, aged 30 to 60 at the time of the survey. This age interval is chosen to exclude students or pensioners and permit a sound and comparable analysis of earnings across types and countries. Since the non-parametric approach only allows for one circumstance, we exclude women and restrict our analysis to male heads of households. This sample consists of 33,688 men aged 44.2 years on average. Country sample sizes vary between 582 observations for Iceland and 5,561 observations for Poland.

4.3.2 Income concepts

Income at a very detailed component level is the core of the EU-SILC survey. All income variables are expressed in euros and refer to the year 2004. We use equivalized, individual income variables, which are deduced from household data. The advantage of using variables derived from household statistics instead of personal data is that they better reflect the impact of redistributive policies, usually aimed at the entire household. Since household statistics cover all household members, benefits or allowances for unemployed or disabled individuals, as well as for families, children and pensioners, are all taken into account.

Our household income variables are derived from total household factor income, which is the sum of all household members' gross personal income components plus gross income components at the household level (see Table 4.1). Note that pensions are also treated as factor income. In order to analyze the effects of taxes and social benefits separately, we include a post-tax income variable (factor income after taxes and before benefits) and a post-benefit income variable (factor income after social benefits but before taxes), respectively. The taxes included in this analysis include taxes on income, social insurance contributions[8], regular taxes on wealth and regular inter-household cash transfers paid. The social transfers considered are all in cash except for housing benefits. Total disposable household income is total household factor income minus taxes plus social benefits. Note that this approach corresponds to the standard accounting approach to measure effective redistribution, where income concepts are defined at different stages of redistribution (e.g. Mitchell (1991), Whiteford (2008)). With this accounting framework a number of measures of the direct redistributive impact of the tax-benefit system can be constructed by comparing inequality measures (or IOp measures) for the different concepts of income. However, this approach is not able to account for any behavioral effects caused by redistributive policies and can only be regarded as a descriptive tool to capture effective redistribution.

We normalize household income by family size, using the household-size equiva-

[8]The variable "tax on income and social insurance contributions" includes tax adjustments-repayment/receipt on income, income tax at source and social insurance contributions, if applicable, see Eurostat (2008a), p. 108.

Table 4.1: Income definitions

(FI) / EQ	Equivalized factor income
(FI - TX) / EQ	Equivalized post-tax income
(FI + SB) / EQ	Equivalized post-benefits income
(FI - TX + SB) / EQ	Equivalized disposable income

Note: All income variables refer to annual incomes.
FI = (Factor income) The sum of all household members' gross personal income components (gross employee cash or near cash income; gross non-cash employee income (in the 2005 data set this variable only includes company car); gross cash benefits or losses from self-employment (including royalties); old-age benefits; survivor benefits); and gross income components at the household level (rental income from property or land; regular inter-household cash transfers received; interest, dividends and profit from capital investments in unincorporated business; income received by people aged under 16).
SB = (Social benefits) Unemployment, sickness and disability benefits; education-related allowances; family/children related allowances; social exclusion not elsewhere specified; and housing allowances.
TX = (Taxes) Taxes on income and social insurance contributions; regular taxes on wealth and regular inter-household cash transfer paid.
EQ = Equivalence scale.

lence scale.[9] By dividing total household factor income and total disposable household income (adjusted with the within-household non-response inflation factors) by the equivalized household size, we obtain equivalized factor income, equivalized post-tax income, equivalized post-benefits income and equivalized disposable income. Considering individuals, rather than households, as the unit of analysis is appropriate, since our analysis of EOp aims to identify inequalities at the individual level.

In order to rule out any potential bias due to extreme values, we adjust all income measures for each country by omitting the top 0.1 per cent of the total income distributions and all values equal to or below zero.

[9]For each person the equivalent (per-capita) income is the household income divided by the equivalent household size according to the modified OECD scale, which assigns a weight of 1.0 to the head of household, 0.5 to every household member aged 14 or older and 0.3 to each member aged under fourteen. Summing the individual weights gives the household-specific equivalence factor.

4.3.3 Individual circumstances

The circumstances affecting individual income are manifold. The GO index, in contrast to the parametric method, requires a reasonable number of observations within each type, as described in Section 4.2. Consequently, we begin by analyzing the impact of a single circumstance and investigate how the resulting EOp levels differ with respect to the underlying method. In line with most of the literature on EOp (see Roemer (1998); Ferreira and Gignoux (2011); Lefranc et al. (2008); Aaberge and Colombino (2012)), we use the level of father's education to represent social background.

In the 2005 EU-SILC module "Intergenerational transmission of poverty", respondents are asked about the highest level of education their father had attained before and during the period the interviewee was a young teenager, i.e. between the age of 12 and 16 (Eurostat (2008b)). Respondents were asked to choose between six categories: (1) less than primary education, (2) primary education, (3) lower secondary education, (4) upper secondary education, (5) post-secondary non-tertiary education and (6) first and second stages of tertiary education. We combine levels (1), (2) and (3) to create a new category of 'low educational level'. Similarly, the combination of education levels (4) and (5) is 'medium level of education' and level (6) constitutes the 'high educational level'.[10]

When using the parametric approach to assess EOp levels, we increase our circumstance set. Together with the father's highest level of education, we also include the highest education level of the mother. The variable is operationalized in the same way as the father´s educational level. In addition, we include a variable representing the main activity status of the father. Here we differentiate between the categories (1) employee, (2) self-employed, (3) unemployed, (4) retired and (5) unpaid family worker, housework or other. Finally, we also include a categorical variable which indicates the migration status of the individual: whether the individual was born (a) in the same country as residence, (b) in an EU country or (c) in any other country. We do not include further circumstance variables such as father's occupational status or if the respondent experienced financial difficulties

[10] As a robustness check, we assess the impact of parental education on EO and EOp by combining father's and mother's level of education. However, this does not qualitatively change our main findings.

during childhood because this information is not (sufficiently) available for all countries in the sample.

4.4 Empirical analysis

4.4.1 Inequality of opportunity in Europe

We first proxy family background according to the father's level of education for only the GO index and the parametric estimation method. The left-hand columns of Table 4.2 show the GO and corresponding Gini indices for equivalized factor income for all 17 countries under analysis. On the right-hand side of the table is the Theil (0) index of classic outcome inequality and the results for the parametric estimation method. Here we first base our results on one circumstance only in order to allow for better comparison to the non-parametric estimation method according to Lefranc et al. (2008). We then use the parametric framework to compute IOp levels based on our full set of four circumstances. Thus, in the last columns of Table 4.2, together with father's education we also consider mother's level of education, the country of birth and father´s activity. For easier comparison all indices have been multiplied by 100. In the case of the parametric estimation method, we also express IOp levels in terms of the share in total inequality (measured by the Theil (0) index).

Note that it is not possible to compare directly the resulting IOp levels of the two methods, even when considering the same set of circumstances (in our case father´s educational level). Observed differences may be due to the different construction of the underlying inequality measures and the fact that inequality measures from the GE family are not normalized. In addition, the Gini coefficient is more sensitive to changes in the middle, and the Theil (0) is most sensitive to income differences at the bottom of the distribution. An investigation whether the country rankings remain stable under the two different methods is much more appropriate. Figure 4.1 illustrates how country rankings change under different methods and different circumstance sets. First, the black dots show how countries differ when ranked according to the GO index (y-axis) compared to the parametric IOp index (x-axis) using only father's education as circumstance variable. Second,

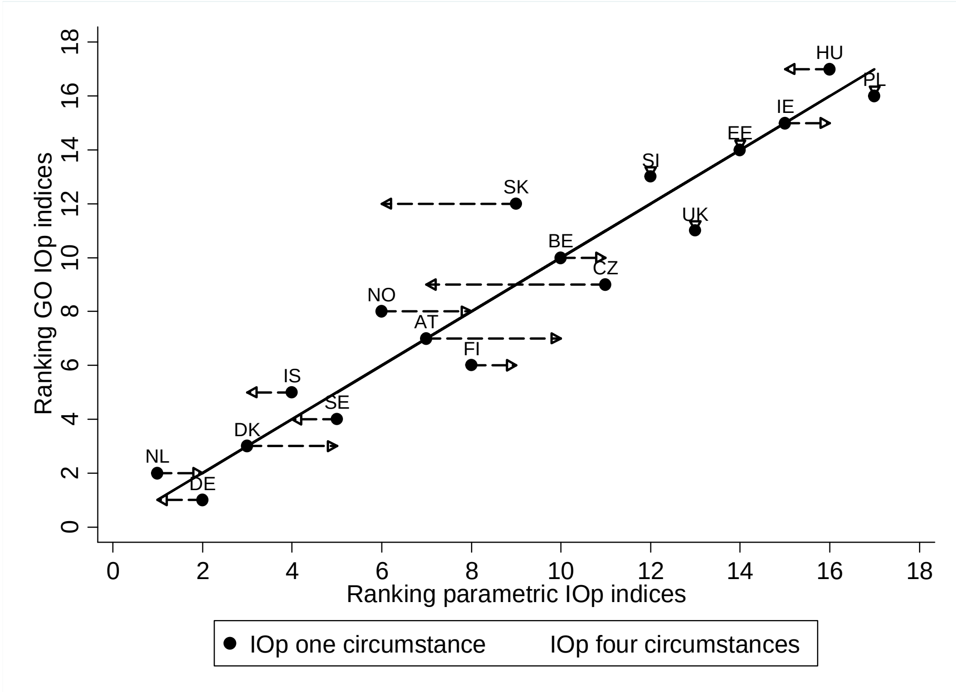


Figure 4.1: Robustness of country rankings with respect to methods

the dashed arrows show how the ranking changes when comparing the GO index (y-axis) with the parametric IOp index using all four circumstances (x-axis). Countries are ordered from the lowest to the highest IOp levels, i.e. from most opportunity-equal to most opportunity-unequal. Thus, dots lying above the 45 degree-line show countries that achieve relatively better ranks in terms of EOp when relying on the parametric method using one circumstance variable compared to the GO index. An arrow to the left of the dot indicates that this rank increases when using four circumstances instead of one. Contrary, arrows to the right of the dot mean that a country is ranked worse in terms of EOp in that case.

When both methods rely on the same circumstance (black dots), we see that the states – with a few exceptions – are found close to the 45 degree-line, indicating that the rankings in this case remain fairly stable. The exceptions concern changes of three ranking positions: Czech Republic from 8 to 11, Finland from 5 to 8 and

Norway from 9 to 6.[11] When considering all four circumstances, it is especially the ranks of the worst performing countries which remain very stable. We do find some larger switches within the middle-ranking countries. The Czech Republic and the Slovak Republic rank considerably better, but for Austria, Denmark and Norway the opposite is true. Yet on the whole, we can conclude that the country ordering remains relatively robust, regardless of the method and the set of circumstances used. Given that the different approaches yield similar results, in the next section we focus on the parametric estimation method with the full set of circumstances, which allows for easier comparison to related studies.

Returning to Table 4.2, the Nordic and some Continental countries clearly rank higher in terms of EOp. The Anglo-Saxon countries, in contrast, are found in the bottom half of the ranking and are hence categorized by relatively low EOp. There is a divide within the Eastern European countries: the Czech Republic, the Slovak Republic and Slovenia are situated in the middle of the ranking, while Estonia, Hungary and Poland are at the end of the scale. When comparing IOp with IO, as represented by the Gini and the Theil (0) indices, we observe that countries in which IO is low, IOp is also usually low. In addition, countries which score worst in terms of EO also score worst in terms of EOp. However, we also see that there are some interesting changes in the country order. Germany and the Netherlands score considerably better for IOp than for outcomes. The opposite is true for Belgium and Slovenia. However, the Nordic countries of Denmark and Finland rank lower in IOp than IO. As can be seen from the IOp ratios, the circumstance variable of father's education can only explain a rather small fraction of inequality in most countries. Although our full circumstance set explains considerably more of the observed IO (up to 13.8 per cent) when compared to the set with only one circumstance, we are still likely to underestimate the true share of IOp, since we are not able to observe and include all relevant circumstances. Therefore, we can only reveal the lower bounds of IOp (Ferreira and Gignoux (2011)). Although the clustering of countries remains basically the same, our results suggest important differences in the ordering of countries if we examine IOp instead of IO. This is in

[11] When comparing the country rankings based on the Gini index with those from the Theil (0), the ranking is almost exactly the same. Only the Czech Republic has a significant gain in ranking with regards to the Theil (0) index compared to the Gini (a change of more than one ranking position).

line with findings in Lefranc et al. (2008) and emphasizes the importance of distinguishing between the different concepts of inequality assessment. As the degree of inequality is often used as a basis for the redistributive design of tax-benefit systems, we now extend existing EOp analyses (Lefranc et al. (2008), Checchi et al. (2010), Marrero and Rodríguez (2010b)) and also examine the different impacts of redistributive policies on reducing IOp versus IO.

Table 4.2: IO and IOp indices for equivalized factor income

	Gini vs. Non-parametric GO index		Theil(0) vs. Parametric IOp index				
		One circumstance		One circumstance		Four circumstances	
Country	Gini index	GO index	Theil(0)	IOp	Ratio (%)	IOp	Ratio (%)
AT	0.305	0.026	0.170	0.003	1.9	0.012	7.0
BE	0.279	0.035	0.153	0.005	3.2	0.013	8.3
CZ	0.301	0.028	0.158	0.005	3.3	0.007	4.2
DK	0.239	0.021	0.125	0.001	0.9	0.005	4.4
EE	0.345	0.055	0.210	0.014	6.6	0.016	7.7
FI	0.293	0.022	0.161	0.004	2.8	0.008	5.0
DE	0.311	0.009	0.172	0.001	0.5	0.002	0.9
HU	0.385	0.061	0.259	0.022	8.6	0.025	9.7
IS	0.268	0.023	0.126	0.002	1.7	0.005	3.8
IR	0.382	0.049	0.269	0.020	7.6	0.030	11.0
NL	0.312	0.014	0.186	0.001	0.3	0.003	1.8
NO	0.317	0.031	0.206	0.003	1.4	0.008	3.7
PL	0.400	0.077	0.296	0.031	10.5	0.041	13.8
SK	0.298	0.032	0.163	0.005	3.0	0.007	4.0
SI	0.298	0.046	0.163	0.009	5.6	0.014	8.9
SE	0.286	0.019	0.152	0.003	1.8	0.005	3.2
UK	0.350	0.047	0.214	0.011	5.4	0.016	7.3

Source: Own calculations based on EU-SILC 2005 data.

4.4.2 EOp and redistribution

Governments can impact on the distribution of incomes and promote EOp among their citizens through the specific design of their tax and transfer policies. In the following we examine the degree to which income taxes, social contributions and social transfers are associated with establishing more EOp, i.e. with reducing

IOp. These policies primarily aim at reducing income inequality and providing insurance against unforeseeable events. In doing so, however, they may prioritize disadvantaged groups, thus leading to more equal opportunities. To capture the different welfare mechanisms across Europe, we analyze the impact of taxes and social benefits separately before considering their common influence. As indicated earlier, we consider the impact of effective redistribution via four income concepts defined at different stages under the tax and transfer scheme (see Section 4.3.2). Note again that this method does not account for any behavioral effects caused by redistributive policies. Therefore, it may only be regarded as a descriptive tool to capture direct effective redistribution.

The effect of taxes (benefits) is measured by comparing IOp for equivalized factor income with that for equivalized post-tax (post-benefit) income. The effect of both taxes and transfers together is captured when comparing IOp for equivalized factor income with that obtained using equivalized disposable income as defined in Section 4.3.2. In all cases IOp is measured via the parametric index described in Section 4.2.3 with the use of four circumstances variables as indicated in Section 4.3.3.

4.4.2.1 Post-tax income

To analyze how a country's tax system impacts on EOp, we compare the parametric indices for pre- and post-tax income. Table 4.3 reports the parametric indices without taxes in the first column and with taxes in the second. In almost all cases taxes lead to a reduction in the parametric index and thus to a decrease of IOp. These reductions are more pronounced in countries where opportunities are originally rather unequal, such as Ireland, Hungary and Slovenia. However, there are also countries, namely the three Nordic states of Finland, Iceland and Sweden, that show relatively large reductions in their IOp indices – albeit their initial levels of IOp are already relatively small. The only exception is Germany, with a higher IOp after taxation compared to the pre-tax situation. Even if we are not able to explore this finding further within the realm of our methodological approach, one might hypothesize that this is partly due to the well-known regressivity of the German social security contribution (SSC) system.

In Figure 4.2 we contrast the relative inequality reduction by taxes in IOp with the reduction they achieve in IO as measured by the Theil (0) index. For reasons of comparison, the additional symbols beside the bars show the respective changes for the GO index, the parametric IOp index using one circumstance and the classical Gini index. For the vast majority of countries the reduction in IOp measured via the parametric index (four circumstances) is larger than the reduction in IO measured via the Theil (0) index, when moving from the pre- to the post-tax situation. The only exceptions are Germany, the Netherlands and Slovenia. This might suggest that the overall effective redistributive impact of taxation tends to mitigate IOp more than IO. Whether, and to which extent, this result is due to policies specifically aimed at decreasing IOp must be left for future research. Nevertheless, if this is the case, the design of these tax systems might appear "fairer" to citizens and be more likely to be accepted, according to theories of distributive justice that account for some notion of EOp. As far as Germany is concerned, it is interesting to see that effective taxation reduces IO but increases IOp. Continuing the hypothesis from the previous paragraph, this would suggest that the regressivity of the German SSC system meets disadvantaged people in terms of opportunities rather than people at the bottom of the income distribution.

The overall results hold when compared to changes in IOp (IO) measured by the non-parametric GO (Gini) index, i.e. for most of the countries the reduction in IOp is larger than the reduction in IO. For Germany the negative (positive) impact of taxation on EOp (EO) remains when using the GO (Gini) index.

4.4.2.2 Post-benefit income

In order to analyze the impact of social benefits on IOp, we compare the parametric IOp index for post-benefit income, in the third column of Table 4.3, with that one obtained for equivalized factor income, in the first column. For all countries we observe that the parametric IOp index for post-benefit income is smaller than the same index obtained in the pre-benefit situation. Thus, in all 17 countries under analysis the direct redistributive effect of social benefits leads to a reduction in their parametric IOp indices and to an increase in EOp. Considering Figure 4.3, we find that the equalizing effects of social benefits are substantially larger

Table 4.3: IOp indices for different income concepts

Country	Parametric index for equivalized factor income	Parametric index for equivalized post-tax income	Parametric index for equivalized post-benefit income	Parametric index for equivalized disposable income
AT	0.0119	0.0090	0.0097	0.0068
BE	0.0128	0.0100	0.0080	0.0059
CZ	0.0066	0.0055	0.0049	0.0037
DK	0.0055	0.0046	0.0022	0.0013
EE	0.0161	0.0145	0.0151	0.0136
FI	0.0081	0.0057	0.0061	0.0040
DE	0.0015	0.0018	0.0012	0.0013
HU	0.0251	0.0166	0.0193	0.0116
IS	0.0048	0.0037	0.0046	0.0032
IR	0.0297	0.0228	0.0242	0.0180
NL	0.0033	0.0030	0.0030	0.0026
NO	0.0075	0.0067	0.0036	0.0030
PL	0.0407	0.0391	0.0354	0.0322
SK	0.0066	0.0050	0.0056	0.0041
SI	0.0145	0.0113	0.0102	0.0073
SE	0.0049	0.0037	0.0028	0.0019
UK	0.0156	0.0130	0.0136	0.0106

Source: Own calculations based on EU-SILC 2005 data.

compared to those achieved by taxes (see Figure 4.2) with maximum reductions in opportunity inequality of about 40–60 per cent (Denmark, Norway and Sweden) compared to a range of maximum values around 25–35 per cent (Finland, Hungary and Sweden) in the case of taxes.

In Figure 4.3 we compare the impact of social benefits on IOp with their effects on classic IO, as measured by the Theil (0) index. Similar to Figure 4.2, the symbols in front of the bars show the respective reductions for the GO index, the parametric IOp index using one circumstance and the classical Gini index. In line with Fuest, Niehues and Peichl (2010) we also find that the outcome equalizing effects of social benefits are substantially larger compared to those ones obtained in the case of taxation. When comparing the IOp results with the traditional IO, some considerable differences can again be observed. Particularly in the three Nordic countries of Denmark, Norway and Sweden the reduction in the parametric IOp index is considerably larger than the reduction in the Theil (0) index. This is also true for two of the CEE countries (the Czech Republic and Slovenia) and

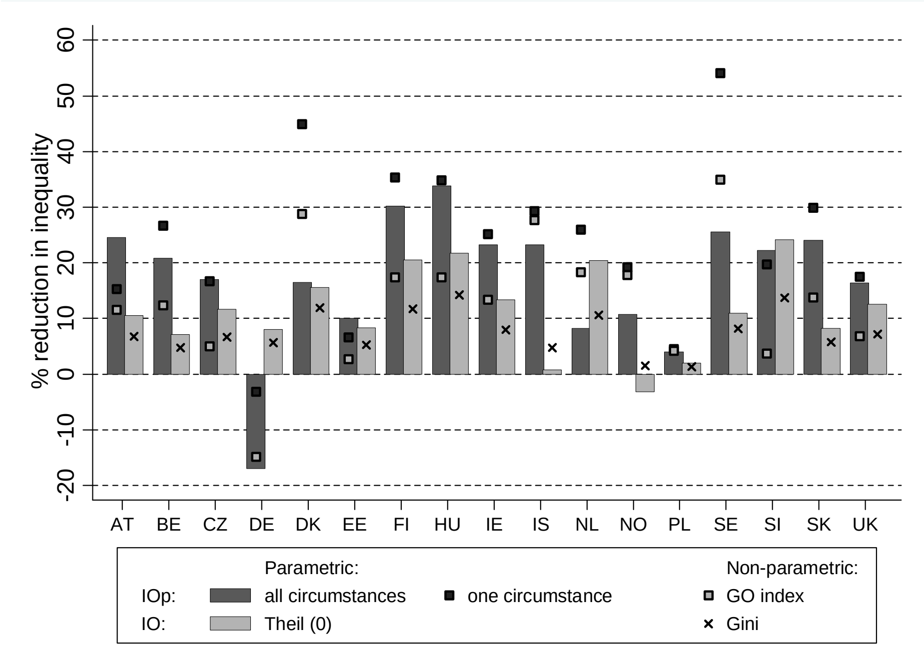


Figure 4.2: Reduction in IOp and IO through taxes

for Belgium. For most of the Continental European (Austria, Germany and the Netherlands) and the Eastern European countries (Estonia, Poland and the Slovak Republic), however, the opposite is observed. Iceland is the Nordic exception here. Once again, whether, and to which extent, these results are due to benefit systems specifically designed on the basis of some EOp or EO principles can only be hypothesized at this point and must be left for future research.

Finally, when comparing IOp measured by the GO index with the Gini index of IO, the results are again very similar: for most of the countries a parametric IOp index higher than the Theil (0) corresponds to a GO index higher than the Gini. In addition, the impact of benefits on EOp measured via the GO index is positive for almost all countries. The exception is Iceland, where this effect turns to be negative when measured via the GO or the parametric IOp index using one circumstance.

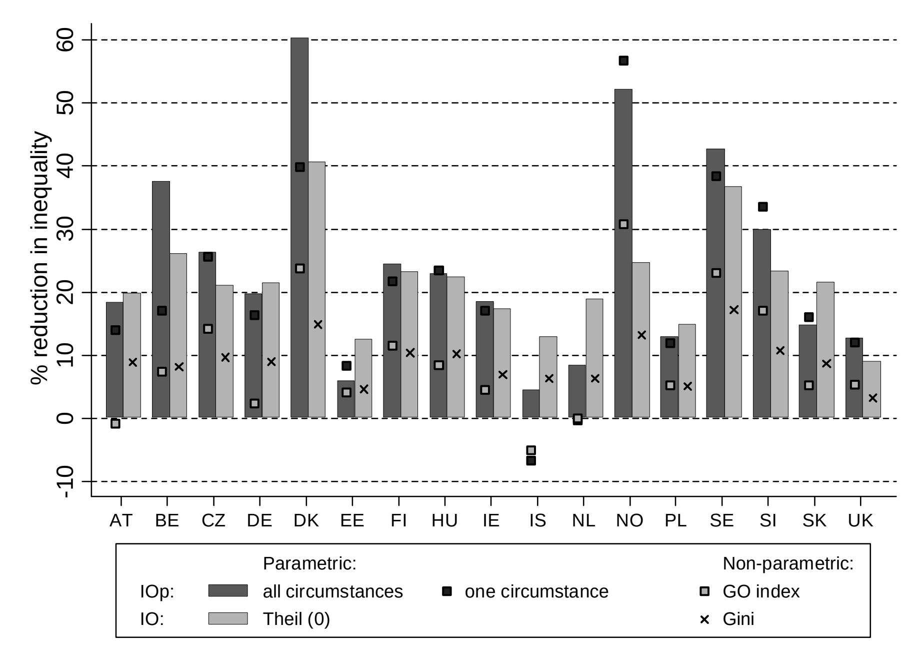


Figure 4.3: Reduction in IOp and IO through social benefits

4.4.2.3 Disposable income

In the two previous sections we analyzed how taxes and benefits separately affect IOp. In this section we explore how the full tax-benefit schemes, i.e. taxes and benefits together, impact on EOp. Therefore, we compare IOp for disposable income (as defined in Section 4.3.2) to IOp for factor income. Note that this effect cannot be calculated in an additive way using the two former effects.

The parametric IOp indices for disposable income are shown in the fourth column of Table 4.3. For almost all countries we observe that IOp for disposable income is not only markedly smaller than IOp in the initial, i.e. factor income, situation but also smaller than IOp obtained for the separated cases of post-tax and post-benefit income. This is, of course, not surprising, as for both of these cases we are able to observe reductions in IOp. The only exception is Germany. Due to the increase in IOp in the post-tax situation, the effect of taxes and transfers together on IOp is slightly smaller than the exclusive effect of benefits. However, the former still positively affects EOp compared to the original situation.

Figure 4.4 reveals that for a clear majority of countries, the reductions in IOp due to the overall tax-benefit scheme are usually larger than the decrease of IO. The largest relative changes, up to nearly 80 per cent, can be observed for the Nordic countries (Denmark, Finland, Norway and Sweden), some of the CEE countries (the Czech Republic, Hungary and Slovenia) and, again, Belgium. Exceptions are Estonia, Germany and the Netherlands, which show not only a higher reduction in the Theil (0) index compared to the parametric IOp index but also relatively small reductions in IOp in general. Note from Table 4.3, however, that it is especially Germany and the Netherlands which perform relatively well in terms of the level of EOp.[12] Together with all five of the Nordic countries, they rank highest in terms of EOp, followed by the Czech Republic and Slovak Republic and the remaining Continental European countries of Austria and Belgium. At the bottom of the ranking are the Anglo-Saxon countries and the remaining Eastern European countries (Estonia, Hungary and Poland). Nevertheless, this cross-country variation in IOp is still smaller than before redistribution, indicating that the direct tax- and cash-benefit systems narrow the overall opportunities for income acquisition across countries.

4.5 Discussion of results

Opportunities for income generation are more equally distributed after taxes and benefits are taken into account in all countries. We compared the relative changes in IOp with those in IO (using the Theil (0) index) after redistributive state intervention. Whilst in the case of taxation the reduction in IOp is usually higher compared to the decrease in IO, the picture is less definitive in the case of benefits. For disposable income the opportunity equalizing effect prevails again, with two clear exceptions: Germany and the Netherlands. Both countries, however, perform among the best in terms of the level of EOp. While in the previous section we concentrated on cross-country differences in IOp changes, this section discusses more specifically differences in the level of IOp as well as the corresponding ranking of countries.

[12] How country rankings differ when comparing IOp levels for the different income concepts is discussed in the following section.

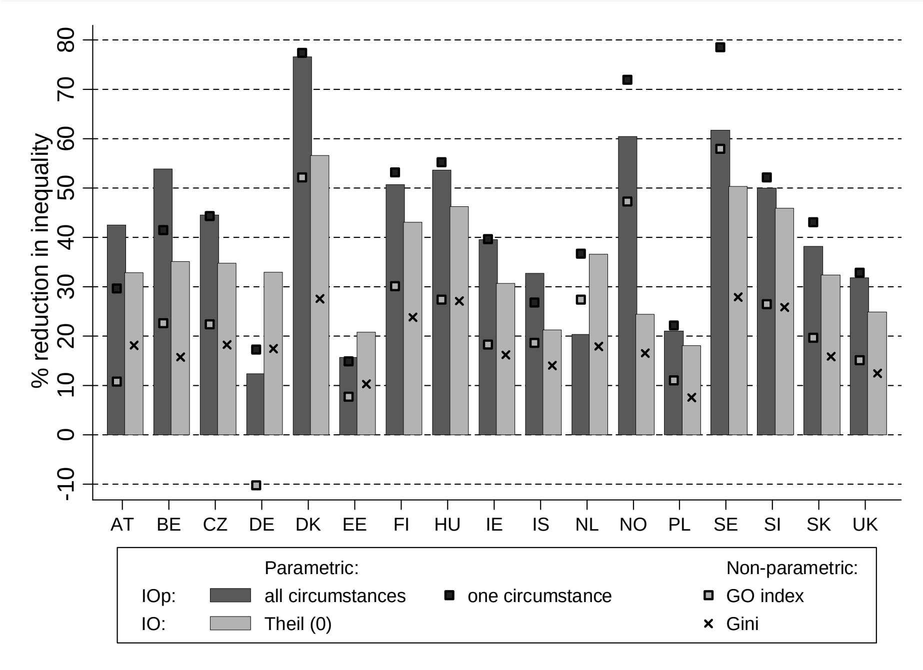


Figure 4.4: Reduction in IOp and IO through taxes and social benefits

Figure 4.5 shows how the ranking of countries changes when moving through the different income concepts. Countries are ranked from 1 to 17 from most opportunity equal to most opportunity unequal. The top-left graph of Figure 4.5 shows the ranking differences in terms of EOp when moving from initial factor income to income after taxes. A position on the 45 degree-line means that the country's rank does not change. As can be seen, only a small amount of re-ranking takes place, with only four countries changing their rank. For Finland and Sweden the post-tax income leads to a better performance in terms of EOp, while for Iceland and Norway the opposite is true. However, few changes also indicate that even if we observe quite substantial changes in IOp through taxes, especially for some of the Eastern European states, this does not improve their ranking among countries. For the top-right graph we observe a few more changes. Albeit their relatively low level of IOp for factor income, it is especially Denmark and Norway, but also Sweden and Belgium, which can improve their rank via social benefits. In contrast, Austria, Iceland, the Netherlands and the Slovak Republic perform

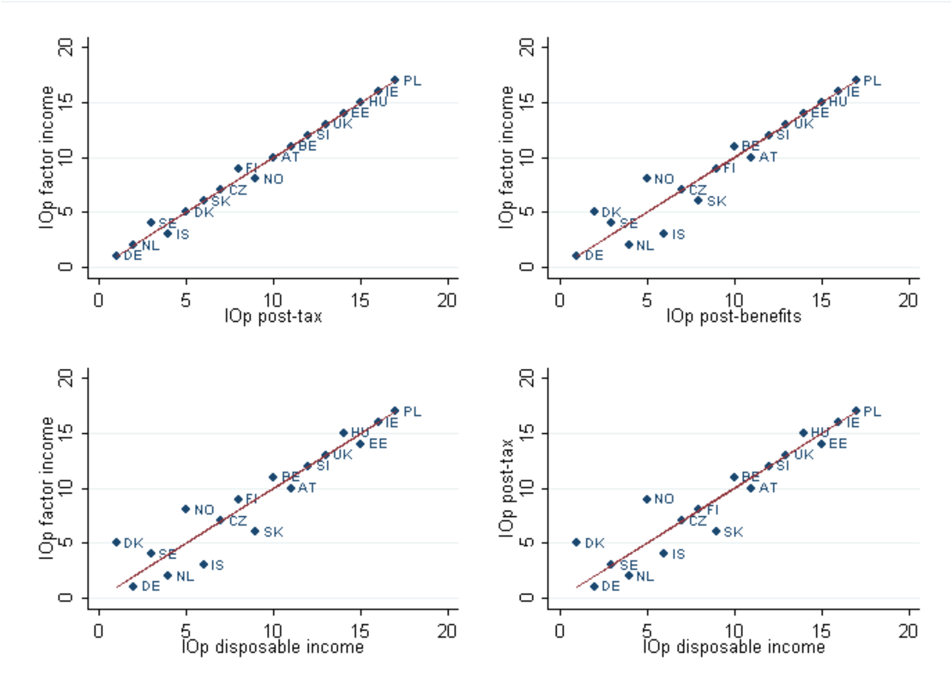


Figure 4.5: Changes in EOp country rankings for different income concepts

worse when benefits are taken into account.[13] At the bottom of the ranking, for the Anglo-Saxon and most of the Eastern European countries, again nothing changes. This holds for the bottom-left graph, where the ranks in IOp indices for disposable income are compared to the ranking in the initial situation. While it is – not surprisingly – similar to the previous one, Germany now loses its top position to Denmark. The bottom-right graph of Figure 4.5 shows that this effect of benefits is also similar when taxes have been accounted for.

In a second step we explore how equity and economic efficiency are correlated across countries.[14] In our analysis, equity is understood as EOp measured by the parametric IOp coefficients (four circumstances) for disposable income. Economic

[13]All these countries show relative small reductions in IOp trough benefits (see Section 4.4.2.2).

[14]It is widely believed that there exists a trade-off between outcome equality and economic efficiency because of its detrimental effects on incentives. However, the literature is less conclusive about the relation between EOp and economic performance (e.g., Roemer (1998), Paes de Barros et al. (2009), Marrero and Rodríguez (2010a)).

efficiency is gauged by a country's labor productivity per worker.[15] Hence, we compare the opportunity equalizing effects of the different tax and transfer systems with the economic performance of the different countries. Figure 4.6 reveals a strong negative correlation between our inequality measure and economic performance (for easier comparison, the IO coefficients are multiplied by 1000). All Eastern European countries are found in, or at the border to, the fourth quadrant, combining low levels of labor productivity with high parametric IOp coefficients, i.e. with high IOp for earnings acquisition after taxes and transfers. Exceptions are the Czech Republic and the Slovak Republic, showing fairly low levels of IOp but also below-average levels for labor productivity. Without exception, the Continental economies and the Nordic countries are located in the first quadrant, performing above-average, as measured by labor productivity per worker, while at the same time being characterized by low IOp, i.e. below-average IOp coefficients. The Anglo-Saxon countries score above-average in both dimensions.

Overall, higher economic performance in the European countries under analysis is accompanied by higher levels of EOp after redistributive state intervention. However, whether this finding contradicts the (theoretical) trade-off hypothesis between economic power and EOp – as stated by Roemer (1998) – cannot be concluded from this purely descriptive exercise and the limited set of countries at use. Thus, the direction and shape of causality is still far from being clear, and further research is necessary with regard to the links between EOp and economic strength. Yet our analysis at least suggests that – with certain exceptions – Europe seems to be divided between the Eastern European countries, where low economic performance is accompanied by low levels of EOp, and the Continental and Nordic countries, which are not only economically stronger, but also provide their citizens with higher levels of EOp. Hence, the link between family background and economic success seems to be generally tighter in poor countries than in rich ones, even after redistributive state intervention. The Anglo-Saxon countries, however, do not correspond to the general pattern. Being among the top economic performers, Ireland and the United Kingdom are below-average with regard to EOp.

[15]Ideally, we would have used total factor productivity (TFP). However, due to data limitations we are restricted to use labor productivity as a proxy for a country's economic efficiency.

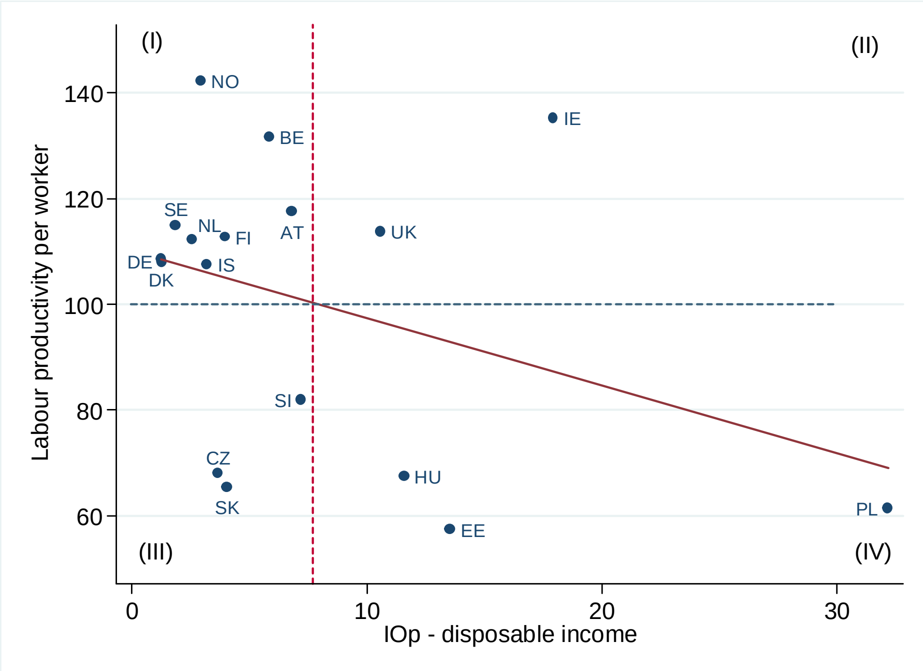


Figure 4.6: IOp and labor productivity per worker

Despite these descriptive findings, more needs to be learned about the causal mechanisms linking economic performance with EOp and more research needs to be carried out with respect to the identification of opportunity equalizing public policies. Furthermore, it would be interesting to study what might explain the observed differences in EOp across countries. Are they, for instance, the result of differing attitudes towards eliminating IOp among individuals in European countries? If preferences for EOp turn out to be country-specific, this could explain why European welfare regimes really put different degrees of emphasis on equalizing opportunities, i.e. why redistribution is, for example, less pronounced in Estonia but plays an integral role in Finland.

4.6 Conclusion

The recent EU enlargements have brought together countries with considerably different economic back-grounds. Strengthening economic and social cohesion has become a key issue in the European Union, with specific attention given to equalizing opportunities between and within member states (Commission, 2007, 2008). In this study we analyze the status quo of EOp in 15 EU member states plus Norway and Iceland and investigate the extent to which current tax-benefit systems in Europe succeed in equalizing opportunities for their citizens – in terms of direct effective redistribution.

Our results suggest that differences in opportunities are still widespread both within and across the countries under analysis. Europe seems to be divided between the Continental nations and the Nordic countries (especially Denmark and Sweden), where EOp is high, and the Anglo-Saxon and Eastern European countries, where the degree of EOp is relatively low. The tax and transfer schemes, however, are generally found to reduce IOp, albeit their redistributive power differs across Europe. In particular, it can be concluded that both taxes and transfers reduce IOp in Europe, while social benefits are typically playing the key role in this regard. If we compare the equalizing effects of taxes and benefits across the two concepts of inequality assessment, we generally find that the full tax-benefit schemes are more successful at equalizing opportunities rather than outcomes (exceptions are Estonia, Germany and the Netherlands). Greater differences can be observed when looking at the tax-benefit instruments separately, where results are less homogeneous especially for the impact of social transfers. The results in terms of country rankings are robust with respect to different methods and different circumstance sets.

Note, however, that our study has several limitations. First of all, and as mentioned above, we abstract from behavioral adjustments caused by redistributive policies, and thus assume that taxes and transfers do not have any indirect influence on the pre-tax income distribution. Our results can only be seen as descriptive in terms of capturing direct effective redistribution. Second, because of data restrictions our redistributive analysis cannot take into account the effects of indirect taxes and in-kind transfers on EOp. Third, our analysis remains static, since we do not consider the distribution of lifetime incomes. Future research needs to make dynamic and long-run, cross-national comparisons of EOp, including various age cohorts and different periods of time. Such studies could reveal national trends and shed light on the role of economic development and globalization.

We suggest two additional lines for further research. We believe that more research is needed on the causal mechanisms behind the observed family associations. Previous research on the determinants of IOp has, among other things, tried to explain unequal opportunities through native intelligence, family networking and differences in productivity (Björklund, Eriksson, Jäntti, Raaum and Österbacka (2002); Roemer et al. (2003); Checchi and Peragine (2010)). Behavioral economics and neuroeconomics might provide a deeper understanding of the channels through which parental background impacts their offspring's income generating capacity. We also suggest investigating how EOp can be best promoted. Many research findings point to the importance of education in fostering equal opportunities, such as pre-primary education, reducing dropout rates and ensuring education until at least the secondary level (Checchi, Peragine and Serlenga (2008); Causa, Dantan and Johansson (2009); Marrero and Rodríguez (2010b)). The stratification of the educational system, in contrast, seems to exacerbate IOp (Brunello and Checchi (2007); Cunha and Heckman (2007)). Others highlight the role played by labor market institutions. They find that union presence, the access to the labor market and work-support programs, such as earned income tax credits, positively impact on EOp (Checchi and Peragine (2010); Checchi et al. (2010)).

The issue of EOp is central to contemporary policy design and will become even more important in view of the progressing European integration. Perhaps even the proposal found in Roemer (2006) to switch from per capita income as a measure of economic development to the degree, to which the society in question has equalized opportunities for income acquisition, might become reality some day. Research in this field is and will continue to be of the utmost importance for public policy makers.

Chapter 5

Economic effects of a European tax-benefit system and fiscal equalization mechanism

5.1 Introduction

The debt crisis in the eurozone has brought the issue of deeper fiscal integration to the top of the European policy agenda. Many observers argue that the currency union will not survive unless it is complemented by a 'fiscal union'. The concept of fiscal union has many interpretations, ranging from the introduction of a set of balanced budget rules to the more ambitious project of shifting significant tax and spending powers to the European level. The latter would imply that fiscal institutions in the EU or at least in the eurozone would become more similar to those of existing federations like the US or Switzerland (see e.g. Bordo, Markiewicz and Jonung (2011); Fuest and Peichl (2012)).

In the debate about how a fiscal union should be designed, some countries, in particular Germany, emphasize the role of budgetary discipline and fiscal governance. Yet, the widespread view is that this is insufficient. In a recent paper, Herman van Rompuy, President of the European Council, makes this point: *"Strengthening discipline alone is ... not sufficient. In the longer term, there is a need to explore the option to go beyond the current steps to strengthen economic* *governance by developing gradually a fiscal capacity for the EMU. Such a fiscal capacity could take several forms and various options would need to be explored"*.[1] Moreover, EU Commissioner László Andor recently suggested that an EU level unemployment insurance scheme should be introduced.[2] Such proposals reflect an upcoming debate about fiscal integration in Europe which would introduce fiscal stabilization mechanisms and which might even include elements of a joint tax and transfer system.

Although fiscal integration in Europe is a key policy issue, little is known about its economic implications. This chapter analyzes the economic effects of two important potential elements of fiscal integration: i) an EU-wide integrated tax and transfer system; and ii) a fiscal equalization mechanism. Our analysis includes 11 eurozone countries.[3] We employ the European tax-benefit calculator EUROMOD, which uses harmonized and representative household microdata and allows calculating taxes, transfers and disposable incomes for each household. EUROMOD enables us to run counterfactual simulations so that we can analyze policy reforms and their effects on tax revenues, the income distribution and labor supply. We proceed as follows. First, we construct a European tax and transfer system, which can be interpreted as an average of the national tax and transfer systems. The system is designed such that its introduction would be revenue neutral at the EU level but not necessarily at the level of each member state. We analyze various scenarios where the European tax and transfer system (partly or fully) replaces the national systems. Second, we consider the introduction of a fiscal equalization

[1] 'Towards a genuine Economic and Monetary Union', Interim Report, The President of the European Council, Brussels, 12 October 2012, p. 4. Along the same lines, in October 2012, the German chancellor Angela Merkel suggested the introduction of a budget for the eurozone, which would coexist with the EU budget and would have the function to provide fiscal stabilization in the case of asymmetric shocks ('Regierungserklärung von Bundeskanzlerin Angela Merkel zum Europäischen Rat vom 18. und 19. Oktober in Brüssel', Berlin, 18 October 2012).

[2] László Andor: 'A strong employment agenda – the pathway to economic recovery', dinner speech at the Conference "Jobs for Europe: The Employment Policy Conference", Brussels, 6 September 2012, European Commission, SPEECH/12/588.

[3] These are the founding members of the EMU (except Luxembourg) and include Austria (AT), Belgium (BE), Finland (FI), France (FR), Germany (GE), Greece (GR), Ireland (IR), Italy (IT), the Netherlands (NL), Portugal (PT) and Spain (SP). In the following we will refer to this group as 'the EU', neglecting that the European Union has 27 member countries. We focus on these 11 countries due to data availability and because we are primarily interested in studying fiscal integration in the eurozone.

scheme which redistributes tax revenue across countries.

The main argument in favor of deeper fiscal integration in Europe is that it might improve macroeconomic stability in the eurozone. However, fiscal integration also raises various concerns. Firstly, households in high income countries fear bearing the burden of income redistribution to countries with lower incomes. Secondly, a common tax and transfer system may have a negative impact on incentives to work, not just in poorer countries, where people would receive higher transfers, but also in richer countries where people would face higher tax burdens. Thirdly, tax avoidance and tax evasion may significantly differ across countries, and consequently a common tax system uniform for all countries may be implemented rather differently in practice than theory. The analysis in this chapter focuses on the first two concerns – income redistribution and the effects on incentives to work – yet abstracts from the latter. This is because our simulation model and underlying data do not allow us to simulate avoidance and evasion behavior.[4]

Thus, in our simulation of an EU wide tax and transfer system, we measure the redistributive effects, taking into account behavioral responses in the form of labor supply adjustments that can be expected as a reaction to the change in tax burdens (Bargain et al. (2012)). Moreover, we analyze how the different reforms affect the ability of the tax and transfer system to act as an automatic stabilizer in the presence of macroeconomic shocks. Building on Dolls, Fuest and Peichl (2012), we study simulated shocks on gross income and investigate to which extent the existence of the European tax and transfer system contributes to stabilizing disposable income. We are particularly interested in a situation where individual countries are unable to let national automatic fiscal stabilizers work because they have lost access to capital markets as is partly the case in the recent economic crisis.

Our analysis leads to the following results. In the first simulation experiment, the introduction of a European tax and transfer system that replaces one third of the national systems would increase the disposable income of a small majority of households in Europe. At the same time it would lead to significant redistribu-

[4]Schneider and Enste (2000) compare shadow economies for a large set of countries and do find significant differences between Northern and Continental European countries on the one hand and Southern European countries on the other.

tive effects between countries. The winners include Greece, Portugal, Spain, Italy, and, surprisingly, Germany, with average gains ranging between approximately eight per cent of disposable income in Greece and one per cent in Germany. The gains in the Southern European countries come at the cost of a decline in labor supply. In contrast, Austria, France, Ireland and the Netherlands all lose. Within countries, households at different income levels are affected differently: in the Southern European countries, the gains are concentrated among the low income quintiles whereas in high income countries, the upper income quintiles gain on average. The middle class loses in some countries. Introducing the EU tax system reduces EU-wide income inequality and this also holds for inequality within countries in most cases.

How does the introduction of the EU tax-benefit system affect automatic fiscal stabilizers? Unsurprisingly, the reform will increase automatic stabilizers in countries where national tax systems have smaller stabilizers than the European average – this particularly applies to the Southern European countries. In the case where the EU tax and transfer system replaces one third of the national system, the EU system would absorb between 10 per cent (Ireland) and 15 per cent (Germany) of a proportional shock to gross income across countries, assuming that countries are credit constrained. In the case of the more progressive EU tax system, the stabilization properties are similar.

Our second simulation experiment involves the introduction of a fiscal equalization system within which the national tax and transfer systems are assumed to remain in place. The fiscal equalization mechanism redistributes tax revenue across countries. It does so based on an indicator measuring the taxing capacity and expenditure needs of each member country. Countries with lower taxing capacity/higher expenditure needs than the EU average receive transfers and vice versa. As expected, the system implies transfers flowing from high to low income countries.

How does this system of fiscal equalization perform when it comes to providing stabilization in the event of an asymmetric shock? We consider a shock in the form of a proportional decline in gross income by five per cent which hits Greece, Ireland, Italy, Portugal, and Spain (the 'GIIPS' group). In all other countries, income remains constant. Interestingly, the fiscal equalization mechanism performs rather poorly in terms of stabilization even leading to a destabilizing effect in Greece and a stabilization effect close to zero in Portugal. The reason is that Greece and Portugal benefit most from fiscal equalization in the situation before the shock. The shock reduces their taxing capacity, but also the taxing capacity of the union as a whole. Therefore, the sum of money available for fiscal equalization declines, and countries that initially benefited may even lose transfers due to the shock. This effect becomes even more relevant when simulating a shock comparable to the 2008-09 economic crisis.

Our findings for both reform scenarios have important policy implications. First, in order to achieve significant income stabilization effects through the introduction of an EU tax and transfer system, that system would have to be large. However, this would lead to significant redistributive effects, which will make the reform difficult to sell politically – despite a small majority of EU citizens gaining in terms of disposable income. As decisions about more fiscal integration in the EU require unanimity among member states, such a reform does not seem feasible as long as there are winner and loser countries. However, even considering less strict voting mechanisms casts doubt on the political feasibility. Moreover, the EU tax and transfer system would have adverse effects on labor supply incentives in some countries. In addition, as mentioned above, one important margin of behavioral adjustment is not considered within our analysis: tax avoidance and evasion. As avoidance and evasion behavior differs across countries, this may represent a further obstacle to finding support for the introduction of a joint tax-transfer system.

Second, the creation of a fiscal equalization mechanism could give rise to even larger redistributive effects, depending on the design of the system. But a high degree of fiscal equalization does not imply that the system always offers a substantial degree of fiscal stabilization in the presence of asymmetric shocks. The stabilization effect may vary for different countries, with the variant considered here showing that even a destabilizing effect is possible.

The setup of the rest of this chapter is as follows. Section 5.2 describes the related literature as well as the concept and design of a fiscal union in our general simulation scenarios. Section 5.3 introduces the empirical strategy, i.e. the micro data and the tax-benefit calculator EUROMOD, the different sub-scenarios, as well as some descriptive information. The results for the EU tax and transfer system are presented in Section 5.4. Our findings for the EU fiscal equalization mechanism follow in Section 5.5. Section 5.6 further discusses the results and points out some caveats of the analysis. Section 5.7 concludes.

5.2 Related literature and conceptual framework

5.2.1 Related literature

The related literature about European integration in the area of fiscal policy can be divided into two broad areas.[5] The first strand of literature focuses on the EU budget, its expenditure and its revenue sources (see e.g. Atkinson (2002b); Begg (2005)). One important issue is whether the EU should be allowed to levy taxes. For instance, Sijbren Cnossen argues in favor of "a federal government with real taxing powers and financial leverage over the Member States to mitigate adverse effects that might arise from Member State tax policies" (Cnossen (2001), p. 466f). The EU is currently essentially financed through contributions from the member states, with most literature about EU taxes focusing on indirect taxes such as a European VAT or environmental tax. Other proposals include a European corporate income tax or, more recently, a European financial transactions tax (see e.g. Le Cacheux (2007); Begg (2011)). The key argument in favor of a European tax is that it would increase the transparency and improve democratic control of EU policies. Wigger and Wartha (2003) develop a theoretical model focusing on the interaction between tax coordination and allocating taxing rights between the national and EU level. In the presence of tax coordination between member states, they argue that giving the EU the power to tax is not desirable due to the coexistence of taxing powers at the national and EU level leading to overtaxation. The key difference from our study is that none of these contributions considers the quantitative economic effects of introducing a European tax, while our focus lies on quantifying redistribution, labor supply and income stabilization effects.

The second strand of related literature studies the implications of EMU for fis-

[5]There is a third strand of literature that discusses the coordination and harmonization of taxes and tariffs required to create a common market, surveyed, for instance, in Keen (1993). For the present chapter, this literature is less relevant because our focus does not lie on tax obstacles for border crossing economic activity.

cal policy integration (see e.g. De Grauwe (2009), for an overview). An important early discussion of the key issues can be found in the MacDougall (1977) Report, which had the broad objective to analyze the role of public finances for European monetary integration. One of the key findings of the report is that "public finance in existing economic unions plays a major role in cushioning short term and cyclical fluctuations ... there is no such mechanism in place ... between member countries and this is an important reason why in present circumstances monetary union is impracticable" (p. 12). This view has been confirmed by most of the later literature on the implications of EMU for fiscal policy in Europe. Eichengreen (1990) compares Europe to the US, emphasizing that the federal income tax in the US provides significant insurance against asymmetric macroeconomic shocks. Since regional problems are likely to be greater in Europe than in the US, he argues that fiscal shock absorbers would have to be significantly larger.

Many economists have similarly warned that the Euro area is too heterogeneous and thus far from being an optimum currency area, along the lines of Mundell (1961) and Kenen (1969). Therefore, the EMU will be fragile and vulnerable to economic shocks unless complemented by more fiscal integration (see e.g. Sachs and Sala-i Martín (1992); Buiter, Corsetti and Roubini (1993); Mélitz and Vori (1993); Bayoumi and Masson (1995); Masson (1996); Eichengreen and Wyplosz (1998); Engwerda, van Arle and Plasmans (2002); Uhlig (2003)). One exception is Fatás (1998) who argues that the cross-regional insurance potential of a European fiscal union would be limited, based on GDP data prior to the introduction of the EMU. His main objection to other empirical studies is that they fail to distinguish properly between intertemporal transfers (essentially self-insurance through debt financing), on the one hand, and true interregional insurance, on the other hand. Moreover, several authors have proposed an increase in the European budget in order to establish a horizontal fiscal equalization mechanism (Italiener and Vanheukelen (1993); Hammond and von Hagen (1998); Dullien and Schwarzer (2005); Marzinotto, Sapir and Wolff (2011)). Schuknecht, Moutot, Rother and Stark (2011) emphasize the importance of fiscal discipline, proposing an independent fiscal council for the euro area with the aim of improving governance and compliance.

Some economists, however, challenge the view that monetary union requires more fiscal integration. They argue that the "unprecedented divorce between the main monetary and fiscal authorities" (Goodhart (1998)) offers advantages in limiting political influence on monetary policy (see e.g. Beetsma and Bovenberg (1998); Dixit and Lambertini (2003); Beetsma and Giuliodori (2010)). However, the current debt crisis in the eurozone has renewed doubts about the wisdom of this approach.

5.2.2 What is a 'fiscal union'? Simulation scenarios

The term 'fiscal union' is used very differently within the debate on reforms of fiscal institutions in the eurozone. Fuest and Peichl (2012) suggest five possible elements of a European fiscal union, namely: (i) fiscal rules for the member states and concerning policy coordination and supervision (like those currently in place in form of the Stability and Growth Pact and the new Fiscal Compact); (ii) a crisis resolution mechanism (e.g. the European Financial Stability Facility (EFSF), the European Stabilization Mechanism (ESM) or the ECB Outright Monetary Transactions); (iii) a joint guarantee for government debt (see e.g. the discussion about eurobonds or a Debt Redemption Fund); (iv) a fiscal equalization mechanism for transfers between countries; and (v) an extended EU budget and European taxes. While much of the political debate so far has focused on short term crisis management and thus elements (i) - (iii), this chapter concentrates on elements (iv) and (v), which are probably more relevant in the medium and long term and for which the political discussion has started at least partly. We start by considering element (v), the creation of a European tax and transfer system. As a second simulation experiment, we analyze the creation of a fiscal equalization system (element (iv)).

EU tax-benefit system. Conceptually, simulating the introduction of a European tax and transfer system raises four key questions: (1) How is the European system designed? (2) How does the reform affect overall tax revenue and spending? (3) What is the share of the European system in overall taxes and transfers? (4) How is the revenue distributed among the EU level and member states?

First, several approaches are possible for the design of the EU tax-benefit system. A simple one would be introducing an EU income tax surcharge as a percentage of national income tax payments. However, this raises various issues. Most importantly, a simple surcharge on the national income tax would have very different effects in different member states since national income tax systems vary significantly. It would also create incentives for individual member states to rely more on revenue sources other than income taxes, such as social insurance contributions. They could also replace transfers by tax credits, which reduce income taxes. Thus, introducing an EU income tax surcharge would require a complete harmonization of national income tax systems. Therefore, we consider the introduction of a separate EU tax and transfer system which can coexist with the national systems. The EU tax and transfer system in our simulations includes the income tax, social insurance contributions and cash transfers. The reason is that the member states have very different combinations of income taxes and social insurance contributions. Moreover, cash transfers are integrated into the income tax system in some member states but not in others. Accordingly, it is helpful to consider all three elements together as part of an integrated tax and transfer system (and not just income taxes).

How is the EU tax and transfer system designed in our analysis? Rather than inventing a new tax system, we derive what can be interpreted as an average of the national systems.[6] Importantly, for the EU as a whole, this system collects the same amount of revenue as all national systems taken together. As a next step, we also increase the progressivity of the EU system .

Second, for overall revenue, we focus on reforms that are revenue neutral for the EU as a whole. This choice appears to be a natural solution for two reasons: first, it ensures the comparability of different reform scenarios; and second, we avoid the debate about generally increasing (decreasing) the size of government. Note that revenue neutrality at the EU level does not imply revenue neutrality at the national level when introducing the reform. However, as we discuss below, we have to impose revenue neutrality also at the national level after implementing the EU system (through redistribution of EU net revenues in order to ensure that taxes and expenditures not included in our analysis remain unchanged).

Third, a wide range of possibilities could be considered regarding the share of

[6]How exactly we derive this tax and transfer system will be explained in Section 5.3.2. Note also that we consider different variants of this system, with different degrees of progressivity.

the EU system in overall taxes and transfers. In most existing fiscal unions, tax-benefit systems exist at different levels of government. For instance, two thirds of overall tax revenue in the US is collected at the federal level, compared with one third at the state and local level. However, moving two thirds of the national tax and transfer systems to the EU level might seem unrealistic, even if a major reform towards fiscal union takes place. Our analysis therefore considers two sub-scenarios: in the first sub-scenario, the EU system replaces one third of the national systems; whereas in the second sub-scenario, the national systems are replaced entirely as a theoretical benchmark.

Fourth, we have to make assumptions about which level of government receives the revenue generated by the EU system. When national tax and transfer systems are partly replaced by the EU system, the EU tax and transfer system collects revenue from all citizens in the participating countries, paying out cash transfers to all recipients. However, note that the member states lose part of their (net) revenue as a share of the national tax and transfer system is replaced by the EU system. We therefore assume that the net revenue now available at the EU level is redistributed to the member states, with each member state government fully compensated for the net revenue lost due to the introduction of the EU system. As a result, national expenditures on public goods and services, other tax sources at the national level (e.g. indirect taxes) and national budget deficits are unaffected by the reform. The only elements that change are the revenues and payments from the taxes and benefits included in the EU system and its redistribution among households, affecting their tax burdens.

Fiscal equalization. Concerning the introduction of a fiscal equalization mechanism in Europe, we assume that national tax and transfer systems are unaffected, but that the mechanism redistributes revenue between member states. Whether a member state contributes to the fiscal equalization scheme or receives money depends on its relative taxing capacity and expenditure needs. This is in line with most existing fiscal equalization schemes, typical of federal states. In order to determine the taxing capacity and expenditure needs of individual member states, we use the EU average tax and transfer system developed in the first simulation experiment as a measurement tool. The net revenue produced if it was hypothetically applied to a country can be interpreted as an indicator of taxing capacity and expenditure needs. Member states where this indicator is below (above) the EU average will be recipients (contributors) in the fiscal equalization mechanism.

5.2.3 Conceptual framework

In this section, we provide an intuitive framework for the simulations described in Section 5.3 (while the concrete empirical model is described in Section 5.3.2). Gross market income X_i of household i is defined as the sum of all incomes from market activities:

$$X_i = E_i + Q_i + I_i + P_i + O_i, \tag{5.1}$$

where E_i is labor, Q_i business, I_i capital, P_i property, and O_i other income. Disposable income Y_i is defined as market income minus net government intervention $T_i = TAX_i + SIC_i - BEN_i$:

$$Y_i = X_i - T_i = X_i - (TAX_i + SIC_i - BEN_i), \tag{5.2}$$

where TAX_i are income taxes, SIC_i employee social insurance contributions, and BEN_i cash benefits (i.e. negative taxes). In the following, we refer to the difference between taxes and social insurance contributions paid and transfers received, T_i, as 'net taxes'.

Example. As an illustrative example, consider a common tax and transfer system for two countries $k = A, B$ with net tax schedules $T_{ik} = f_k(X_i, \mathbf{z}_i)$ for individuals i. X_i is gross market income and $\mathbf{z}_i$ is a vector of other characteristics relevant for taxation, like marriage status, age or occupation. For simplicity, consider a linear-progressive net tax schedule independent of characteristics $\mathbf{z}_i$, i.e. $T_{ik} = t_k X_i - a_k$ where t_k is the marginal tax rate and a_k is a refundable tax credit (equal to a benefit if a_k is positive). Then, an easy way to introduce a revenue neutral common tax system is to use the "average" system

$$T_{i,avg} = \frac{t_A X_i - a_A + t_B X_i - a_B}{2} = \frac{t_A + t_B}{2} X_i - \frac{a_A + a_B}{2}, \tag{5.3}$$

i.e. applying the average marginal tax rate and average tax credit to each country. In reality, tax-benefit systems do not only depend on income but also on other characteristics. In addition, the observed tax-benefit systems are directly progressive with increasing marginal tax rates. Therefore, we construct the EU average tax and transfer system using a regression approach as described in Section 5.3.2, however, with the economic intuition as in our simple example.

Two country model of a fiscal union. As a next step, we consider a simple model of a fiscal union, again with two countries A and B and where the tax system $T_{ik} = f_k(X_i, \mathbf{z}_i)$ might be non-linear as usually observed in reality. In country A there are N_A citizens with characteristics $(X_A, \mathbf{z}_A)$, while country B has N_B citizens with characteristics $(X_B, \mathbf{z}_B)$. Under the national tax and transfer systems, the national government budget constraint of country k is given by

$$\sum_{i=1}^{N_k} T_{ik} + T_k^R - B_k = E_k \tag{5.4}$$

where $\sum_{i=1}^{N_k} T_{ik}$ is revenue from net taxes (income taxes and social insurance contributions net of transfers), T_k^R is revenue from other taxes like consumption taxes or corporate income taxes, B_k is the budget deficit and E_k is expenditure on publicly provided goods and services such as defence, police or schools (including interest payments on government debt). Equation 5.4 holds in the reference scenario in our simulations, i.e. the initial situation without a common tax and transfer system, referred to as the 'baseline' in the following. In this reference scenario, the aggregate disposable income of the citizens of country k is given by

$$\sum_{i=1}^{N_k} Y_{ik} = \sum_{i=1}^{N_k} (X_{ik} - T_{ik}). \tag{5.5}$$

Now, both countries define a common tax and transfer system denoted by $T_{iEU} = f_{EU}(X_i, \mathbf{z}_i)$ (with subscript EU denoting the 'fiscal union', which not necessarily has to be constructed by averaging tax systems to achieve overall revenue neutrality, as assumed in the previous paragraph). In the following, we denote by T_{iEUk} the net tax payment arising if the common tax system is applied to citizen i residing in country k. This tax system is constructed such that, for the union as a whole and given market incomes, it generates the same net tax revenue as the national tax systems: $\sum_{i=1}^{N_A} T_{iA} + \sum_{j=1}^{N_B} T_{jB} = \sum_{i=1}^{N_A} T_{iEUA} + \sum_{j=1}^{N_B} T_{jEUB}$. Countries A and B reduce their national net taxes by a factor $(1-\alpha)$ and fill the gap by introducing the common tax system. As a result, aggregate disposable income of the citizens of country k in the case of fiscal union becomes $\sum_{i=1}^{N_k} Y_{ik} = \sum_{i=1}^{N_k}(X_{ik} - (1-\alpha)T_{ik} - \alpha T_{iEUk})$.

Labor supply adjustment. Thus far, we have assumed that market incomes remain constant. However, the reform of the tax and transfer system will affect market incomes due to its influence on labor supply. Denoting the market income of individual i residing in country k before the reform by X_{ik}^0 and market income after the reform by X_{ik}^1, the change in aggregate disposable income of citizens of country k, $\sum_{i=1}^{N_k}[Y_{ik}^1 - Y_{ik}^0]$ can be expressed as

$$\sum_{i=1}^{N_k}[Y_{ik}^1 - Y_{ik}^0] = \sum_{i=1}^{N_k}[X_{ik}^1 - X_{ik}^0 - [(1-\alpha) f_k(X_{ik}^1, \mathbf{z}_{ik}) - \alpha f_{EU}(X_{ik}^1, \mathbf{z}_{ik}) - f_k(X_{ik}^0, \mathbf{z}_{ik})]]. \tag{5.6}$$

Most of our analysis focuses on the change in disposable income as an indicator of whether countries or individuals benefit or lose from a reform.[7] What are the factors driving changes in disposable income in different countries? Firstly, countries with a low net tax burden compared to the European average will suffer a loss in disposable income due to the reform, simply because European taxes are higher. Secondly, low income countries will tend to experience an increase in disposable incomes because they benefit from now sharing a tax and transfer system with richer taxpayers in other countries. Thirdly, changes in disposable income will occur as taxpayers adjust their labor supply.

Effects on overall tax revenue and national budgets. How does the reform affect overall tax revenue and the budget constraints of the national governments? Consider first the impact on the national budgets. National net tax revenue changes for two reasons. Firstly, the national tax and transfer system is

[7]Here, one may object that 'welfare' should be used as an indicator because a higher level of labor supply may increase disposable income but not welfare (taking into account leisure). We use disposable income because it is a widespread and easily understandable indicator, however we also report results for welfare changes (Section 5.4.2) and disposable income changes without labor supply adjustments (appendix). The pattern of the results remains the same for all indicators.

cut by a factor $(1-\alpha)$. Secondly, the net revenue changes due to labor supply adjustments. The change in net tax revenue collected by country k due to the reform is given by

$$\sum_{i=1}^{N_k}[T_{ik}^1 - T_{ik}^0] = \sum_{i=1}^{N_k}[(1-\alpha)f_k(X_{ik}^1, \mathbf{z}_{ik}) - f_k(X_{ik}^0, \mathbf{z}_{ik})]. \tag{5.7}$$

The net revenue collected by the common tax system (for two countries A and B), denoted by R_{EU}, is given by

$$R_{EU} = \alpha[\sum_{i=1}^{N_A} f_{EU}(X_{iA}^1, \mathbf{z}_{iA}) + \sum_{j=1}^{N_B} f_{EU}(X_{jB}^1, \mathbf{z}_{jB})]. \tag{5.8}$$

R_{EU} is equal to the sum of net revenue lost by the national governments by abolishing a share α of their national tax and transfer systems if market income remains constant. The reason is that the new tax system was designed to assure revenue neutrality ex ante, before labor supply adjustments. Without changes in labor supply, the tax revenue collected at the European level would be exactly sufficient to compensate the governments of the member states for their net tax revenue losses (or gains). No further adjustments to balance the government budgets would be required: the variables 'other' taxes (T_R), budget deficits (B) and expenditures on public services (E) are the same before and after the reform.

However, given that we take changes in labor supply caused by the reform into account, revenue neutrality ex post is not guaranteed, i.e. the net revenue collected by the common tax system may differ from the revenue required to compensate the national governments for changes in their net tax revenue. Assume that the European budget nevertheless compensates the national governments for the changes in national net tax revenue caused by the reform, i.e. also after labor supply adjustments. In this case, the European budget constraint can be written as

$$B_{EU} = \sum_{i=1}^{N_A}[T_{iA}^1 - T_{iA}^0] + \sum_{j=1}^{N_B}[T_{jB}^1 - T_{jB}^0] - R_{EU} \tag{5.9}$$

where B_{EU} is the deficit (or, if negative, surplus) in the EU level budget. A deficit $B_{EU} > 0$ arises if the reform leads to behavioral adjustments that reduce EU-wide net tax revenue. If there is a deficit, the question of how to finance it arises, likewise how the burden is distributed across countries. Similarly, if there is a surplus, this money can be distributed to the national governments. As we show below, this effect is quantitatively very small and can thus be neglected.[8]

5.3 Empirical strategy

5.3.1 EUROMOD: model and database

In order to analyze the hypothetical introduction of an EU-wide tax-benefit system, it is necessary to run counterfactual simulations. We use the microsimulation technique to calculate taxes, benefits and disposable income for a representative microdata sample of households. As a basis for our simulations, we use EUROMOD, a static tax-benefit model for the EU countries, which was designed for comparative analysis, allowing the comparison of countries in a consistent way through a common framework. EUROMOD was originally created in the late 1990's, by a consortium of research institutes with members from each EU15 country, with detailed knowledge and expertise in their respective national tax-benefit systems. The tax-benefit systems included in the model (1998 and 2001 for the EU-15, 2003 for a subset of countries and 2005 for four new member states) have been validated against aggregated administrative statistics as well as national tax-benefit models (where available), and the robustness has been checked through numerous applications (see e.g. Bargain (2007)).

The model can simulate most direct taxes (especially income taxes on all sources of income including tax credits, payroll taxes and social insurance contributions) and benefits (e.g. welfare benefits and social assistance, housing benefits, family and child benefits) except those based on previous contributions due to information not usually being available from the cross-sectional survey data used as input datasets. Information on these instruments is taken directly from the

[8]In the different scenarios outlined in Section 5.3.2, the deviations from revenue neutrality range between a surplus of 0.47 Euros to a deficit of 0.68 Euros per week and household. Table 5.13 in the appendix reports these numbers as a percentage of net tax payments.

original data sources. While simulations are usually carried out for counterfactual situations, EUROMOD also simulates various taxes and transfers for the baseline that are not observed in the original data. We use the original data provided by EUROMOD complemented by those simulated components.

Information on consumption is missing in the data; hence indirect taxes and taxes on corporate profits are not included in the model, likewise in-kind benefits. Clearly, these elements differ between countries and would affect the results presented. Table 5.8 in the appendix reports the shares of taxes captured by the model for the different countries. While these shares vary across countries - between 44 per cent (Ireland, Portugal) and 66 per cent (Germany), we do not find a systematic relationship between these shares and our results. In addition, the table contains information about the deficit and debt ratios for each country. In our analysis we do not impose a balanced budget rule and thus keep these initial conditions fixed.

EUROMOD assumes full benefit take-up and tax compliance focusing on the intended effects of tax-benefit systems, which may influence the results in terms of the redistributive and stabilizing effects of fiscal reforms when this behavior substantially varies across countries.

The main stages of the simulations are as follows. First, a representative micro-data sample of individuals in households (including information on gross income from various sources as well as demographic characteristics that are relevant to determine taxes and benefits such as household size, age and number of children, marital status, employment status, disability status, region of living; see also below) and the respective tax-benefit rules (e.g. for singles or couples) are read into the model. Subsequently, the model constructs corresponding assessment units (for instance the individual, family or household) for each tax and benefit instrument, ascertaining which are eligible for that instrument and determining the amount of benefit or tax liability for each member of the unit (accounting for the individual or joint assessment of taxes or benefits for each household member). Finally, after all taxes and benefits are simulated, disposable income is calculated, including all monetary incomes except capital gains and irregular incomes.[9]

[9]For further information on EUROMOD, see Sutherland (2007). There are also country reports available with detailed information on the modeling and validation of each tax-benefit system,

Due to data limitations, our analysis is based on the 2001 tax-benefit systems, two years after the introduction of the euro for the eurozone countries.[10] It is important to bear this in mind, especially given that many countries have implemented significant reforms in their tax and transfer systems in the last decade. The input datasets for these countries are summarized in Table 5.9 in the appendix. The sample sizes vary across countries from 7,000 to more than 25,000 households. All monetary variables are updated to 2001 using country-specific uprating factors, as the income reference period varies from 1999 to 2001.[11]

5.3.2 Tax-benefit scenarios

The simulations of the different reform scenarios for the introduction of an EU tax-benefit system, as introduced in Section 5.2.2, proceed in four steps. As mentioned, the estimated EU average system will then also be used later on as a basis to construct a fiscal equalization mechanism. First, we use EUROMOD to extract net taxes for each individual (and household) i in representative samples for each country k. In particular, EUROMOD simulates the country specific net taxes (income and payroll taxes minus benefits) $T_{ik} = f_k(X_i, \mathbf{z}_i)$ as a function of gross market income X_i and a vector of non-income factors $\mathbf{z}_i$ taken from the data.

Second, using those simulated net taxes T_{ik}, we obtain the "average EU tax function" $T_{i,EUavg}$ so that it yields the same net revenue at the EU level as the sum of the national systems. In order to calculate this average system, we adopt an Ordinary Least Squares (OLS) regression approach and estimate the following reduced form tax function on the pooled sample:

$$T_{ik} = \omega_i f_{EU}(X_i, \mathbf{z}_i) + \epsilon_i \tag{5.10}$$

Function f_{EU} is specified as a transformation of $(X_i, \mathbf{z}_i) \rightarrow T_{ik}$. ϵ_i is the OLS

see http://www.iser.essex.ac.uk/research/euromod.

[10] Unfortunately, this is the most recent year for which for all countries data is available. For later years, Germany and France would be missing. A more recent version for the EU27 countries is being constructed at the time of writing this chapter.

[11] There are three exceptions: Austria (1998), Greece (1994) and Italy (1995), which are the most recent years of data integrated in the version of EUROMOD that we used. Note however, that also for these two countries the data is uprated/re-weighted by the EUROMOD team based on aggregate statistics to reflect 2001 distributions.

residual and ω_i the household sample weight. We use a very flexible functional form with higher order polynomials and interaction terms of income and all relevant characteristics observed in the data for the assignment of taxes and benefits (such as gross income from various sources, household size, age and number of children and old people, marital status eligibility for certain benefits and pensions, homeownership etc.). Table 5.10 in the appendix reports the mean values of the main variables in each country. Given that weights sum up to the EU population size this function directly accounts for a population weighted average tax function at the EU level. Through this approach we are able to predict households' net tax payments except for the difference across countries, i.e. the difference of interest. Therefore, the fit of this tax regression in terms of the $R2$-measure is close by but not equal 1. Third, the estimated function is subsequently used to predict net tax payments for the EU average tax system $T_{i,EUavg}$ for each household in the sample.

Fourth, we use the predicted EU average tax system to construct four different scenarios of replacing the national tax-benefit systems with an EU-wide system (again, yielding the same revenue on the EU level, but not for each country). In principle, a continuum of scenarios for introducing a fiscal union is possible. We focus on two different tax systems, either replacing the current national systems $T_k = T_{nat}$ with the EU average system T_{EUavg} or with a system $T_{EUavg-p}$ with increased progressivity compared to T_{EUavg} (again yielding revenue neutrality).[12] The latter scenario can be considered a proxy for a switch towards a more "northern" European system with higher progressivity. Thus, for both systems, we simulate two weighted combinations of the current national and the EU average system, resulting in a total of four different scenarios. Here, we simply look at full integration (the share of the average system being 100%) and partial integration of 33.3% (which could be seen as a first step for such a major reform). The benchmark is the current national system of each country (i.e. the share of the average system is 0%). Formally, we calculate for each household i of country k

[12] Precisely, we calculate $T_{EUavg-p}$ by first introducing a proportional surcharge of 7.5% to T_{EUavg} which will subsequently be fully redistributed across all households in the pooled sample via a lump sum transfer equal to its mean value across households, i.e. $T_{i,EUavg-p} = T_{i,EUavg} + T_{i,EUavg} * 0.075 - b$ with $b = \frac{1}{N}\sum_{i=1}^{N} T_{i,EUavg} * 0.075$. Results for a surcharge of 5% (10%) are qualitatively in line with the results presented here, and simply less (more) pronounced with view to the expected effects when increasing progressivity of the EU average system.

$$T_i = \alpha T_{i,EUavg} + (1-\alpha)T_{ik}; \alpha \in \left\{\frac{1}{3}, 1\right\}.^{13} \quad (5.11)$$

In sum, the four scenarios are:

i) EUavg - Sc.1: The partial substitution ($\alpha = 1/3$) of the national tax systems by the EU average system;

ii) EUavg - Sc.2: the full substitution ($\alpha = 1$);

iii) EUavg-p - Sc.1: the partial substitution ($\alpha = 1/3$) of the national tax systems by the more progressive EU system;

iv) EUavg-p - Sc.2: the full substitution ($\alpha = 1$) by the more progressive EU system.

What are the implications of this approach with respect to the resulting "new" tax-transfer systems of the different countries? By construction and as described in Section 5.2.3, we assume that all of the revenue collected from T_{EUavg} as well as $T_{EUavg-p}$ goes to the central EU budget and is immediately redistributed across countries and households. The structure of national budgets is affected in the importance of the simulated elements being reduced according to the weighting factor $(1-\alpha)$. In the extreme scenario with $\alpha = 1$ it is decreased to zero and fully replaced by the EU system. This also implies that revenues and expenditures that are not captured by our data – such as revenues from indirect or corporate income taxes or expenditures on defence and other publicly provided goods, as well as deficit (or surplus) levels – remain constant for each country. The absence of a balanced budget in the analysis is particularly important, since following the recent crisis, fiscal consolidation and the size of governments have become central to the debate on fiscal reforms in Europe.[14] In principle, countries with a deficit (surplus) would need to raise more (less) revenue – or spend less (more) on benefits – and hence the households in those countries would, ceteris paribus, lose (gain) in terms of disposable income.

[13]For $\alpha = 1/3$, results are qualitatively similar and lie in between the results for $\alpha = 1/3$ and $\alpha = 1$.

[14]In principle, it would be possible to increase or decrease the revenues from each country, however this would prompt the question of how this should be achieved (e.g. in a proportional or progressive manner). This would then have additional distributional and stabilizing effects which are not in the focus of the present chapter. Hence, we abstract from modeling changes to the fiscal position of each country in our analysis.

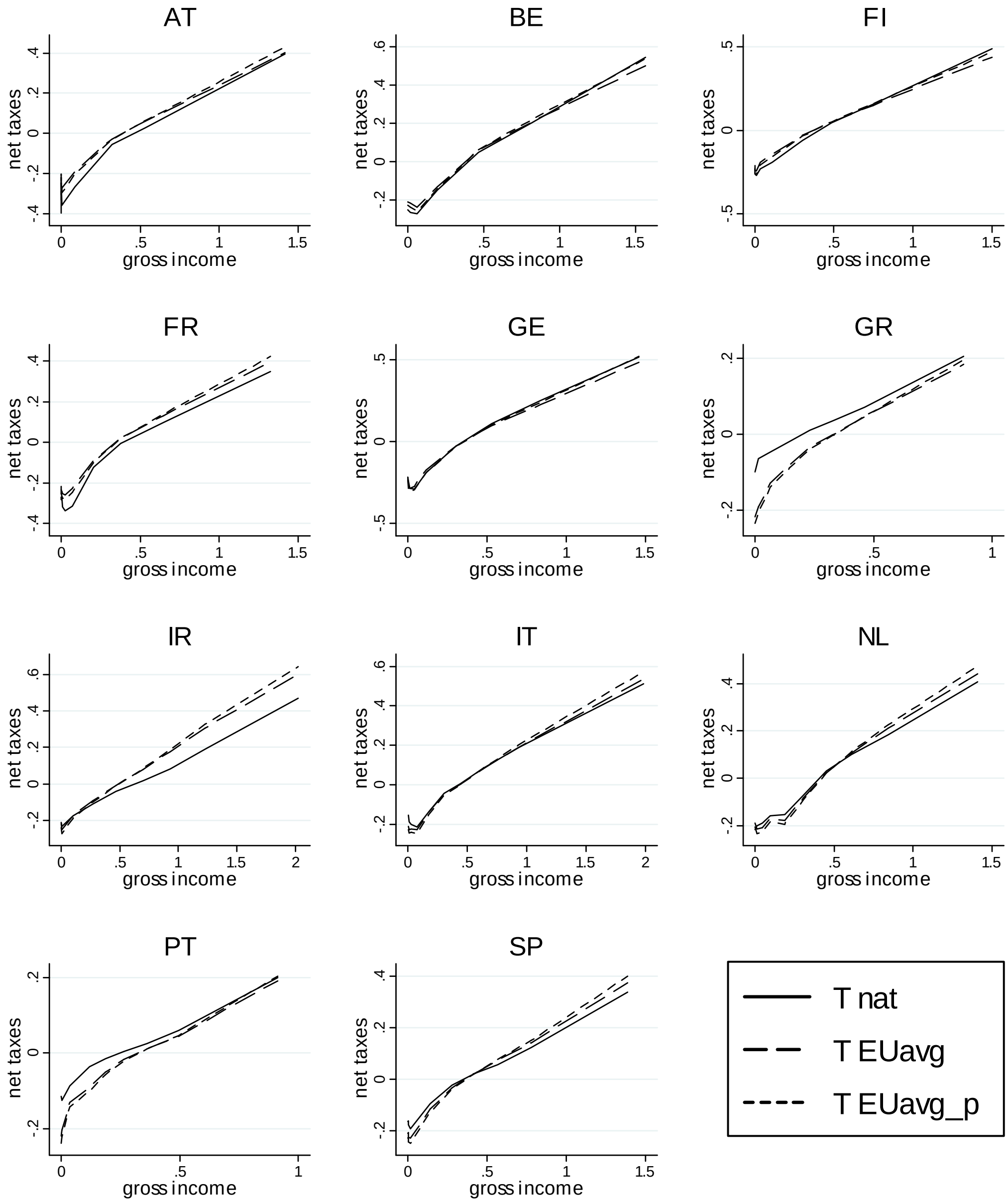


Figure 5.1: National tax-benefit schemes compared to EU average systems (based on country means for gross income deciles; weekly thousand 2001 EUR)

Figure 5.1 includes plots of the current national tax-benefit functions as well as the two EU average functions for each country in the sample. It is immediately evident that the redistributive effects of the different reforms under consideration will differ between countries. In some cases the EU average function is always below (above) the national tax-benefit system, in others there are sometimes crossings, i.e. different parts of the income distributions will be affected differently. A first visual inspection suggests that low income households in Greece and Portugal as well as high income households in Belgium, Finland and Germany will gain, while particularly high income households in France, Ireland, the Netherlands and Spain will pay higher taxes.

5.3.3 Descriptive information

In this section we report descriptive information on the variables used in our simulation exercise as well as for the estimated tax-benefit scenarios. We report values of these variables at the overall EU level and for individual countries in Table 5.1.

Table 5.1: Average weekly household income and taxes (2001 EUR)

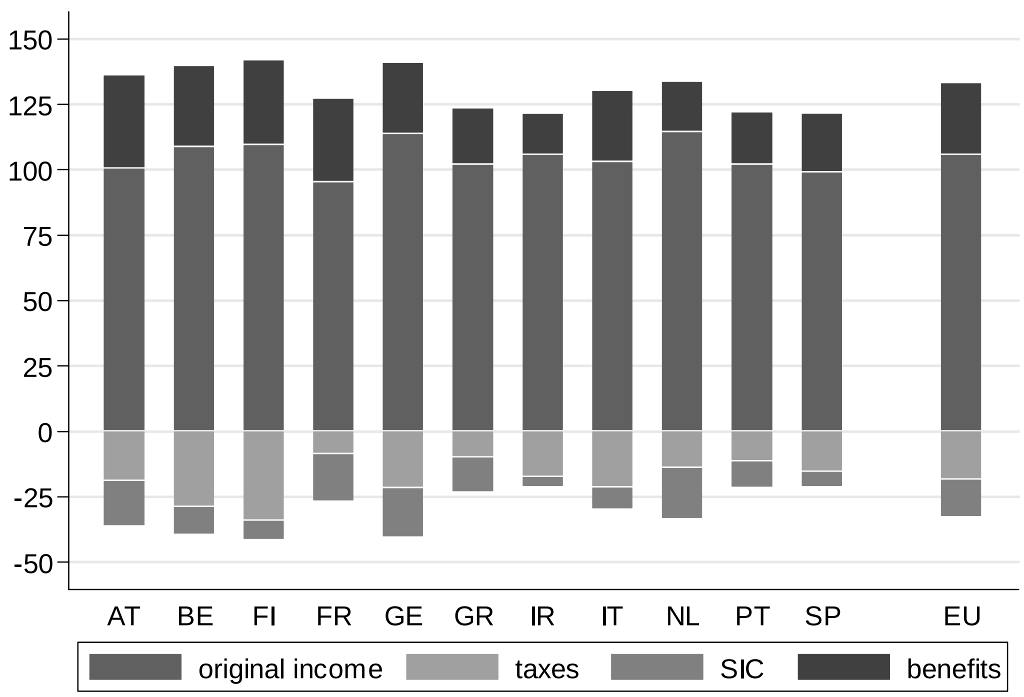
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EU	1.00	491.0	466.4	83.6	68.9	127.8	24.7	24.7	24.7
AT	0.03	544.3	539.9	104.0	94.1	193.6	4.5	42.2	43.5
BE	0.04	547.2	502.2	146.1	54.0	155.1	45.0	52.7	54.8
FI	0.02	507.9	464.4	159.3	35.0	150.8	43.5	45.5	47.0
FR	0.21	463.7	487.3	42.9	89.1	155.6	-23.6	16.2	15.6
GE	0.32	519.5	457.4	100.3	86.8	124.9	62.1	48.3	50.1
GR	0.03	259.4	254.4	25.4	34.4	54.7	5.1	-59.4	-65.8
IR	0.01	699.8	661.9	116.3	25.8	104.3	37.8	91.4	96.4
IT	0.17	498.4	485.0	104.6	40.6	131.8	13.4	2.3	0.6
NL	0.06	614.6	537.0	75.5	106.2	104.1	77.6	83.3	87.7
PT	0.03	314.2	308.9	35.4	31.6	61.7	5.4	-36.4	-41.0
SP	0.10	430.9	434.4	68.0	26.1	97.6	-3.5	-13.8	-16.7

Note: (1) Population share; (2) gross income; (3) disposable income; (4) gross taxes; (5) gross SIC; (6) gross benefits; (7) net taxes baseline; (8) net taxes EUavg (9) net taxes EUavg with increased progressivity. EUavg indicates the estimated EU average tax system. *Source*: Own calculations based on EUROMOD.

Columns 2 and 3 of Table 5.1 show the average weekly gross and disposable incomes per household, respectively (population shares in the first column). Columns 4 to 6 include initial gross taxes, employee social insurance contributions (SIC) and benefits. Column 7 reports initial net taxes, namely income taxes plus SIC paid minus cash benefits received. Average net taxes in France and Spain are negative, reflecting that benefits paid by the government exceed revenue from income taxes and SIC. Thus, these countries use revenue sources that are not included in our analysis (such as indirect taxes) to finance transfers. This becomes also visible with Figure 5.2, illustrating how gross income is transformed into disposable income and highlighting considerable differences in structures of tax and transfer systems across member states. Clearly, income taxes play a relatively small role in financing transfers in France compared to countries such as Germany or Belgium. Again considering Table 5.1, the final two columns report net taxes emerging under the EU average system (without and with increased progressivity in columns 8 and 9, respectively). Note that by construction, at the EU level, both systems lead to the same average net tax revenue as the sum of the national systems in the baseline.

Finally, Table 5.1 and Figure 5.2 reveal considerable differences across individual countries with respect to income levels. Average gross income ranges from 700 Euros in Ireland, 43 per cent above the EU average of 491 Euros, to a value of 259 Euros in Greece, just 47 per cent below the EU average. However, one should note that these income levels are not adjusted for differences in purchasing power, which would render income differentials somewhat smaller.[15] Initial net taxes also differ considerably, between 78 Euros in the Netherlands and -24 Euros in France. Net taxes would change significantly under the EU average system. They would increase to 83 Euros in the Netherlands while the countries with the largest net transfers would now be Greece (59 Euros) and Portugal (36 Euros). This is plausible because these countries have the lowest gross income levels. These effects are re-enforced in the EU average system with higher progression, as expected.

[15]This leads to slight changes when recalculating the results presented in Section 5.4 for PPP-EUR. The main difference is that Spain now shows a majority of gainer households for the reforms considered, while the rest of the findings are qualitatively broadly in line with the results presented here, i.e. for not PPP-adjusted 2001 EUR.



Source: Own calculations based on EUROMOD.

Figure 5.2: Composition of 100 Euros disposable income by country

5.4 Economic effects of a European tax-transfer system

In this section we present and discuss the key results of our first simulated policy scenario, the introduction of an EU-wide tax and transfer system, in four subsections. Section 5.4.1 focuses on the impact on the distribution of income, considering the four sub-scenarios described in the previous section (share of the EU average system of 33.3% and 100%, respectively, with and without increased progressivity). Behavioral effects are accounted for throughout the analysis in the form of labor supply adjustments. We summarize these effects in the appendix (Table 5.13), and also report results without behavioral adjustments (Table 5.11). In Section 5.4.2, we consider changes in inequality and social welfare, as well as changes for income quintiles in the different countries. In Section 5.4.3, we investigate whether such reforms could be politically feasible. Finally, Section 5.4.4 analyses the potential of the EU average tax system to act as an automatic fiscal stabilizer in presence of an asymmetric shock, compared to the current national tax-benefit systems.

5.4.1 Changes in disposable income and labor supply

This section addresses the concern that a common tax-transfer system within the eurozone would lead to massive redistribution and adverse effects on work incentives. As Bargain et al. (2012), we follow van Soest (1995) or Hoynes (1996), estimating a structural discrete choice labor supply model for all European countries under analysis by specifying consumption-leisure preferences in a very flexible way (without imposing separability between consumption and leisure). The model is estimated from the microdata and subsequently used to predict the potential labor supply effects of a switch to the European system. The model is described in detail in Appendix 5.8.3, where estimated elasticities (Table 5.12) as well as the labor supply effects (Tables 5.13 for the full population and 5.14 for subgroups) are also reported.

The labor supply effects are negative in all countries that are found to benefit from the reform (cp. below), except Germany and Finland. For instance, in Greece and Spain overall labor supply, measured in full time equivalents, falls by more than 2 per cent. However, in countries where the most significant income losses occur, labor supply effects are mostly positive, except for Ireland and Austria. We find the largest effects for women in couples and single females. This reflects the relatively high labor supply elasticities for this group as reported in Table 5.12 in the appendix. For Austria, women in couples are the only group reducing their labor supply due to the reform, which determines the direction of overall change in labor supply. This is also true for single men in Germany, which reflects an income effect for those who initially worked full- or over-time and now benefit from a reduced progressivity, compared to the German tax-benefit system. For all other countries, the direction of overall labor supply effects and those for the subgroups are the same, albeit magnitudes differ substantially. Particularly large negative responses can be observed for married and single women in Greece and Spain.

With respect to Greece, we find this to be partly due to income or substitution effects caused by the substantial increases in transfers while for Spain this reflects both, income or substitution effects for those experiencing a shift in disposable income due to more generous benefits and a substitution effect for higher income earners suffering from increased progressivity.[16]

How does the introduction of the common tax and transfer system redistribute income between households in Europe? Table 5.2 summarizes information on changes in disposable income for all four scenarios. The first column for each scenario simply reports the fraction of winners in terms of changes in disposable income – for the EU as a whole as well as each country. While this information does not account for the size of gains or losses (an increase in disposable income by one cent already constitutes a winner), the percentage change of mean disposable income is provided in the second column for each scenario. Even if a country shows a majority of winners (losers), the average gain (loss) of the winners (losers) might be lower than the average loss (gain) of the losers (winners). This additional information is summarized in the final two columns for each scenario.

As can be seen from Table 5.2, a partial introduction (EUavg - Sc.1) of the EU average system leads to a slight majority of winners at the EU level (while overall mean disposable income does not change as the average loss is higher than the average gain). The share of winners slightly increases again when moving to full integration (EUavg - Sc.2). Note that, by construction, the shares of losers and winners do not change over these two scenarios in case of fixed labor supply (Table 5.11 in the appendix).

Therefore, the change in the fraction of winners can only be due to behavioral responses. At the level of the individual member states, a majority of winners is derived in 6 of 11 countries, namely Greece, Italy, Portugal, Spain and, perhaps surprisingly, Germany, as well as Finland, which is only slightly above the margin with 51% winners – in Belgium it is 50-50. In Spain and Germany, average gains in disposable income are rather small (they are zero in Finland). As expected, they are largest in Greece (more than 8 per cent) and Portugal (4.5 per cent). The most significant income losses occur in Austria, Ireland and France, where average disposable incomes decline by between 2 and 3 per cent.

[16]For an intuitive explanation of the results, see Figure 5.1.

Table 5.2: Gains and losses in disposable income

	A-Sc.1				A-Sc.2				B-Sc.1				B-Sc.2			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
EU	55	0.0	20	-24	56	0.5	60	-70	53	0.0	21	-24	54	0.4	64	-71
AT	35	-2.2	17	-28	36	-6.5	51	-85	32	-2.4	19	-28	33	-6.8	55	-83
BE	50	-0.3	19	-22	51	-0.5	58	-67	44	-0.5	19	-20	46	-1.2	57	-59
FI	51	0.0	19	-20	53	0.7	57	-59	49	-0.1	18	-19	51	0.1	55	-57
FR	31	-2.8	14	-26	32	-7.9	43	-79	30	-2.8	17	-27	31	-7.9	51	-80
GE	66	1.0	20	-25	68	3.6	61	-74	64	0.8	19	-23	66	3.0	59	-70
GR	80	8.5	31	-13	80	26.1	94	-38	79	9.3	34	-13	80	28.8	103	-41
IR	28	-2.7	21	-34	29	-7.6	63	-98	28	-3.0	26	-38	29	-8.2	76	-110
IT	63	0.9	20	-22	63	2.8	60	-66	62	1.0	22	-22	62	3.3	66	-67
NL	40	-0.6	17	-17	41	-1.3	50	-47	38	-0.9	20	-21	39	-2.2	59	-59
PT	68	4.5	29	-18	69	13.6	88	-54	67	5.0	33	-19	67	15.0	99	-56
SP	60	0.9	20	-20	61	3.1	61	-61	59	1.1	23	-21	61	4.0	70	-64

Note: (A) EUavg; (B) EUavg-p; (1) Percentage of winners (100 minus (1) is the percentage of losers); (2) overall %-change in household weekly mean disposable income; mean difference from zero for (3) positive and (4) negative changes in household weekly mean disposable income (in 2001 EUR). *Source*: Own calculations based on EUROMOD.

An interesting aspect of these results is that one would intuitively assume the rich countries systematically losing in a common system; however this is only partly true. It is particularly puzzling that Germany and France are affected very differently, with France losing significantly despite its average income being lower. This finding is due to the national tax and transfer systems of these two countries being very heterogeneous, despite their similarity in other dimensions. Indeed, inspecting Figure 5.1 shows that the EU tax system involves higher taxes and lower transfers than the French national system, which implies that the net tax burden on the French population increases. In addition, French income levels are close to the EU average, so the country cannot benefit from participating in a system with higher average incomes. Figure 5.3 (which will be discussed in detail in the next section) shows that the low income quintiles in France suffer more than the high income quintiles. However, the situation is different in Germany, with the national tax and transfer system characterized by higher progressivity and slightly higher taxes for high income earners. For lower income levels, the distance between the national and the EU tax and transfer system is rather small.

As a result, all quintiles in Germany gain from introducing the EU tax.

The general pattern of results in terms of losers and winners at the country level (as well as the direction in labor supply responses) is robust when switching to the EU average tax system with an increase in tax progressivity (EUavg-p - Sc.1, Sc.2). The fractions of winners and losers change slightly, as do the magnitudes of average gains and losses. However, apart from Belgium and Finland, for which the difference between fractions of losers and winners is more pronounced now, no country shows a shift from a majority of losers to a majority of winners, or vice versa.[17]

5.4.2 Effects on welfare and inequality

Table 5.3 reveals that the pattern of winner and loser countries does not change when considering welfare instead of disposable income, using a social welfare function (SWF) increasing in income and decreasing in inequality. At least in the first two scenarios, it is again the same group of countries - Germany, Greece, Italy, Portugal and Spain (but not Finland) - that benefits in terms of the percentage change in social welfare.[18] Inequality also declines in the EU as a whole, likewise all individual countries except Belgium and Finland. Greece again benefits the most, showing the largest decrease in the Gini coefficient (having the highest level of initial inequality).[19]

When moving to the average system with increased progressivity, the overall pattern does not change (minor changes can be observed for Finland and the

[17]The reason is that Belgium and Finland have very similar tax schemes that are also close to the EU average system, but slightly more progressive. This difference is basically offset under the more progressive EU system for the upper income quintiles while especially the lower income quintiles in Finland gain more (see Figures 5.1 and 5.3).

[18]Precisely, the SWF applied is defined as $W = \mu * (1 - G)$ with μ the mean disposable income of the respective population and G the accordant Gini index (Yitzhaki (1979)). Findings are confirmed when aggregating the individual utilities from the labor supply model using a utilitarian SWF, which we did as a check.

[19]The Gini levels reported here are generally higher compared to official (e.g. OECD) and EUROMOD statistics for the data year 2001 (EUROMOD (2008)). This is due to the fact that consistently with the rest of our analysis, calculations for Gini coefficients are based on household disposable income as the un-weighted sum of individual disposable income across all household members. Usually, Gini coefficients are calculated on an individual basis using equivalized household income to account for economies of scale within households. With the latter approach, we are able to reproduce the results presented in EUROMOD (2008).

Netherlands). However, as expected, decreases (increases) in inequality and increases (decreases) in welfare become stronger (less strong or even negative) compared to the scenarios without increased progressivity.

Table 5.3: Inequality and social welfare

	Baseline		A-Sc.1		A-Sc.2		B-Sc.1		B-Sc.2	
	(1)	(2)	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)
EU	0.34	315	-3.2	1.7	-6.4	3.8	-4.5	2.4	-10.5	6.0
AT	0.31	382	-0.4	-2.1	3.5	-7.9	-1.8	-1.6	-1.2	-6.3
BE	0.33	347	1.8	-1.2	8.1	-4.4	0.1	-0.6	2.9	-2.6
FI	0.34	315	1.0	-0.5	5.1	-2.0	-0.4	0.1	1.2	-0.6
FR	0.31	343	-2.1	-1.9	-2.4	-6.9	-3.5	-1.2	-6.9	-5.0
GE	0.33	323	-2.8	2.4	-5.5	6.3	-4.4	3.0	-10.3	8.2
GR	0.42	151	-12.8	18.4	-27.4	50.7	-14.3	20.5	-29.8	56.2
IR	0.36	432	-1.3	-2.0	-3.1	-6.0	-2.4	-1.7	-6.2	-5.1
IT	0.37	307	-4.0	3.2	-9.5	8.6	-5.2	4.1	-13.0	11.2
NL	0.31	391	-1.1	-0.1	-2.2	-0.3	-2.4	0.2	-5.9	0.3
PT	0.40	191	-8.0	10.1	-16.3	25.9	-9.4	11.5	-18.7	29.3
SP	0.37	281	-4.5	3.5	-10.9	9.6	-5.7	4.4	-14.1	12.5

Note: (A) EUavg; (B) EUavg-p; (1) Gini coefficient; (2) social welfare; (3) change in Gini in %; (4) change in social welfare in %. *Source*: Own calculations based on EUROMOD.

Figure 5.3 shows the share of winners across gross income quintiles for the different scenarios by countries. The left (right) panel displays the 6 (5) countries that on average suffer (benefit) from the EU tax reforms (with switching countries Belgium and Finland on the left hand side). Consider first the countries that benefit on average. In the four Southern European countries, low income quintiles benefit most due to transfers in the EU system being more generous than those in the national systems. In Italy and Spain high income quintiles lose most. However, the pattern in Germany is different, with the share of winners slightly higher in the middle to upper quintiles than in the lower ones. This pattern can also be observed for Austria, Belgium and Finland, whereas the losses mostly fall on the high income quintiles in France, Ireland and the Netherlands (cf. also Figure 5.1).

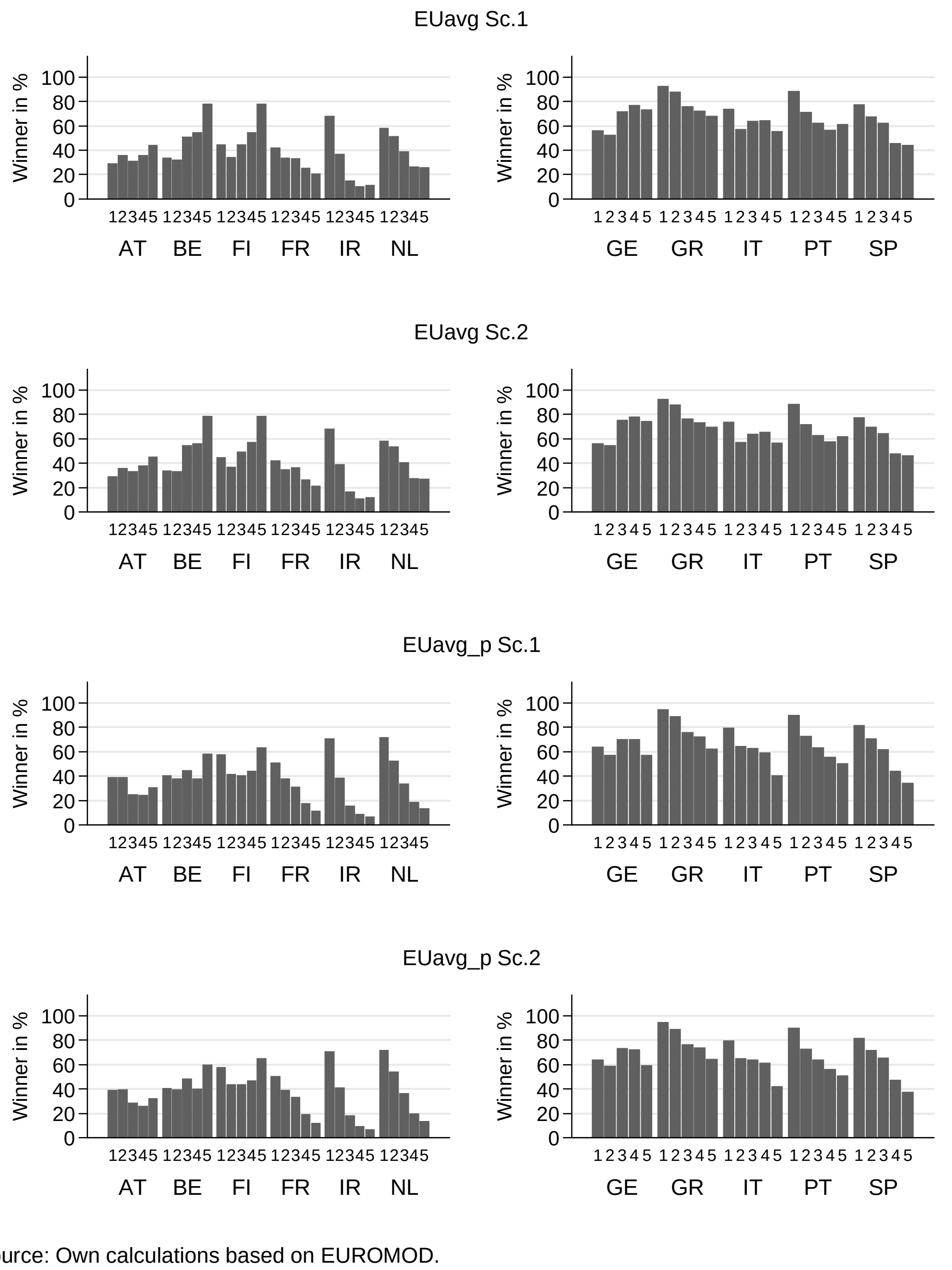


Figure 5.3: Share of winners in country gross income quintiles by scenario

5.4.3 Political feasibility

The introduction of a common tax and transfer system in Europe would be a major reform, particularly in terms of generating political support for such a project. While decisions about more fiscal integration would require unanimity among the member states under current voting rules, this section analyzes the implications considering different voting mechanisms for the Council of the European Union that might be applied to fiscal issues in the future. In order to do so, we make the following assumptions. Firstly, if a majority of taxpayers in a country benefits from a reform in terms of changes in disposable income, we assume that the government of this country will support the reform in terms of voting at the European level, independent of the extent of gains and losses. Note, that we also do not take countries' benefits or losses into account in terms of automatic fiscal stabilization, which are discussed in the next subsection. Even if automatic stabilization is of key importance with respect to the benefits of deeper fiscal integration, we argue that significant changes in disposable income will already largely determine countries willingness whether to vote in favor of the reform or not. Therefore, and with view to the substantial redistributive effects of the reform found in the previous section, we base our analysis in this section on changes in disposable income only. Secondly, we assume that decisions at the European level will require qualified majorities. Currently, decisions of the Council of the European Union regarding tax matters would usually require unanimity, which implies that none of the reforms considered here will be implemented unless side payments are possible. The reason is that by construction of the average system, there will be always some countries that benefit from the reform and others that lose, independent of the specific scenario. However, as political integration in Europe proceeds, it may well be that the role of decisions by qualified majority increases. Moreover, deeper fiscal integration might also be possible within the framework of 'enhanced cooperation', where a minimum of nine EU member states is allowed to establish advanced cooperation in a certain area without the other members being involved. This is currently in preparation for a European financial transaction tax.[20]

[20]See 'Statement by Commissioner Šemeta on an EU Financial Transactions Tax – ECOFIN Council', 9 October 2012, European Commission, MEMO/12/762.

We consider two voting rules for Council decisions that can currently be found in the EU treaties. The first, referred to as the 'double majority rule', was established with the Lisbon Treaty and is supposed to be enacted from 2014 onwards. This rule states that a qualified majority decision requires support of at least 55 per cent of the member states and a positive vote of member states representing at least 65 per cent of the population. The second rule is stipulated in the Treaty of Nice and is currently in force, containing three elements. First, it requires a simple majority of the member states. Second, this rule uses weighted votes given to countries to reflect population differences. Here, the required quorum is 74 per cent. In addition, the support of member states representing at least 62 per cent of the population might be required (on the demand of one member state). Table 5.4 illustrates this for two groups of countries, the group of 11 countries as before and a smaller 'core union' consisting of 6 countries.[21]

We focus on scenarios EUavg – Sc.1 and EUavg-p – Sc.1. In sum, we find that it would be difficult to generate the required political support for the two reforms under consideration. In the case of the first scenario, we observe a narrow majority of countries in favor of the reform, i.e. 6 versus 5 votes, a simple majority representing 67 per cent of the population. Thus, the reform would pass under the double majority rule of the Treaty of Lisbon, yet be rejected with the Treaty of Nice, failing to achieve the required majority under weighted voting (116 versus 139 votes). Surprisingly, the reform would fail for the smaller 'core union' under both rules, reflecting the tax structure and political weight of France. The same holds true for both groups of countries for the second scenario with increased progressivity.

These results suggest that a move towards a common tax and transfer system would be unlikely to happen even if qualified majority rules were applied to reforms as fundamental as the introduction of a common tax and transfer system. Clearly, from a political economy perspective, the resistance of those who would lose from moving to a fiscal union can only be overcome if something can be offered to

[21] Here, we re-estimate the EU average system for the proposed 'core union'. Detailed results are available in an earlier version of this chapter (CBT Working Paper WP12/22). A general pattern that will be consistent across different combinations of countries is that, as long as the reform is revenue neutral by construction of an average system, there will always be winner and loser countries.

Table 5.4: Political feasibility of reform scenarios using different voting rules

	EUavg - Sc. 1						EUavg-p - Sc. 1					
	Eurozone			Core union			Eurozone			Core union		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
AT	-	0.03	10	-	0.04	10	-	0.03	10	-	0.04	10
BE	-	0.04	12	+	0.05	12	-	0.04	12	+	0.05	12
FI	+	0.02	7	+	0.03	7	-	0.02	7	+	0.03	7
FR	-	0.21	29	-	0.31	29	-	0.32	29	-	0.31	29
GE	+	0.32	29	+	0.48	29	+	0.32	29	+	0.48	29
GR	+	0.03	12	.	.	.	+	0.03	12	.	.	.
IR	-	0.01	7	.	.	.	-	0.01	7	.	.	.
IT	+	0.17	29	.	.	.	+	0.17	29	.	.	.
NL	-	0.06	13	-	0.09	13	-	0.06	13	-	0.09	13
PT	+	0.03	12	.	.	.	+	0.03	12	.	.	.
SP	+	0.10	27	.	.	.	+	0.10	27	.	.	.
SUM	11	1.00	187	6	1.00	100	11	1.00	187	6	1.00	100
Lisbon	6	0.65	.	4	0.65	.	6	0.65	.	4	0.65	.
Nice	6	0.62	139	4	0.62	74	6	0.62	139	4	0.62	74
SUM+	6	0.67	116	3	0.56	48	5	0.65	109	3	0.56	48

Note: (1) Yes (+) or no (-) vote as defined in the text; (2) percentage of the population; (3) weighted votes. SUM: total sum across countries; SUM+: sum across countries voting 'yes' in (1). Lisbon/Nice indicate the following regulations: A qualified majority according to the Treaty of Nice requires a simple majority of member states plus 74 per cent of the weighted votes plus 62 per cent of the population (on demand of one member country); the Treaty of Lisbon requires 55 per cent of the member states plus 65 per cent of the population being represented. *Source*: Own calculations based on EUROMOD.

compensate the losers. To make this possible, the reform would either have to be linked to other issues, or it would have to generate significant benefits beyond those considered so far in the analysis. One possible source of benefits would be an improvement in income stability through automatic fiscal stabilizers. This issue will be analyzed in the next section.

5.4.4 Automatic fiscal stabilization

A key expected benefit from a common European tax-transfer system is an increase in macroeconomic stability, both of the individual countries and the eurozone as a whole. Automatic fiscal stabilization is associated with the ability of taxes and transfers to automatically stabilize disposable income and consequently consumption in the face of economic shocks. This relies on a simple mechanism: in the presence of a given negative shock to gross income, taxes decline and transfers increase, with the decline in disposable income being smaller than the shock to gross income. Several components of government budgets are affected by the macroeconomic situation in ways that operate to smooth the business cycle, with progressive income taxes and unemployment benefits being the most prominent example. Automatic stabilization might not only have effects on disposable income but also on GDP itself. If fewer taxes are collected and more transfers are paid in a recession, this should support private incomes and dampen adverse movements in aggregate demand.

Naturally, cushioning shocks through taxes and transfers comes at the cost of an increase in the government budget deficit. The usual assumption is for this gap to be closed through debt financing. However, in the current eurozone debt crisis, some countries have lost access to private capital markets and thus need outside help to close this gap. We will return to this issue further below.

The extent to which automatic stabilizers mitigate the impact of income shocks on household demand essentially depends on the tax and transfer system, determining the way in which a given shock to gross income translates into a change in disposable income. For instance, in the presence of a proportional income tax with a tax rate of 40%, a shock on gross income of 100 Euros leads to a decline in disposable income of 60 Euros. In this case, the tax absorbs 40% of the shock to gross income. In turn, a progressive tax would have a stronger stabilizing effect (van den Noord (2000); Girouard and André (2005)).

A common measure for estimating automatic stabilization is the "normalized tax change" used by Auerbach and Feenberg (2000) which can be interpreted as "the tax system's built-in flexibility" (Pechman, 1973, 1987). Based on this idea, Dolls et al. (2012) define the "income stabilization coefficient", τ, that shows how changes in market income X (defined as the sum of all incomes from market activities such as (self)-employment, business and property income) translate into changes in disposable income Y (market income minus taxes plus benefits) through changes in net tax payments T. They extend the concept of normalized tax change to include other taxes as well as SIC and transfers such as e.g. unemployment benefits. We follow their approach, taking into account personal income taxes (at all government levels), SIC as well as payroll taxes and transfers to private households, such as unemployment benefits. τ is computed using arithmetic changes in total disposable income ($\sum_i \Delta Y_i$) and market income ($\sum_i \Delta X_i$) based on household micro level information:

$$\tau = 1 - \frac{\sum_i \Delta Y_i}{\sum_i \Delta X_i} = \frac{\sum_i (\Delta X_i - \Delta Y_i)}{\sum_i \Delta X_i}. \qquad (5.12)$$

In order to compute this income stabilization coefficient, we simulate country-specific shocks to gross income of 5% for all households. Note that automatic stabilization is a static concept and does not imply any (macro- or microeconomic) feedback mechanism. Importantly, we therefore do not incorporate potential labor supply reactions to the simulated shock at this stage of the analysis. Results are presented in Table 5.5, with the levels and differences across countries in the baseline scenario in line with the calculations in Dolls et al. (2012).

Table 5.5: Income stabilization coefficients (for 5% gross income shock)

		EUavg			EUavg-p		
	Baseline	(1)	(2)	(3)	(1)	(2)	(3)
EU	0.40	0.40	0.13	0.40	0.41	0.15	0.45
AT	0.43	0.43	0.14	0.42	0.44	0.15	0.45
BE	0.51	0.45	0.11	0.34	0.46	0.12	0.37
FI	0.42	0.42	0.14	0.42	0.44	0.16	0.47
FR	0.36	0.38	0.14	0.41	0.39	0.15	0.45
GE	0.49	0.47	0.15	0.44	0.48	0.16	0.48
GR	0.29	0.30	0.11	0.34	0.31	0.12	0.36
IR	0.38	0.36	0.10	0.31	0.38	0.13	0.38
IT	0.34	0.35	0.12	0.37	0.38	0.15	0.46
NL	0.40	0.41	0.14	0.43	0.42	0.15	0.46
PT	0.30	0.31	0.11	0.32	0.31	0.11	0.34
SP	0.30	0.32	0.12	0.36	0.33	0.13	0.39

Note: (1) Scenario 1 (partial integration); (2) scenario 1 with credit constraints for countries; (3) scenario 2 (full integration). *Source*: Own calculations based on EUROMOD.

How does an EU tax-benefit system cushion asymmetric shocks in individual countries? In case of partially introducing the EU tax-benefit system, most countries gain in terms of automatic stabilization – except Belgium and Germany, with the highest automatic stabilizers in their national tax and transfer systems (column "Baseline"), as well as Ireland (column 1). Furthermore, these patterns are re-enforced in the case of a fully integrated system (column 3). Here, the cushioning effect is evidently independent of a single country's access to credit markets. However, in the case of partial integration, the stabilization coefficient is a combination of the national and European system. Hence, assuming free access to the credit market or not plays a role. That is, if individual countries are credit constrained, they cannot let the national stabilizers work and would have to adjust taxes or expenditures to keep the budget balanced. In this case, automatic stabilization can only come from the European tax and transfer system with the assumption that the EU budget deficit can be financed by issuing debt. Hence, we re-compute the stabilization coefficient for this case (column 2), with values for the income stabilization coefficients ranging between 0.10 for Ireland and 0.15 for Germany, representing a share of approximately one third of the stabilization provided by the fully integrated EU average system.

In the case of the more progressive EU system, the qualitative results are rather similar, however with the Southern European countries having even higher, and Belgium and Germany even lower stabilizers (column 1). This shows that a more progressive EU tax system does not necessarily increase automatic stabilizers for all countries. In the case of national credit constraints (column 2), the automatic stabilizers slightly increase for all countries, absorbing an average of approximately 15 per cent of an income shock.

In sum, the results illustrate that even a quite radical reform such as replacing one third of the national tax and transfer systems by a supranational system would only have moderate fiscal stabilization effects in the event of country specific shocks.

5.5 Economic effects of a European fiscal equalization mechanism

In this section, we analyze a system of fiscal equalization based on differences in taxing capacity across countries, calculating transfers between countries that would be generated by this mechanism and considering two variants of a negative macroeconomic shock. We first calculate the extent to which a fiscal equalization mechanism would provide insurance against a shock specific to a subset of countries (the 'GIIPS' group), and second, a shock comparable to the 2008-09 recession.

More precisely, the simulation experiment is set up as follows. The fiscal equalization system we consider leaves the national tax and transfer systems in place yet redistributes tax revenue across countries. This redistribution is based on the hypothetical ability of a country to generate tax revenue and its expenditure needs, which we refer to in the following as its (net) taxing capacity. Basing fiscal equalization on indicators of tax revenue and expenditure needs is a common approach in existing federations (see e.g. Boadway (2004); Büttner (2006)). We define the taxing capacity of a country as the net tax revenue the country would raise from its households if fully applying the EU average tax and transfer system used in Section 5.4 (compare Table 5.1, column 8). This taxing capacity can be interpreted as an indicator of the amount of net tax revenue raised by a country if tax rates and transfers were set as in other countries, and serves as the basis for equalization payments: countries above (below) the average taxable capacity will pay (receive) transfers to (from) the equalization mechanism.

This setup can be interpreted as a simple version of a European 'transfer union'. Note that the mechanism considered here is quite ambitious, with the fiscal equalization system fully compensating for differences in taxing capacity. In practice, one might expect a more moderate system that would only compensate a share of the differences in taxing capacity. Either way, it is clear that in such a system, a country as a whole either gains or loses – depending on whether it is a net contributor or a net recipient of fiscal equalization payments.

However, how these payments affect the distribution of taxes and transfers *within* a country is less straightforward. For simplicity we assume that the equalization payments are shared equally among households, i.e. households receive a (positive or negative) lump-sum transfer. Note that his assumption is not crucial for the stabilization effects we focus on. The question here is only whether a country as a whole receives more or less money from the equalization system after being hit by a shock. If it receives more, it can let its own automatic stabilizers work.[22]

Table 5.6 shows the average household net tax payments by country in the baseline as well as for the EU average system, which serves as our measure of taxing capacity. The resulting fiscal equalization payments are reported in column 3 (a positive (negative) value indicates a net contributing (receiving) country), while column 4 includes the new distribution of net taxes.

Table 5.6: 5% asymmetric shock to 'GIIPS' countries with fiscal equalization mechanism

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EU	24.7	24.7	0.0	24.7	2	22.1	22.1	0.0	22.1	7
AT	4.5	42.2	17.5	22.0	0	4.5	42.2	20.1	24.6	0
BE	45.0	52.7	28.0	73.0	0	45.0	52.7	30.6	75.6	0
FI	43.5	45.5	20.8	64.3	0	43.5	45.5	23.3	66.9	0
FR	-23.6	16.2	-8.5	-32.1	0	-23.6	16.2	-5.9	-29.5	0
GE	62.1	48.3	23.6	85.7	0	62.1	48.3	26.2	88.3	0
GR	5.1	-59.4	-84.1	-79.1	5	1.1	-61.9	-84.0	-82.9	-1
IR	37.8	91.4	66.7	104.5	5	23.3	77.4	55.3	78.6	33
IT	13.4	2.3	-22.4	-9.0	5	4.5	-7.0	-29.1	-24.6	27
NL	77.6	83.3	58.6	136.2	0	77.6	83.3	61.2	138.8	0
PT	5.4	-36.4	-61.1	-55.7	5	0.4	-40.2	-62.3	-61.8	8
SP	-3.5	-13.8	-38.5	-42.0	5	-9.8	-21.1	-43.2	-53.1	22

Note: Monetary values are in weekly 2001 EUR. (1) Net taxes baseline; (2) net taxes EUavg; (3) fiscal equalization (FE); (4) FE taxes; (5) gross income shock in %; (6) net taxes national system after shock; (7) net taxes EUavg after shock; (8) FE after shock; (9) FE taxes after shock; (10) change in automatic stabilization in %. (3) = (2)-24.7; (4) = (1)+(3); (8) = (7)-22.1; (9) = (6)+(8). *Source*: Own calculations based on EUROMOD.

Consider first the direct cross country distributional effect of the fiscal equalization system. As expected, the high income countries are net contributors to the system with average contributions per household and week ranging from 66.7 Eu-

[22] Note also, that we do not consider any behavioral effects for the simulation of this second reform in our study, be it by households (e.g. labor supply) or governments (e.g. adjustment of tax-benefit structure and composition of revenues).

ros in the case of Ireland to 17.5 Euros in Austria. These are huge contributions, equivalent to 10.0 per cent and 3.2 per cent of disposable income, respectively (compare this to column (2) of Table 5.2 where for the first scenario of the common tax-benefit system (negative) changes in disposable income for contributing countries range from 0.3 to 2.8 per cent of disposable income). Clearly, these unrealistically large contributions reflect that the degree of fiscal equalization is 100 per cent. Accordingly, the countries with below average taxing capacity receive huge transfers including Greece, Portugal, Spain, Italy and France. In Greece, the fiscal equalization payment is equal to 84 Euros, an implausible 33 per cent of average disposable income. France receives the lowest payment per household, at just 8.5 Euros, which equals 1.7 per cent of average disposable income.

What are the implications of this system for automatic stabilizers? Consider an asymmetric shock in the form of a decline in gross incomes by 5% hitting the periphery of the eurozone, i.e. the 'GIIPS' countries, which corresponds to a 2% shock at the aggregate EU level (column 5). The shock leads to a reduction in the net tax payments collected in the affected countries (column 6), as well as a reduction in their taxing capacity (column 7). Consequently, the fiscal equalization payments have to be adjusted for all countries (column 8), resulting in a new distribution of net taxes (column 9). Finally, column 10 reports the automatic stabilization effect of the fiscal equalization scheme in the affected countries measuring the change in fiscal equalization payments as a percentage of the change in income caused by the shock: negative values imply that payments received from the fiscal equalization scheme decline in response to the negative shock or increased contributions made to the scheme by a country, with a destabilizing effect occurring.

That the fiscal equalization system may have a destabilizing, rather than stabilizing, impact on some of the countries hit by the shock is the most striking result. In our specification this applies to Greece, the country most favored by the initial fiscal equalization system. Despite its fiscal capacity declining as a consequence of the shock, the payment received from the fiscal equalization system slightly declines. The payment received by Portugal is almost unchanged. Only the countries closer to average taxing capacity experience a stabilizing effect in the form of higher fiscal equalization payments. The reason is that the shock has two effects.

Firstly, the taxing capacity of the countries affected by the shock declines, which with all other things being equal, increases equalization payments. Secondly, since other countries are also affected by the shock, the overall taxing capacity within the union declines as well. The combination of these two effects may result in individual countries hit by the shock receiving lower payments than before, and thus the fiscal equalization scheme having a destabilizing, rather than stabilizing, effect for them.

This issue becomes even more relevant when considering an extreme shock scenario, such as the recent economic crisis. To illustrate this, we take the observed reduction in GDP for all 11 countries under analysis from 2008 to 2009 (4 per cent on average) in order to adjust gross incomes. All countries experienced a substantial reduction in GDP during that period, ranging from 3 to 8 per cent. In such a situation, the average taxing capacity substantially declines at the EU level, from 24.7 Euros per household before to 15 Euros per household after the shock and fiscal equalization payments substantially decrease for Greece, France, Spain and Portugal. Consequently, all of these countries experience a significant destabilizing effect (with the exception of Italy, where fiscal equalization payments once again increase). This effect is most striking for Greece, where payments received from the scheme fall by more than 100 per cent of the income shock. However, one of the donor countries now also faces a destabilizing effect. While Ireland, as the only donor country hit by a shock in the former scenario, yet had to contribute less to the equalization system and thus experienced a stabilizing effect, Belgium has to contribute more to the system after the crisis in the current scenario. Clearly, the effects reported seem unrealistically large (and by construction, are more pronounced for recipient countries facing a smaller reduction in GDP). Again, this is due to the assumption that the mechanism fully equalizes taxing capacities across countries. Furthermore, in the 2008-09 crisis scenario all countries experience a large shock to gross income at the same time, which necessarily undermines the overall redistributive capacity of the mechanism. Nevertheless, such a scenario emphasizes the finding from the previous analysis, namely that once introduced, a fiscal equalization mechanism can have a destabilizing effect.

Table 5.7: 2008-09 shock to all countries with fiscal equalization mechanism

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EU	24.7	24.7	0.0	24.7	4	15.0	15.0	0.0	15.0	-8
AT	4.5	42.2	17.5	22.0	4	-5.0	32.0	17.0	12.0	2
BE	45.0	52.7	28.0	73.0	3	36.0	46.1	31.0	67.0	-18
FI	43.5	45.5	20.8	64.3	8	24.4	26.3	11.2	35.7	23
FR	-23.6	16.2	-8.5	-32.1	3	-28.1	10.2	-4.8	-33.0	-26
GE	62.1	48.3	23.6	85.7	5	47.8	35.5	20.5	68.3	12
GR	5.1	-59.4	-84.1	-79.1	3	2.7	-60.9	-76.0	-73.2	-105
IR	37.8	91.4	66.7	104.5	7	17.6	71.8	56.7	74.3	20
IT	13.4	2.3	-22.4	-9.0	6	2.7	-8.9	-23.9	-21.2	5
NL	77.6	83.3	58.6	136.2	4	65.9	70.8	55.8	121.7	11
PT	5.4	-36.4	-61.1	-55.7	3	2.4	-38.6	-53.7	-51.3	-78
SP	-3.5	-13.8	-38.5	-42.0	4	-8.6	-19.7	-34.7	-43.3	-22

Note: See Table 5.6. (8) = (7)-15.0. *Source*: Own calculations based on EUROMOD. Changes in GDP (column 5) from OECD.

5.6 Discussion

Our results should be interpreted in the light of the limitations of our analysis, and also the simplifying assumptions made. Most importantly, we should emphasize that our simulations focus on particular scenarios, and despite having considered different variants of the reforms to explore robustness, the results depend on the specific properties of the reform scenarios under consideration. This also applies to the variants of macroeconomic shocks analyzed. We have focused on proportional income shocks (within a country) that affect all households equally. As shown in Dolls et al. (2012), the impact of automatic fiscal stabilizers may be rather different for shocks which affect households asymmetrically. We have also neglected the impact of reforms on indirect taxes and government expenditure other than monetary transfers.

Note also that our analysis abstracts from a number of behavioral effects, apart from potential labor supply reactions that were taken into account for the first general reform scenario, i.e. the common tax-transfer system. In particular, we do not account for tax evasion and avoidance or income shifting. If one assumes that tax evasion is higher in countries with lower incomes, our simulations would underscore the degree of redistribution from high to low income countries caused by the introduction of a common tax system. In addition, we have abstracted from potential effects of fiscal integration on cross country migration. For instance, more generous transfers to households in poor countries or countries affected by macroeconomic shocks could prevent their migration to other countries if they are unemployed. Among other things, this would make adjustments to asymmetric shocks more difficult.

These caveats point to various opportunities for future research. Firstly, it would be interesting to extend the analysis to all current 17 eurozone members, or even the EU27. However, as long as the reform will be revenue neutral at the EU level, there will generally always be winner and loser countries. Which countries win and lose will depend, among other things, on where the households are situated in the European income distribution and how the (progressivity of the) EU system is designed. Secondly, it would be interesting to study particular aspects of a common tax and transfer system, such as a common unemployment insurance system, as recently suggested by EU Commissioner Andor. Thirdly, our finding that a fiscal stabilization mechanism may have destabilizing effects in the event of an asymmetric shock suggests that other designs for a 'fiscal capacity' that provide such insurance are needed and should be studied. One possible design would be a system where grants are only provided to countries if they are actually hit by a shock, i.e. such a system would only grant transfers to countries in times of crisis. Fourthly, it would be desirable to quantify the potential welfare benefits of improved insurance and stabilization through fiscal integration compared to its redistributive effects. This would require the introduction of some notion of risk aversion into the analysis, which raises a number of interesting challenges. Finally, our analysis has taken the policies of the member states as given. However, one can expect the member states to adjust their fiscal policies as a reaction to fiscal integration, which is important to take into account from a political economy perspective on deeper integration in Europe.

5.7 Conclusion

The current debt crisis in the eurozone has brought the idea of deeper fiscal integration to the top of the European policy agenda. In this chapter, we have analyzed the economic effects of two main options for fiscal integration: i) the introduction of an EU-wide integrated tax and transfer system that partly or fully replaces the existing national systems; and ii) the introduction of a fiscal equalization mechanism.

With respect to redistributive concerns, our analysis shows that introducing an EU tax and transfer system would increase the disposable income of a small majority of households in Europe and would simultaneously lead to significant redistribution between countries. Choosing a more progressive variant of the EU tax system would change the magnitudes of gains and losses, yet the patterns would be similar. Given that only a small majority of 6 out of the 11 countries under analysis would gain from the reform in terms of income redistribution, generating political support for such a reform may be difficult with view to current or prospective voting rules of the Council of the European Union.

A key motivation of introducing an EU tax-benefit system could be an increase in automatic fiscal stabilization in the different member countries. In the reform scenario where our EU tax and transfer system replaces one third of the national systems, we find that the EU system would absorb between 10 per cent (Ireland) and 15 per cent (Germany) of a shock to gross income. Given that replacing one third of the existing national tax and transfer systems by an EU system seems rather ambitious, these stabilization effects are not very large.[23]

Regarding the system of fiscal equalization, our findings are even less appealing. We consider a system of strong fiscal equalization, where differences between the taxing capacity of individual countries and average EU taxing capacity are fully neutralized. Unsurprisingly, this system leads to a massive transfer of tax revenue from high to low income countries. These redistributive effects are much larger than those of introducing the common tax and transfer system. However, the achievements are disappointing in terms of income stabilization in the presence

[23] In the US the income stabilization through the federal budget is approximately 25 per cent, see Dolls et al. (2012) and the literature cited there.

of asymmetric shocks with the fiscal equalization mechanism even having a destabilizing effect for some countries. An important policy implication of this analysis is the necessity of distinguishing between the redistributive effects of fiscal integration and its stabilization effects in the presence of an asymmetric macroeconomic shock.

To summarize, our analysis highlights that further fiscal integration could indeed improve fiscal stabilizers in the eurozone and reduce the vulnerability of individual member states to income shocks somewhat. But in the scenarios we consider, a limited improvement in fiscal stabilizers goes along with considerable income redistribution across countries. Thus, it seems unlikely that such reforms will find political support, suggesting that fiscal institutions of existing federations, which typically combine redistributive and stabilizing effects, may not be the way forward for Europe. Instead, it may be necessary to explore ways of improving macroeconomic stability ideally without redistributing income ex ante. Rather than copying fiscal institutions of existing federations, Europe seems to need new concepts to make deeper fiscal integration politically feasible.

5.8 Appendix

5.8.1 Descriptive data

Table 5.8: Main taxes captured by EUROMOD as % of total taxation in 2001

	Taxes captured			Taxes not captured				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AT	23.9	32.9	56.8	33.8	6.9	40.7	0.0	66.8
BE	30.1	31.4	61.5	29.2	7.2	36.4	0.4	106.5
FI	31.5	26.9	58.4	30.0	9.4	39.4	5.1	42.5
FR	18.8	36.8	55.6	35.1	7.0	42.1	-1.5	56.9
GE	23.2	42.8	66.0	28.2	4.3	32.5	-3.1	59.1
GR	13.6	31.9	45.5	41.5	10.1	51.6	-4.5	103.7
IR	29.3	15.2	44.5	41.9	12.1	54.0	0.9	35.1
IT	26.7	28.6	55.3	35.5	7.8	43.3	-3.1	108.2
NL	16.1	35.7	51.8	33.7	11.0	44.7	-0.2	50.7
PT	17.4	26.7	44.1	43.6	10.6	54.2	-4.8	53.5
SP	20.2	36.1	56.3	34.4	8.5	42.9	-0.5	55.6

Note: (1) Income tax; (2) SIC; (3) = (1)+(2); (4) VAT; (5) corporate taxes; (6) = (4)+(5); (7) deficit as % of GDP; (8) debt as % of GDP. Taxes do not add up to 100% as specific taxes (e.g. environmental taxes, other indirect taxes) are not captured in the table. *Source*: OECD. Deficit and debt shares from Eurostat.

Table 5.9: Data sources used by EUROMOD

	Dataset	Years (1)	(2)	(3)	Observations
AT	European Community Household Panel	1999	1998	2001	7,386
BE	Panel Survey on Belgian Households	2002	2001	2001	7,335
FI	Income Distribution Survey	2001	2001	2001	25,010
FR	Household Budget Survey	2000	2000	2001	25,803
GE	German Socio-Economic Panel	2001	2000	2001	16,874
GR	Household Budget Survey	1995	1994	2001	15,062
IR	Living in Ireland Survey	2000	2000	2001	11,436
IT	Survey of Households Income and Wealth	1996	1995	2001	23,924
NL	Sociaal-Economisch Panelonderzoek	2000	1999	2001	10,344
PT	European Community Household Panel	2001	2000	2001	13,092
SP	European Community Household Panel	2000	1999	2001	14,787

Note: (1) Data collection; (2) incomes; (3) simulated policy. *Source*: EUROMOD.

Table 5.10: Cross-country heterogeneity in main characteristics for tax functions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EU	2.5	0.5	0.4	50.5	23.8	30.4	16.1	1.8	5.2
AT	2.5	0.5	0.4	49.8	23.1	8.5	17.8	1.4	5.7
BE	2.4	0.6	0.4	52.3	25.7	11.7	16.8	2.6	6.0
FI	2.2	0.5	0.3	48.5	22.5	20.6	17.1	4.9	6.0
FR	2.4	0.6	0.4	50.0	25.1	33.6	15.0	1.9	2.9
GE	2.1	0.4	0.3	51.0	24.3	39.9	16.9	2.7	4.2
GR	2.8	0.6	0.5	52.3	25.1	7.8	16.0	1.0	10.4
IR	3.0	0.8	0.3	46.2	19.8	14.1	11.4	3.4	6.2
IT	2.9	0.5	0.4	51.2	23.9	32.0	17.9	0.4	6.9
NL	2.3	0.5	0.3	48.8	27.3	25.1	14.1	0.9	2.7
PT	3.2	0.7	0.5	48.4	22.1	4.5	14.0	1.1	8.2
SP	3.2	0.6	0.5	50.0	19.7	30.8	14.3	1.7	6.3

Note: (1) Average number of household members; (2) average number of household members between 0-17 years old; (3) average number of household members $>$ 65 years old; (4) Average age of household head; (5) share of couple households; (6) share of households with property income; share of households where at least one member is (7) eligible for pensions, (8) eligible for unemployment benefits, (9) self-employed. *Source*: Own calculations based on EUROMOD.

5.8.2 Income changes without behavioral adjustments

Table 5.11: Gains and losses in disposable income - for baseline labor supply

	A-Sc.1				A-Sc.2				B-Sc.1				B-Sc.2			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
EU	54	-0.1	20	-24	54	-0.1	60	-71	52	-0.1	21	-24	52	-0.3	63	-72
AT	34	-2.3	17	-28	34	-6.8	52	-85	31	-2.4	19	-28	31	-7.2	57	-83
BE	48	-0.4	19	-22	48	-1.2	58	-67	43	-0.6	19	-20	43	-1.8	57	-60
FI	50	-0.1	19	-20	50	-0.2	57	-59	48	-0.3	19	-20	48	-0.7	56	-59
FR	30	-2.8	15	-27	30	-8.5	44	-80	29	-2.8	18	-27	29	-8.5	53	-81
GE	65	0.9	20	-25	65	2.8	60	-74	63	0.7	19	-23	63	2.2	58	-70
GR	79	8.4	31	-13	79	25.2	92	-38	79	9.2	34	-13	79	27.6	102	-40
IR	28	-2.8	21	-34	28	-8.4	64	-103	28	-3.1	26	-39	28	-9.2	77	-116
IT	63	0.8	20	-22	63	2.5	59	-65	61	1.0	22	-22	61	2.8	65	-66
NL	40	-0.6	17	-17	40	-1.9	51	-51	38	-1.0	20	-21	38	-3.0	60	-63
PT	68	4.5	29	-18	68	13.4	88	-54	66	4.9	33	-19	66	14.8	99	-56
SP	59	0.8	20	-20	59	2.3	60	-61	58	1.0	23	-21	58	2.9	70	-64

Note: See Table 5.2. *Source*: Own calculations based on EUROMOD.

5.8.3 Behavioral adjustment

As Bargain et al. (2012), we follow van Soest (1995) or Hoynes (1996) in the choice of a structural discrete choice labor supply model to be separately estimated for all countries under analysis. In this framework, labor supply decisions are reduced to choosing among a discrete set of possibilities, e.g. inactivity, part-time and full-time. This modeling includes non-participation as one of the options, in order that both the extensive (participation) and intensive margin (working hours) are directly estimated. We assume that there are $K = 7$ discrete hour possibilities for each potential worker (0, 10, 20, 30, 40, 50, 60 hours per week), and specify consumption-leisure preferences in a very flexible way (without imposing separability between consumption and leisure) using a quadratic utility function as in Blundell et al. (2000). That is, the deterministic utility of a couple i at each discrete choice $j = 1, \ldots, J$ can be written as:

$$\begin{aligned} U_{ij} &= \beta_{ci} C_{ij} + \beta_{cc} C_{ij}^2 + \beta_{h_f i} C_{ij}^f + \beta_{h_m i} C_{ij}^m + \beta_{h_{ff}} (H_{ij}^f)^2 \\ &+ \beta_{h_{mm}} (H_{ij}^m)^2 + \beta_{ch_f} C_{ij} H_{ij}^f + \beta_{ch_m} C_{ij} H_{ij}^m + \beta_{h_m h_f} H_{ij}^f H_{ij}^m \\ &- \eta_j^f 1(H_{ij}^f > 0) - \eta_j^m 1(H_{ij}^m > 0) \end{aligned} \tag{5.13}$$

with household consumption C_{ij} and spouses' work hours H_{ij}^f and H_{ij}^m. The J choices for a couple correspond to all combinations of the spouses' discrete hours, that is, $J = 7 * 7 = 49$. For singles, the model above is simplified to only one hour term H_{ij}, and J is simply the number of discrete hour choices $K = 7$. Coefficients on consumption and work hours are specified as:

$$\beta_{ci} = \beta_c^0 + z_i^c \beta_c + u_i \tag{5.14}$$

$$\beta_{h_f i} = \beta_{h_f}^0 + z_i^f \beta_{h_f} \tag{5.15}$$

$$\beta_{h_m i} = \beta_{h_m}^0 + z_i^m \beta_{h_m} \tag{5.16}$$

i.e. they vary linearly with several taste-shifters z_i (including polynomial form of age, presence of children or dependent elders and region). The term β_{ci} also incorporates unobserved heterogeneity, in the form of a normally-distributed term u_i, for the model to allow random taste variation and unrestricted substitution patterns between alternatives. The fit of the model is improved by the introduction of fixed costs of work, estimated as model parameters. Fixed costs explain that there are very few observations with a small positive number of worked hours. These costs, denoted η_j^k for $k = f, m$, are non-zero for positive hour choices and depend on observed characteristics (e.g. the presence of young children).

For each labor supply choice j, disposable income (equivalent to consumption in the present static framework) is calculated as function $C_{ij} = d(w_i^f H_{ij}^f, w_i^m H_{ij}^m, y_i, Z_i)$ of female and male earnings, non-labor income y_i and household characteristics Z_i. The tax-benefit function d is simulated using EUROMOD. In the discrete choice approach, disposable income only needs to be assessed at certain points of the budget curve, in order that nonlinear budget constraints resulting from nonlinear taxes, joint filing and unemployment benefits can be easily taken into account.

Male and female wage rates w_i^f and w_i^m for each household i are calculated by dividing earnings by standardized working hours. We assume that hourly wages are constant across the working hour categories and do not depend on the actual working time, which is standard within the literature. For unemployed people, we estimate their (potential) hourly wages using the Heckman correction for sample selection. The stochastic specification of the labor supply model is completed by i.i.d. error terms ϵ_{ij} for each choice $j = 1, \ldots, J$. Accordingly, total utility at each alternative is written

$$V_{ij} = U_{ij} + \epsilon_{ij} \tag{5.17}$$

with U_{ij} as previously defined. Error terms are assumed to represent possible observational errors, optimization errors or transitory situations. Under the assumption that they follow an extreme value type I (EV-I) distribution, the (conditional) probability for each household i of choosing a given alternative j has an explicit analytical solution:

$$P_{ij} = \exp(U_{ij}) / \sum_{k=1}^{J} \exp(U_{ik}) \tag{5.18}$$

The unconditional probability is obtained by integrating out the disturbance terms (unobserved heterogeneity in preferences) in the likelihood. In practice, this is achieved by averaging the conditional probability P_{ij} over a large number of draws (here 100) for these terms, with the parameters being estimated by simulated maximum likelihood.

The model is estimated separately for each country, ensuring that estimated parameters are country-specific. These estimates are used to calculate the probabilities of changing working time categories due to a marginal change in wage rates or non-labor incomes, with resulting elasticities reported in Table 5.12. We note that elasticities are relatively small and similar across countries. Nonetheless, some country differences can be observed, largely respecting differences in preferences and childcare institutions, as shown in Bargain et al. (2012).

The model is used to predict a change in disposable income induced by the EU tax reform, with the expected working hours calculated after the implementation of the reform and reported in Table 5.13 for the whole population and Table 5.14

for subgroups. The first row shows results at the EU level, while figures at the national level are subsequently presented.

Table 5.12: Estimated labor supply elasticities by subgroups

	AT	BE	FI	FR	GE	GR	IR	IT	NL	PT	SP
Married women											
(A1)	0.34	0.31	0.13	0.13	0.31	0.62	0.32	0.33	0.32	0.14	0.51
(A2)	0.05	0.05	0.01	0.02	0.08	0.03	0.05	0.05	0.13	0.05	0.08
(A3)	0.27	0.23	0.12	0.10	0.22	0.57	0.27	0.28	0.20	0.11	0.43
(B1)	-0.001	-0.002	0.001	-0.002	-0.006	-0.004	-0.007	0.001	-0.001	0.000	0.000
(B3)	-0.001	-0.001	0.001	-0.002	-0.004	-0.004	-0.007	0.001	-0.001	0.000	0.000
Married men											
(A1)	0.07	0.12	0.10	0.06	0.14	0.11	0.15	0.04	0.06	0.04	0.08
(A2)	0.02	0.02	0.00	0.02	0.03	0.01	0.03	-0.01	0.01	0.03	0.07
(A3)	0.05	0.09	0.10	0.04	0.11	0.10	0.12	0.05	0.06	0.03	0.07
(B1)	0.000	-0.002	0.001	0.000	-0.004	-0.005	-0.004	-0.017	-0.002	0.000	-0.002
(B3)	0.000	-0.001	0.001	0.000	-0.002	-0.003	-0.002	-0.013	-0.001	0.000	-0.002
Single women											
(A1)	0.14	0.59	0.21	0.12	0.18	0.41	0.37	0.67	0.16	0.08	0.20
(A2)	0.01	0.07	0.00	0.02	0.01	-0.01	0.06	0.05	0.02	0.04	0.04
(A3)	0.13	0.41	0.20	0.09	0.17	0.43	0.24	0.58	0.11	0.05	0.19
(B1)	-0.001	-0.004	0.029	0.001	-0.006	-0.010	-0.003	0.019	-0.003	0.000	-0.007
(B3)	0.000	-0.002	0.028	0.002	-0.003	-0.009	-0.001	0.019	-0.002	0.000	-0.005
Single men											
(A1)	0.14	0.28	0.33	0.14	0.20	0.19	0.67	0.22	0.08	0.03	0.57
(A2)	0.05	-0.01	-0.01	0.02	0.01	0.05	0.03	0.02	0.01	-0.02	0.09
(A3)	0.08	0.27	0.34	0.12	0.21	0.15	0.62	0.22	0.08	0.04	0.47
(B1)	0.000	-0.008	0.112	-0.002	-0.007	0.000	-0.028	-0.003	-0.003	0.000	-0.012
(B3)	0.000	-0.005	0.104	0.000	-0.003	0.000	-0.021	0.000	-0.001	0.000	-0.012

Note: (A) Wage elasticities; (B) income elasticities; (1) total hours; (2) intensive margin (hours); (3) extensive margin (participation). Wage (income) elasticities are computed numerically as the responses to a 1% uniform increase in wage rates (unearned income). The intensive margin corresponds to the response in hours among workers; the extensive margin to the participation response (measured as a % change in the participation rate). *Source*: Bargain et al. (2012).

Table 5.13: Hours worked and (changes in) fulltime equivalents

	Baseline		EUavg		EUavg-p	
	(1)	(2)	(3)	(4)	(3)	(4)
EU	29.9	71.1	-0.1	-1.0	-0.6	-2.6
AT	32.0	2.1	-0.1	-0.9	-0.6	-2.2
BE	32.7	2.6	2.5	5.6	1.8	3.7
FI	33.2	1.7	2.0	4.6	1.6	3.6
FR	30.8	17.3	0.5	1.3	0.3	0.6
GE	30.0	23.5	0.4	0.0	-0.3	-2.3
GR	25.3	1.3	-3.1	-10.2	-3.7	-12.1
IR	28.1	0.7	-1.3	-4.7	-1.8	-6.6
IT	26.7	8.4	-1.4	-4.9	-1.9	-6.6
NL	31.3	5.2	0.2	-0.2	-0.3	-1.7
PT	34.5	2.0	-0.3	-1.2	-0.5	-2.0
SP	27.7	6.4	-2.4	-8.0	-2.9	-9.9
	Net tax base		%-change net taxes			
EU	26.3		1.8	-2.4	0.5	-2.6

Note: (1) Mean hours worked per week; (2) fulltime equivalents (FTE) in millions; (3) change FTE scenario 1 in %; (4) change FTE scenario 2 in %. Number of observations: 30382. *Source*: Own calculations based on EUROMOD.

Table 5.14: Labour supply effects by subgroups

	Baseline	EUavg		EUavg-p		Baseline	EUavg		EUavg-p	
	(1)	(2)	(3)	(2)	(3)	(1)	(2)	(3)	(2)	(3)
	Single men					Single women				
EU	7.8	0.3	-1.3	-0.4	-3.7	8.1	0.5	0.4	-0.3	-2.2
AT	0.3	0.8	1.8	0.5	0.9	0.3	0.6	0.8	0.1	-0.9
BE	0.2	6.0	9.6	5.3	7.9	0.2	7.7	17.5	6.2	14.1
FI	0.2	5.3	13.5	4.5	11.4	0.2	3.0	7.7	2.5	6.5
FR	1.6	2.6	6.1	2.2	5.0	2.0	2.5	7.6	2.2	6.7
GE	3.5	-0.4	-3.4	-1.3	-6.6	3.2	0.4	-0.3	-0.7	-3.8
GR	0.1	-1.4	-4.8	-1.7	-5.8	0.1	-9.7	-27.9	-11.0	-31.5
IR	0.1	-1.7	-8.0	-3.1	-12.4	0.1	-1.3	-5.1	-2.1	-7.8
IT	0.6	-1.1	-3.6	-1.7	-5.6	0.7	-3.9	-13.4	-5.2	-18.0
NL	0.5	1.3	2.6	1.0	1.8	0.5	2.5	6.1	2.0	4.6
PT	0.1	-0.1	-1.4	-0.4	-2.3	0.2	-1.6	-5.3	-2.1	-7.0
SP	0.6	-4.9	-18.9	-6.3	-23.9	0.6	-3.2	-11.4	-3.8	-13.7
	Married men					Married women				
EU	37.4	0.0	-0.8	-0.4	-1.9	17.8	-0.5	-1.9	-1.1	-3.7
AT	1.1	0.2	0.2	-0.2	-0.8	0.5	-1.9	-6.0	-2.7	-8.4
BE	1.4	1.6	3.8	1.0	2.3	0.8	1.6	4.1	0.8	1.7
FI	0.7	1.7	3.8	1.3	2.7	0.5	0.8	1.1	0.6	0.6
FR	8.7	0.1	0.0	-0.1	-0.6	5.0	-0.1	-0.5	-0.4	-1.2
GE	11.2	0.6	0.9	0.1	-0.8	5.5	0.5	0.5	-0.2	-1.6
GR	0.9	-1.8	-6.7	-2.2	-8.2	0.3	-5.3	-15.8	-6.3	-18.7
IR	0.4	-0.6	-2.4	-0.9	-3.6	0.2	-2.7	-8.8	-3.2	-10.8
IT	5.1	-1.1	-4.1	-1.4	-5.1	2.0	-1.4	-4.5	-2.1	-6.7
NL	2.9	0.0	-0.6	-0.4	-1.9	1.3	-0.8	-2.9	-1.7	-5.5
PT	1.1	-0.1	-0.6	-0.3	-1.2	0.7	-0.4	-1.3	-0.6	-2.1
SP	4.0	-1.2	-4.3	-1.5	-5.3	1.2	-4.5	-13.5	-5.6	-16.5

Note: (1) FTE baseline; (2) change FTE scenario 1 in %; (3) change FTE scenario 2 in %.
Source: Own calculations based on EUROMOD.

Chapter 6

Benefiting from a European fiscal union? Redistribution vs. stabilization

6.1 Introduction

With the current debt crisis, a debate concerning deeper fiscal integration in Europe emerged. Options discussed range from the introduction of balanced budget rules to the more ambitious project of developing a 'fiscal capacity' for the European Union (EU) or at least the European Monetary Union (EMU). The latter "could take several forms" with "various options" to be explored, as recently suggested by the President of the European Council, Herman van Rompuy.[1] More precisely, EU Commissioner László Andor made a proposal for a European unemployment insurance scheme that could act as an automatic stabilizer in presence of macroeconomic shocks complementary to national insurance mechanisms.[2] This is an issue especially important for the EMU, where contrary to monetary policy, fiscal policy remained the responsibility of the individual member states after its

[1] 'Towards a genuine Economic and Monetary Union', Interim Report, The President of the European Council, Brussels, 12 October 2012, p. 4.

[2] László Andor: 'A strong employment agenda – the pathway to economic recovery', dinner speech at the Conference "Jobs for Europe: The Employment Policy Conference", Brussels, 6 September 2012, European Commission, SPEECH/12/588.

introduction, which had two implications. First, a joint monetary and exchange rate policy can be too restrictive to cushion asymmetric shocks in single countries. Second, especially the experiences in the recent economic crisis of 2008-09 have shown that national fiscal policy is also insufficient or even unable (when countries are credit constrained) to fulfill this function.[3] Thus, the view is widespread that moving towards a 'fiscal union' complementing the monetary union would have stabilizing effects in case of macroeconomic shocks. Cross-regional transfers within an accordant mechanism are then supposed to balance out asymmetric shocks but usually not to induce redistributive effects across countries. Rather, the latter are considered a concern in the debate. However, one should note that a certain harmonization of living standards across the European member states is a general goal of the EU (Art. 158 on 'economic and social cohesion' of the Treaty establishing the European Community) and could also be a political aim as such within more fiscal integration.

Proposals as those of van Rompuy and Andor indicate an even more intense debate about these issues which could imply that fiscal institutions in the EU become more similar to those of existing federations like the US, including elements of a joint tax and transfer system. Although a renewed interest in the topic can be observed in (theoretical) research (e.g. Evers (2012), Werning and Farhi (2012), Engler and Voigts (2013)) and policy advice (e.g. Enderlein, Bofinger, Boone, de Grauwe and et al. (2012); Bernoth and Engler (2013), Dullien and Fichtner (2013), HWWI-PWC (2013)) there is no clear consensus yet about the design of a 'fiscal union' for Europe and little is known about its general economic implications from an empirical viewpoint. In this chapter, we study the economic effects for the benchmark case of introducing an EU-wide tax and transfer system and allow for redistributive as well as stabilizing effects. Our study is closely related to Bargain et al. (2013b) who firstly addressed this specific issue using household micro data. For 11 founding members of the eurozone and 2001 data, they analyzed the economic implications of i) an EU-wide integrated tax and transfer system and ii) a fiscal equalization mechanism. However, they assessed redistributive effects

[3] According to the theory of optimal currency areas (Mundell (1961)), asymmetric economic shocks could be also counterbalanced by open international labor markets and flexible wages. Though, labor mobility in Europe is known to be rather low.

(at the micro level) separately from stabilizing effects (at the macro level). In this chapter, we extend their analysis and use an explicit theoretical framework to assess both elements at the individual level in an integrated way. Precisely, we apply an expected utility approach and calculate individual equivalent variations of an EU-wide tax and transfer system relative to the baseline with the national systems. Additionally, we provide a decomposition into a "redistributive" and a "stabilization" component.[4]

We employ the most recent version of the European tax-benefit calculator EUROMOD, which uses harmonized and representative household micro data and allows calculating taxes, transfers and disposable incomes for each household in the sample. On this basis, we construct a European tax and transfer system using data and systems from 2007 for all current 27 EU member states. As in Bargain et al. (2013b), our design of a fiscal union can be interpreted as an average of the national tax-transfer systems. Most importantly, on the one hand, this leads to revenue neutrality of the reform at the EU level, while necessarily implying redistributive effects across countries, on the other hand. With respect to the latter, we argue that an average mechanism including countries' tax-transfer systems with respective population weights could be the most natural first step for a transfer mechanism that also implies redistributive effects.

Our main results go as follows. We find that a majority of countries, represented by their median voters, would gain from fiscal integration with equivalent variations ranging from a huge contribution of −530 EUR per month in Ireland to 188 EUR per month in Hungary, and being mainly driven by the redistributive component. Effects across gross income deciles within countries differ greatly and depend on income levels and the structures of existing national systems. We show and explain that countries which benefit (lose) in terms of the redistributive component, generally tend to show relatively low (high) benefits in terms of the stabilizing component. Subsequently, we additionally consider smaller fiscal unions, namely for the current 17 members of the euro area, its 12 founding members, as well as two further subgroups as sometimes discussed in the political debate under the label of a "North" and a "South" euro area. Moving to such groups of

[4]Though, we are not able to take into account any behavioral adjustments to the reform (see Section 6.6).

more similar countries generally reduces redistributive and increases the stabilizing effects. However, Pareto improving reforms where at least one country gains while no one loses seem to be possible only for rather severe crisis scenarios with substantial shocks to gross income or for high levels of individual risk aversion.

The reforms we simulate are very prospective from a political viewpoint and rather meant as a conceptual experiment to clarify the impact of the general design as well as the influence of redistributive versus stabilizing effects at the individual level using a consistent framework. However, common tax-transfer policies are a key element of existing fiscal unions and will certainly be introduced in the EU as well in the medium or long term, and in the one form or the other. While always depending on the specific aim and design of the system, we consider our results as kind of a benchmark computation that provides insights in general issues of setting up a European fiscal union.

The rest of the chapter is structured as follows. In Section 6.2, we review the most important related literature. Section 6.3 introduces the concept and design of a fiscal union and develops the framework for an economic evaluation. The microdata and the tax-transfer calculator EUROMOD are presented in Section 6.4, together with first descriptive information. The presentation of the key findings follows in Section 6.5. Section 6.6 discusses the results and limitations of our analysis and concludes.

6.2 Related literature

The related literature addressing issues on the integration of fiscal policies in Europe is vast and we restrict our review to work that specifically studies potential redistributive and/or stabilizing effects of fiscal policy integration in the EU/EMU. We refer to Bargain et al. (2013b) for a broader covering.

An important early discussion of the key issues can be found in the MacDougall (1977) Report, which argues that EMU would be impracticable due to the absence of a common fiscal policy which plays a major role in existing economic unions to cushion asymmetric fluctuations. Besides, the report also argued explicitly in favor of a transfer union harmonizing living standards in Europe. Arguments for equalizing welfare of European citizens through economic and fiscal integration can also be found in Wildasin (1991), Casella (2005) or Atkinson (2002a, 2013). However, most of the literature focuses on the specific implications of EMU for fiscal policy in Europe, stressing one main issue. Along the lines of Mundell (1961) and Kenen (1969), many economists argued that the Euro area is far from being an optimum currency area and thus, needs to be complemented by a European fiscal federation to counterbalance asymmetric fluctuations (the former President of the European Commission, Jacques Delors, emphasized this already 24 years ago, see Delors (1989)). On the one hand, the reason is that a joint monetary policy might be too restrictive when countries are very heterogeneous which could even reinforce economic fluctuations and the divergence of member state economies. On the other hand, the effectiveness of national fiscal policy in a monetary union to cushion asymmetric shocks seems to be limited (e.g. due to time lags or lack of fiscal discipline); see e.g. Eichengreen (1990), Sachs and Sala-i Martín (1992), Mélitz and Vori (1993), Bayoumi and Masson (1995), Asdrubali, Sorensen and Yosha (1996), Masson (1996), Eichengreen and Wyplosz (1998), Engwerda et al. (2002), Galí and Perotti (2003), Uhlig (2003) and, for a detailed overview, von Hagen and Wyplosz (2008).

In contrast, Fatás (1998) shows that the cross-regional insurance potential of a European fiscal federation would be limited (around 10% of an income shock). His main objection to some of the other empirical studies is that they fail to distinguish properly between intertemporal transfers on the one hand, and interregional insurance on the other hand. He argues that intertemporal transfers are essentially self-insurance against shocks that can be provided by national governments through debt financing. However, this debt has to be counterbalanced in the future. The same effect has to be taken into account for transfers at a federal level and only the remaining component can be considered as true interregional insurance (risk-sharing). As a response to Fatás (1998), Forni and Reichlin (1999) focus on the latter, too, but find that 40% of long-run income volatility of the EU15 are potentially insurable through a pure joint insurance device, i.e. without generating (ex-ante) redistributive effects. In addition, both studies stress the general difficulty of avoiding (ex-post) redistribution within such an insurance mechanism, namely the additional effect on income levels in the long-run rather than on income volatility only (basically due to time lags or mistargeting). This might cause problems for political implementability (on this, see also von Hagen (1992), Goodhart and Smith (1993), Obstfeld and Peri (1998)).

Two remarks have to be made with view to the present chapter. First, we are not able to properly distinguish between intertemporal stabilization and cross-regional insurance. The main reason is data limitation, i.e. we can only use cross-sections for all countries under analysis in a comparable way and are thus not able to provide empirical estimates for intertemporal stabilization at a national level or the amount of insurable risk at a common level (based on country-specific income volatility). We therefore rely on a counterfactual approach using tax-transfer calculators and derive stabilization measures assuming hypothetical shocks to gross income. The advantage of the counterfactual approach is the clear identification of the simulated effect (Bourguignon and Spadaro (2006)) and given that we are interested in hypothetical effects of European fiscal integration (simulated on basis of the same methodology) this seems to be an appropriate strategy. Furthermore, as traditional in public finance, the concept of stabilization we consider is a static one. That is, we consider 'contemporaneous' automatic stabilization of disposable income through the immediate impact of the tax-transfer system following a shock to gross income, without implying any (macro- or microeconomic) feedback mechanism (cf. Dolls et al. (2012)).

Second, given our simulation experiment, we have to consider a relevant case when studying stabilizing effects of fiscal integration. Based on his distinction between intertemporal stabilization and cross-regional insurance, Fatás (1998) argues that only the latter would justify a European fiscal federation. However, this is only true when countries have free access to capital markets in order to finance debt. That this access in fact can be lost was exactly one of the experiences in the 2008-09 crisis which led to destabilizing effects particularly in some Southern European countries (see e.g. Bertola (2013)). Thus, one main argument for European fiscal integration is the provision of stabilization from a federal budget when individual countries are credit constrained but the union is not.[5] Therefore, assuming credit constraints at the country level is of key importance to our study.

[5]This of course requires that participating countries are sufficiently heterogeneous in the sense that income volatilities are not perfectly correlated such that the fiscal union can be assumed to stay solvent.

6.3 Methodology

In this section, we provide the theoretical framework for our analysis. We first describe how a fiscal union is constructed and second, introduce the framework for an economic evaluation at the individual level.

6.3.1 Concept of a 'fiscal union'

Generally, different concepts of a 'fiscal union' are possible and the political debate in Europe covers options ranging from fiscal rules for the member states for policy coordination and supervision, over crisis resolution mechanisms (as the European Stabilization Mechanism ESM or the ECB Outright Monetary Transactions) up to a European fiscal capacity in form of an EU level unemployment insurance, for instance (see e.g. Bordo et al. (2011), Fuest and Peichl (2012)). The latter element would be a clear step towards an integration (of elements) of the member states' tax and transfers systems. Even if not at the top of the agenda in the current political debate, a EU fiscal union complementing the currency union can be seen as a final step of European economic integration and its analysis will therefore provide interesting and important results. This is the aim of the present chapter. We thus define a fiscal union as a (complete) integration of its member states tax and transfer systems.

Net taxes within a single country. Consider first how 'net taxes' at the national level are derived. Gross market income X_i of household i is defined as the sum of all incomes from market activities:

$$X_i = E_i + Q_i + I_i + P_i + O_i + SICER_i, \tag{6.1}$$

where E_i is labor, Q_i business, I_i capital, P_i property, and O_i other income. We also assume that employer social insurance contributions $SICER_i$ are part of gross market income in order to include them into the coverage of the tax and transfer system. Disposable income Y_i is defined as market income minus net government intervention $T_i = TAX_i + SIC_i - BEN_i$:

$$Y_i = X_i - T_i = X_i - (TAX_i + SIC_i - BEN_i), \tag{6.2}$$

where TAX_i are income taxes, $SIC_i = SICEE_i + SICER_i$ the sum of employee ($SICEE_i$) and employer social insurance contributions, and BEN_i cash benefits (i.e. negative taxes). In the following, we refer to the difference between taxes and social insurance contributions paid and transfers received, T_i, as 'net taxes'. Assuming that individuals i might reside in different countries $k = 1, ..., K$, disposable income will be determined by country-specific net tax schedules

$$T_{ik} = f_k(X_i, \mathbf{z}_i), \tag{6.3}$$

where $\mathbf{z}_i$ is a vector of all demographic characteristics relevant for taxation, like marriage status, age or number of children and $f_k(X_i, \mathbf{z}_i)$ is a function that transforms market income X_i into disposable income Y_{ik} (which might be non-linear as usually observed in reality).

Construction of a fiscal union. Now, countries $k = 1, ..., K$ define a common tax and transfer system denoted $T_{iEU} = f_{EU}(X_i, \mathbf{z}_i)$. An important precondition for its implementation is that the reform will be performed in a revenue neutral way at the overall level. Thus, we assume that this tax system is constructed such that, for the union as a whole and given market incomes, it generates the same net tax revenue as the national tax systems in sum do: $\sum_{i=1}^{N_1} T_{i1} + ... + \sum_{i=1}^{N_K} T_{iK} = \sum_{k=1}^{K} \sum_{i=1}^{N_k} T_{iEU}$. The easiest way to introduce a revenue neutral common tax system by construction is to use the "average" system over all participating countries,

$$T_{iEU} = f_{EU}(X_i, \mathbf{z}_i) = \frac{1}{K} \sum_{k=1}^{K} f_k(X_i, \mathbf{z}_i). \tag{6.4}$$

Taking the average of the national system is certainly a specific assumption in constructing a fiscal union and can be debated. However, we argue that as a first step, it appears to be a very natural approach since the national tax systems enter the joint system with the weight of its respective population. Then, the more similar (different) the national tax systems are, the less (more) pronounced will be the "averaging" effect. As shown by Bargain et al. (2013b), it is then very straightforward to alter the design of the common system by, for instance, changing its progressivity into the direction of a certain group of countries while compromising on the tax-transfer design of the remaining member states. In the present chapter, we do not alter the average system but rather consider various compositions of a fiscal union. We thus provide a first point of reference without entering the debate about generally increasing or decreasing the size of the government nor the debate about which specific tax-transfer design among different countries should be favored.

Effects on overall tax revenue and national budgets. As mentioned above, we assume that the fiscal union will be introduced in a revenue neutral way at the overall level. However, this generally implies non-revenue neutrality at the national level. The reason is that the integrated system collects revenue from all citizens in the participating countries and we assume that this revenue goes to a common budget. Thus, the national countries lose their tax revenue. We therefore have to make an important further assumption, which is, that the net revenue now available at the union level is redistributed to the member states *after* the implementation of the reform such that each national government is fully compensated for the loss in its *initial* net revenue. The main reason for this assumption is that national expenditures on public goods and services, as well as revenue from other tax sources at the national level and national public deficits should be unaffected by the reform. As we do not consider any behavioral adjustments to the tax reform, the revenue collected at the union level will be exactly sufficient to compensate the governments of the member states for their net revenue losses. In sum, what essentially changes are the revenues from direct taxes and the expenses for cash transfers, collected from and paid to the households within the single countries, affecting their net tax burdens, while all revenues and expenditures outside the direct tax and (cash) transfer system are kept constant. In other words, redistribution is performed between households in terms of disposable income, not between countries in terms of revenues.[6]

6.3.2 The value of moving to a 'fiscal union'

Individual expected utility. We assume that individuals have rational expectations and derive utility from consumption only using a constant relative risk

[6] This is the systematic difference to a fiscal equalization mechanism, cf. the previous chapter.

aversion (CRRA) utility function as standard in the literature:

$$U(C_i) = \frac{C_i^{1-\rho}}{1-\rho}; \rho > 0, \rho \neq 1, \tag{6.5}$$

where i indexes individuals, and ρ is the coefficient of relative risk aversion. As we consider a single period in time, we assume that individuals do not save and consumption C_i thus equals disposable income Y_i (market income X_i minus net taxes T_i as defined in the previous section). Individuals form expectations about two different situations: one in which they receive the current level of consumption, $C_i^0 = X_i^0 - T_i^0$, and one in which the current level of consumption will be altered due to a shock to market income that occurs with a certain probability α, $C_i^1 = X_i^1 - T_i^1$. Individual expected utility thus reads:

$$E_i[U(C_i)] = (1-\alpha)U(C_i^0) + \alpha U(C_i^1). \tag{6.6}$$

The degree of risk aversion is reflected by the concavity of the utility function and leads to the fact that $U(E_i[C_i]) > E_i[U(C_i)] = U(CE_i)$. That is, the individual would accept a certain guaranteed level of consumption denoted CE_i which is less than the expected (but insecure) level of consumption $E_i[C_i]$. CE_i is also called the "certainty equivalent" and is a monetary equivalent expression of expected utility $E_i[U(C_i)]$. Precisely, using (6.5) we get:

$$E_i[U(C_i)] = U(CE_i) = \frac{CE_i^{1-\rho}}{1-\rho} \tag{6.7}$$

$$\Leftrightarrow \quad CE_i = \{(1-\rho)E_i[U(C_i)]\}^{\frac{1}{1-\rho}}. \tag{6.8}$$

Equivalent variation. Assume a group of single countries $k = 1, ..., K$ that form a fiscal union (indexed EU as above in the following) by (completely) integrating their national tax-transfer systems. Under this new tax regime, individuals will receive a level of consumption $C_{iEU}^0 = X_i^0 - T_{iEU}^0$ in the current situation ($C_{iEU}^1 = X_i^1 - T_{iEU}^1$ after a shock) which might be different from their former level of consumption $C_{ik}^0 = X_i^0 - T_{ik}^0$ ($C_{ik}^1 = X_i^1 - T_{ik}^1$ after a shock). We assume that individuals form expectations after the policy switch $T_k \rightarrow T_{EU}$ in the same way as they did before. We then ask for the change in individual expected utility (in monetary terms) due to the regime change, i.e. for the equivalent variation (EV_i) of the integrated tax-transfer system relative to the baseline with the national system. Precisely, the equivalent variation is defined as the amount such that the individual would be indifferent between (i) the situation under the given national tax and transfer system and receiving the equivalent variation and (ii) the situation under the integrated system. EV_i will then be positive (negative) if the regime change is welfare increasing (decreasing). Using (6.8) we get an explicit expression for the equivalent variation in terms of the certainty equivalent CE_i:

$$U(CE_{ik} + EV_i) - U(CE_{iEU}) = 0 \tag{6.9}$$

$$\Leftrightarrow \frac{(CE_{ik} + EV_i)^{1-\rho}}{1-\rho} = \frac{CE_{iEU}^{1-\rho}}{1-\rho} \tag{6.10}$$

$$\Leftrightarrow CE_{iEU} - CE_{ik} = EV_i. \tag{6.11}$$

6.3.3 Decomposition

Redistributive and stabilization value. In the given framework of expected utility, moving to an integrated tax-transfer system will generally have two effects on individual welfare: (i) a "redistributive" effect due to the fact that individual net tax burdens and thus disposable income will change in the baseline situation and (ii) a "stabilization" effect due to the fact that the adjustment of individual net tax burdens, following a shock to market income, might differ as well under the integrated compared to the national system. It is important not to mix that up with the redistributive and insurance capacities of a given tax-transfer system within a single country.[7] In our case, the terms of "redistribution" and "stabilization" only refer to the policy switch, i.e. to the extent to which changes in initial net tax burdens across countries and households on the one hand and the differences in the insurance capacity across the regimes on the other hand affect individual expected utility. In order to express both effects separately, we decompose the total value of the individual equivalent variation EV_i (indexed T in the following and

[7] See Hoynes and Luttmer (2011) who develop a framework to separately identify both effects using US data.

suppressing index i for notational simplicity) accordingly. To perform this, consider first the following decomposition of individual expected utility (independent of the tax regime) adding and subtracting the counterfactual value of consumption where market income is shock adjusted but net taxes are not modified, $X^1 - T^0$ (such that overall expected utility does not change):

$$E[U(C)] = \underbrace{(1-\alpha)U(X^0 - T^0) + \alpha U(X^1 - T^0)}_{\text{expected utility when } X^1 - X^0 = \Delta X = \Delta C,\ i.e.:\ \Delta T = 0} \quad (6.12a)$$

$$+ \underbrace{\alpha U(X^1 - T^1) - \alpha U(X^1 - T^0)}_{\text{change in expected utility due to } \Delta T \neq 0}. \quad (6.12b)$$

We denote the first term of the decomposition $E^*[U(C)]$ and the accordant certainty equivalent CE^* which can be derived from $E^*[U(C)] = U(CE^*)$. When $X^0 > X^1$ and $T^0 > T^1$, we have $E^*[U(C)] < E[U(C)]$ and (6.12b) will be positive. Using (6.12a) and (6.12b) to derive the change in individual expected utility for the regime switch, we get:

$$E[U(C_{EU})] - E[U(C_k)] = \underbrace{(1-\alpha)U(X^0 - T^0_{EU}) + \alpha U(X^1 - T^0_{EU})}_{=E^*[U(C_{EU})]} \quad (6.13a)$$

$$- \underbrace{(1-\alpha)U(X^0 - T^0_k) + \alpha U(X^1 - T^0_k)}_{=E^*[U(C_k)]} \quad (6.13b)$$

$$+\alpha U(X^1 - T^1_{EU}) - \alpha U(X^1 - T^0_{EU}) \quad (6.13c)$$

$$-[\alpha U(X^1 - T^1_k) - \alpha U(X^1 - T^0_k)]. \quad (6.13d)$$

We interpret $E^*[U(C_{EU})] - E^*[U(C_k)]$ as the "redistributive" effect of the regime change on individual expected utility. It is that part of the overall change in expected utility which is caused by the difference in the level of initial net tax burdens between the national and the integrated tax regime, i.e. by $T^0_k \neq T^0_{EU}$, and not by how the two regimes respond to the shock in market income in terms of net tax adjustment. In contrast, if we had $T^0_k = T^0_{EU}$, $E^*[U(C_{EU})] - E^*[U(C_k)]$ would be equal to zero. Using equality $E^*[U(C_{EU})] - E^*[U(C_k)] = U(CE^*_{EU}) - U(CE^*_k)$, the associated value of the equivalent variation, denoted EV_R, can be derived:

$$U(CE^*_{EU} + EV_R) - U(CE^*_k) = 0 \tag{6.14}$$

$$\Leftrightarrow \quad EV_R = CE^*_{EU} - CE^*_k. \tag{6.15}$$

The remaining "stabilization" component follows from the difference of (6.13c) and (6.13d) and captures the change in individual expected utility which is due to the difference in the adjustment of initial net tax burdens after a shock between the two regimes, $T_0 \rightarrow T_1$ (though, differences in the levels of T_0 and T_1 across systems will impact the size of the adjustment; this is further discussed in the empirical section). Note that without any further assumption, this component can be positive or negative and joining the fiscal union can thus increase or a decrease the extent of automatic stabilization for a single country compared to the initial situation under the national tax system. Formally, the corresponding value for the equivalent variation, denoted EV_S, is given by subtracting (6.15) from (6.11):

$$EV_T - EV_R = EV_S \tag{6.16}$$

Credit constraint at the country level. As pointed out in Section 6.2, one important feature of a fiscal integration of countries $k = 1, ..., K$ will be the provision of automatic stabilization in presence of a negative income shock when individual countries are credit constrained but the fiscal union is not. We assume that individuals will be informed also about this and modify their formation of expectations accordingly. A credit constraint at the country level essentially implies that a single country k will not be able to finance the implied automatic decrease in taxes (increase in transfers) following a negative shock to market income by issuing debt.[8] That is, in this case we have $\Delta T_k = 0$ and theoretically, individuals would have to bear the full shock to gross income under the national system such that $\Delta X = \Delta C_k$. This leads exactly to the counterfactual level of consumption

[8] In reality, decreasing incomes in a downturn in presence of credit constraints would even imply statutory tax increases/benefit cuts leading to destabilizing effects.

that has been introduced above and $E[U(C_{EU})] - E[U(C_k)]$ thus becomes:

$$\begin{aligned}
E[U(C_{EU})] - E[U(C_k)] &= (1-\alpha)U(X^0 - T^0_{EU}) + \alpha U(X^1 - T^0_{EU}) && (6.17a)\\
&\quad -(1-\alpha)U(X^0 - T^0_k) + \alpha U(X^1 - T^0_k) && (6.17b)\\
&\quad +\alpha U(X^1 - T^1_{EU}) - \alpha U(X^1 - T^0_{EU}) && (6.17c)\\
&\quad -\underbrace{[\alpha U(X^1 - T^0_k) - \alpha U(X^1 - T^0_k)]}_{=0} && (6.17d)\\
&= E[U(C_{EU})] - E^*[U(C_k)]. && (6.17e)
\end{aligned}$$

Using equality $E[U(C_{EU})] - E^*[U(C_k)] = U(CE_{EU}) - U(CE^*_k)$ and (6.8) we get the accordant value of the total equivalent variation, denoted EV_{T^*}:

$$U(CE_{EU} + EV_{T^*}) - U(CE^*_k) = 0 \Leftrightarrow CE_{EU} - CE^*_k = EV_{T^*}. \quad (6.18)$$

Note that the redistributive value of the equivalent variation is unchanged and by substituting EV_T with EV_{T^*} in (6.16), the stabilization value becomes:

$$EV_{S^*} = EV_{T^*} - EV_R = CE_{EU} - CE^*_k - (CE^*_{EU} - CE^*_k) = CE_{EU} - CE^*_{EU}, \quad (6.19)$$

i.e. the "stabilizing" effect on individual expected utility rests entirely on the capacity of the fiscal union to provide insurance against a negative income shock.[9]

6.4 Data and empirical implementation

6.4.1 EU-SILC and EUROMOD

As in Bargain et al. (2013b), we use EUROMOD as a basis for our analysis. EUROMOD is a static tax-benefit calculator for the EU countries which allows for comparative analysis of tax-benefit systems and their impact on the income distribution in a consistent way through a common framework. However, in contrast

[9]Note that in this case, EV_{S^*} will always be positive (given that $T^0_{EU} > T^1_{EU}$).

to those authors, we are able to apply the latest version of EUROMOD available which uses input-data mainly on basis of the European Union Statistics on Income and Living Conditions (EU-SILC) released by Eurostat, starting from 2006 up to 2008, and which allows for a simulation of policy systems up to 2010 for all current 27 EU member countries.

The simulated components include most direct taxes (especially income taxes on all sources of income including tax credits, payroll taxes and social insurance contributions) and benefits (e.g. welfare benefits, social assistance and partly also transfers based on previous contributions, e.g. unemployment benefits). Information on consumption is missing in the data; hence indirect taxes and taxes on corporate profits are not included in the model, likewise in-kind benefits. Clearly, these elements differ between countries and would affect the results presented. However, with view to an integration of tax-transfer policies across EU member states, one can argue that also existing fiscal unions do not cover all taxes and transfers at the federal level. Also, EUROMOD assumes full benefit take-up and tax compliance focusing on the intended effects of tax-benefit systems only.

The main stages of the simulations are as follows. First, a representative microdata sample of individuals in households (essentially including information on all gross income components as well as all demographic characteristics that are relevant to determine taxes and benefits) and the respective tax-benefit rules are read into the model. Subsequently, the model constructs corresponding assessment units (for instance the individual or household) for each tax and benefit instrument, according to the underlying eligibility rules. On that basis, all taxes and benefits are simulated, and finally, disposable income is calculated.

In this chapter, we use EU-SILC wave 2008, covering information for 2007, i.e. income data from the year before the crisis, and apply 2007 tax-transfer rules.[10] While simulations are usually carried out for counterfactual situations, EUROMOD also simulates various taxes and transfers for the baseline that are not observed in the original data. For our purpose, we use the original data provided by EUROMOD complemented by those simulated components. For more detailed information on the current version of EUROMOD and the underlying

[10] For three countries, France, Malta and the UK, we use uprated incomes provided by EUROMOD as 2007 data is not directly available.

input data, see Sutherland and Figari (2013). In the next section, we explain how the EUROMOD data and model is used to construct an integrated EU-wide tax-benefit model.

6.4.2 Tax-transfer integration

With the EUROMOD data at hand (i.e. all relevant demographic characteristics taken from the original data source but homogeneously coded and named plus the net income/net tax components as simulated by EUROMOD), we construct an EU-wide tax-benefit system in two main steps. However, rather than utilizing EUROMOD directly for this task, we opt for a regression approach which can be seen as a "short-cut" way to design a tax-transfer calculator, being more flexible for our purpose. Therefore, we first predict net taxes calculated by EUROMOD as precisely as possible for each country in the sample in the following way. As explained above, EUROMOD simulates the country specific net taxes (income and payroll taxes minus benefits) $T_{ik} = f_k(X_i, \mathbf{z}_i)$ as a function of gross market income X_i and a vector of non-income factors (demographic characteristics) $\mathbf{z}_i$ taken from the original data, while $f_k(X_i, \mathbf{z}_i)$ covers the set of all country-specific tax-benefit rules that are read into EUROMOD. We take the same set of characteristics $(X_i, \mathbf{z}_i)$ as our right-hand side variables and regress T_{ik} as simulated by EUROMOD using a very flexible OLS specification, including higher order polynomials to account for non-linear effects and interaction terms of income with all relevant characteristics observed in the data for the assignment of taxes and benefits (for similar approaches, see e.g. Frenette, Green and Milligan (2007), Biewen and Juhasz (2012), Bargain et al. (2013b)). That is, we estimate the following function separately for each country k but using the same specification:[11]

$$T_{ik} = \tilde{f}_k(X_i, \mathbf{z}_i) + \epsilon_i. \tag{6.20}$$

$\tilde{f}_k(.)$ denotes a transformation $(X_i, \mathbf{z}_i) \rightarrow T_{ik}$ which now is (technically) dif-

[11]Note that even if our analysis below is entirely performed at the individual level, the tax functions are estimated and validated at the household level. The main reason is that most of the taxes and transfers across countries are assigned to the household as the assessment unit, rather than to the individual. Thus, a regression of household net taxes on household income and characteristics turned out to be the superior approach.

ferent from $f_k(.)$ and ϵ_i is the OLS residual. Subsequently, $\hat{T}_{ik}$ is predicted and validated against T_{ik}. Tables 6.8 and 6.9 in the appendix summarize this information and show the mean values for disposable income as simulated by EUROMOD and predicted with our tax function across gross income deciles, together with the average percentage error in the prediction as indicated in the note to the tables. With errors of usually around $0 - 1\%$ and almost always below 5% (the same is true for the overall Gini coefficient and the decile ratio), we can conclude that our estimated net tax functions do a pretty good job in predicting EUROMOD net taxes for the single countries.

For consistency reasons, predicted net taxes $\hat{T}_{ik}$ are then used in the second main step (i.e. rather than taking T_{ik}) to estimate the integrated net tax function on the pooled sample in the same way over all countries (i.e. single-country systems in the baseline and the counterfactual EU tax function are based on exactly the same specification):

$$\hat{T}_{ik} = \omega_i \tilde{f}_{EU}(X_i, \mathbf{z}_i) + \epsilon_i. \tag{6.21}$$

Note that by construction, this is the "average" approach to the design of an integrated tax-transfer system as defined in the previous section, capturing the cross-country differences in $\hat{T}_{ik}$. Accordingly, $\tilde{f}_{EU}(.)$ denotes the "average" transformation $(X_i, \mathbf{z}_i) \rightarrow \hat{T}_{ik}$ and ω_i is the household sample weight. In Section 6.5 below, five different fiscal unions with altering number and composition of participating countries are analyzed, namely the EU27 (27 current member countries of the EU), EA17 (17 current member countries of the euro area), EA12 (12 founding members of the euro area) and a hypothetical "North" and "South" euro area with each five member countries. For all five unions, we use the same specification but separately estimate the average function in order to predict a unique system. The main estimation output is summarized in Table 6.10 in the appendix, showing the most important single coefficients such as all gross income components, number and age of children or age, hours worked and marital status of the different adult household members. Most coefficients turn out to be significant and show signs as expected. In all five cases, the fit of the regression in terms of the $R2$-measure is around 0.98. In the last step, the average function is then used to predict net taxes

$\hat{T}_{iEU}$, i.e. the net taxes that households would have to pay if they were entirely taxed under the integrated system. In the following, $\hat{T}_{ik}$ and $\hat{T}_{iEU}$ (and accordant predictions for simulated shocks to gross income X_i) are the key ingredients to our analysis.

6.4.3 Descriptive information

In this section, we provide descriptive information on the most important variables used as well as on the estimated EU tax system. Table 6.1 reports values of these variables for the overall EU level and all 27 EU member countries. With view to the individual-level concept of expected utility, our unit of observation throughout the analysis is the individual aged 18-59. However, we account for differences in family size and composition using equivalized income.[12] After the population shares in column 1, columns 2 and 3 report means of gross and disposable income per month and columns 4-7 of gross taxes, (employer plus employee) social insurance contributions (SIC), gross benefits and net taxes.

[Table 6.1 about here.]

The member countries from Eastern Europe make up the lower end of the overall income distribution (with 205 EUR of disposable income in Romania which is only 15% of the EU average) while Luxembourg is the richest country with 2905 EUR (207% of the EU average), followed by Ireland. Note however, that income levels are not adjusted for differences in purchasing power.[13] Scandinavian countries show the highest levels of gross taxes, followed by Belgium, the UK and the Continental European countries. They are particularly low for most Southern and Eastern European countries. SIC are especially important in France. Benefit levels are most generous in Ireland and Luxembourg and lowest in the Eastern European countries, with more than 100 EUR per month in Slovenia only. Resulting net taxes in column 7 are highest for the scandinavian and most of the Continental

[12] We adjust all income variables using the OECD modified equivalence scale. That is, for each person, the equivalized (per-capita) income is its household income divided by the household specific equivalence scale which is a sum of weights equal 1.0 for the household head plus 0.5 for every additional adult member and 0.3 for each child aged less than 14.

[13] The main reason is that also existing fiscal unions are not based on purchasing power adjusted income. Also, Bargain et al. (2013b) re-calculated their key findings using purchasing power parities and did not get significant differences.

European countries, while especially low for Ireland compared to its level of gross income.

Finally, column 8 shows how net taxes would look like under the EU average system, revealing considerable differences to the initial situation. Unsurprisingly, the member countries from Eastern Europe benefit the most with net taxes less than 10 EUR for Bulgaria and Hungary and being even negative in Romania (-63 EUR). Ireland and Luxembourg are the largest contributors to the system. Surprising at first glance, most of the Southern European countries would have to contribute as well, especially Cyprus, Greece and Malta. The reason is, that compared to the other countries, they show quite low levels of taxes and SIC relative to their gross income (as Ireland and Luxembourg) as well as relative to the level of benefits they grant. This becomes more obvious with Figures 6.8 and 6.9 in the appendix which plot net taxes corresponding to columns 7 and 8 in Table 6.1 for the gross income distribution in each country. High income households in all three countries mentioned pay much lower net taxes compared to similar households in the EU while especially low income households in Malta also receive less benefits. On the contrary, a further inspection reveals that high income households in Belgium, Finland and Sweden will benefit from the reform due to high initial progression under their national systems (while the average system apparently would be quite close to existing tax systems in Austria, Germany and the Netherlands). In Eastern European countries, almost all households across the income distribution gain from the reform due to very low income levels compared to the rest of Europe while in Ireland and Luxembourg, it is the other way round. The fact that different parts of the income distribution within countries are often affected differently raises the question about incerasing/decreasing income inequality. Table 6.6 in the appendix reports Gini coefficients and Musgrave-Thin indices (as a measure of redistribution/effective progression), as well as Generalized Entropy indices, and shows that inequality *between* countries is declining through the reform but also raising *within* a couple of member states.

6.5 Results

In this section, we present the key results of our analysis in three subsections. All subsections focus on equivalent variations of an integrated EU tax-transfer system relative to the baseline with national systems for (i) the median voters of the countries and (ii) for gross income deciles within countries (first two subsections). Section 6.5.1 considers a fiscal union for all current 27 EU member states. In Section 6.5.2 the focus is narrowed to the 17 members of the current euro area and three further subgroups, namely the 12 founding members of the euro area as well as a hypothetical "North" and "South" euro area. A sensitivity analysis with respect to the model parameters is provided in Section 6.5.3.

6.5.1 Baseline results: EU27

This section considers the economic effects when moving from the existing national tax-transfer systems to a fully integrated system for the EU27 member states, utilizing the framework developed in Section 6.3. Even if unrealistic in terms of political feasibility (in the short run), we focus on this case as a benchmark. Bargain et al. (2013b) have shown that altering the degree of integration for such a system in terms of the weight of the supranational regime does change quantitative magnitudes but not qualitative findings. The authors also considered various rules for political implementability, including the voting rules of the Treaty of Nice (currently in force) and the Lisbon Treaty (supposed to be enacted from 2014 onwards). However, decisions of the Council of the European Union in tax matters so far require unanimity. As explained above, by construction, our approach is very likely to produce "winner" and "loser" countries in terms of equivalent variations. We therefore do not focus on different scenarios for political feasibility but stick to the unanimity rule when discussing the possibility of Pareto improving reforms in Section 6.5.3.

In the baseline, the parameter values for computing equivalent variations are set as follows. For the coefficient of relative risk aversion, we assume a value of three ($\rho = 3$), which appears to be standard in the literature (see e.g. Hoynes and Luttmer (2011)). With view to the working age population, the probability that an income shock occurs is set to 0.08, the mean unemployment rate in the EU in 2007. As in Dolls et al. (2012), the shock itself is assumed to be a 5% reduction in market income, proportional across all countries and households. One might argue that a 5% decrease in market income is quite low with view to an income shock following unemployment. However, we start with rather modest parameters to identify the implications of our framework sequentially and introduce a more substantial shock in Section 6.5.3. There, we also alter the baseline values of the other parameters.[14]

Table 6.2 presents median values for five different equivalent variations as defined in Section 6.3. For the initial case when countries are not assumed to be credit constrained, column 1 presents the total value of EV (EV_T) and columns 2-3 present its components, the redistributive (EV_R) and stabilizing value (EV_S). Immediately obvious, the total EV is driven by the redistributive component and the stabilization value remains marginal with more (less) than 1 EUR only in two cases. This is due to the relatively modest assumptions for the shock parameters in the baseline. Overall, 17 out of 27 countries would benefit from the regime change. EV_T ranges between 186 EUR per month for Hungary and -535 EUR for Ireland as well as -489 EUR for Luxembourg. The latter are huge contributions and reflect the implications of a full implementation of the average system in terms of redistribution. Generally, all Eastern European countries would gain from the introduction of the EU system, with EVs of less than 100 EUR only for Bulgaria, the Czech Republic, Poland and Slovenia. Consistent with the findings for disposable income above, many Southern European countries would also lose in terms of EV_T, while some Northern and Continental European countries as Finland, Sweden, Belgium or France would gain. This becomes explainable again when considering Figures 6.8 and 6.9 together with Figures 6.1 and 6.2, which plot the mean total EV across gross income deciles within countries. In these countries, especially the higher income deciles also gain in terms of EV_T while the lower deciles sometimes even lose. In the Southern European countries however,

[14] Also, introducing heterogeneity for the parameters across countries or even households could be a reasonable objection. Yet, at least for the coefficient of relative risk aversion, one would need a good theory and reliable empirical estimates for country specific parameters. Since we consider our exercise as a first step, we assume homogeneous values across countries in order to ease comparability and focus on general implications.

it is rather the other way round.

[Table 6.2 about here.]

With view to column 3, one important issue needs to be stressed. As explained above, without any further assumption, moving from the national to an integrated tax-transfer system can increase or decrease the extent of automatic fiscal stabilization. First of all, the countries that pay much higher net taxes under the EU compared to their national system benefit in terms of EV_S, as e.g. Ireland, Luxembourg or the UK, but also Cyprus, Greece, Spain or Malta. This is due to a well-known feature of the concept of automatic stabilization, namely that the extent of income stabilization will be higher for higher tax rates. For example, in the presence of a proportional income tax with a tax rate of 30% versus a tax rate of 40%, a shock to gross income of 100 EUR (given the same level of gross income for both tax rates) leads to a decline in disposable income of 70 EUR in the first and 60 EUR in the second case, i.e. the tax absorbs 30% versus 40% of the shock to gross income. The same would be true for a negative tax rate (a benefit), i.e. the more negative a tax rate is, the higher would be the extent of income stabilization. Table 6.7 in the appendix provides a more detailed analysis. First, for comparison, income stabilization coefficients at the aggregated level (as defined by Dolls et al. (2012)) are calculated for the national as well as the integrated system in columns 1 and 2. Differences between both levels of the income stabilization coefficient are qualitatively in line with the EV-based findings in this section. Also, all countries which have very low (high) initial stabilization coefficients, i.e. clearly below (above) the EU average of 0.49, benefit (lose) in terms of stabilization. Second, to better understand the differences in automatic stabilization across the regimes, we calculate average effective tax rates (AETR) under both systems before and after the shock in columns 3-6.[15] Finally, we compare the magnitudes of income stabilization in columns 7 and 8. One main lesson can be drawn: generally, the higher (lower) effective taxation is under one of the two regimes compared to the other, the lower (higher) is also the reduction in disposable income after a negative shock. This leads to the observation that countries which especially benefit (lose) in terms

[15] If we use these AETRs to calculate average effective marginal tax rates (EMTRs) we get exactly the same values as for the income stabilization coefficients, which we did as a check. That means, income stabilization coefficients can be interpreted as EMTR at the aggregated level (for details see e.g. Immervoll (2004); OECD (2013)).

of redistribution under the EU compared to the national system, lose (benefit) in terms of stabilization. This is especially true for the Eastern European countries, simply because their initial level of effective net tax rates decreases dramatically under the EU system.[16] However, average effective tax rates can only be a first indicator for the extent of income stabilization, which is not only determined by the size of the government but also depends on the structure of the tax-transfer system and the design of the different components (i.e. taxes and benefits are usually not designed as a proportional rate), which explains exceptions from this observation.

Yet, one main argument for a European fiscal union is the provision of stabilization from a federal budget when individual countries are credit constrained but the union is not. Thus, assuming credit constraints at the country level is of key importance. Otherwise, changes in stabilization would entirely depend on differences in the levels of net taxes and the structure of the national versus the EU system. In other words, there is no guarantee that an integrated tax-transfer system would do a better job in stabilizing income than the countries would themselves do when they have free access to credit markets. For simplicity and reasons of comparability we therefore assume that countries are fully credit constrained when computing EV_{T^*} and EV_{S^*} in columns 4 and 5 of Table 6.2 as defined above. By definition, all countries show positive values of EV_{S^*} now. However, they are still too low in order to significantly increase EV_{T^*}. EV_{S^*} values are relatively higher for those countries that still pay higher net taxes in absolute terms due to higher income levels. Note the difference to the situation without credit constraints: now, the tax system that determines EV_{S^*} is the same for all countries and different levels of EV_{S^*} are only due to different levels in income or differences in demographic composition. This becomes also obvious with view to Figures 6.3

[16]Interestingly, this is also true for Romania where AETRs seem to be "not negative enough" yet to invert that finding. Compare this to the results in Bargain et al. (2013b), where Greece and Spain gain most in terms of redistribution for a similar fiscal integration of the founding members of the eurozone (except Luxembourg and using 2001 data), but show also substantial increases in automatic stabilization. The reason is that both countries receive huge negative net taxes under the EU average system (-59 and -36 EUR per week, respectively, versus -63 EUR per month for Romania in this analysis). Besides, one should bear in mind that we use data from 2007 versus 2001 in the previous chapter. Further differences are the focus on the working age population, the individual as the unit of analysis and the inclusion of employer SIC in this chapter.

and 6.4, which plot mean values of EV_S and EV_{S^*} across gross income deciles within countries. Furthermore, due to the same effect, always the highest income deciles within a country gain most in terms of EV_{S^*}.

[Figures 6.1, 6.2, 6.3 and 6.4 about here.]

In the next section, we analyze if fiscal integration for different subgroups of the EU27 leads to different results.

6.5.2 Results for the euro area

The first subgroup for which we analyze the introduction of an EU average tax system is the euro area with its current 17 member states (EA17). For this group, political steps towards a fiscal union are probably more important and especially more likely in the nearer future. The parameter assumptions are the same as in the previous section. Table 6.3 presents equivalent variations for median voters, focusing on the most relevant cases of EV_{T^*} and EV_{S^*}. The first two columns reveal a pattern for the EA17 which is pretty similar to that of the EU27, i.e. all countries that would benefit (lose) from an average tax system of the EU27 would also benefit (lose) now, such that a slight majority of nine countries would favor the integrated system. For some countries, EV_{T^*} values are even more pronounced. Estonia and Slovakia would gain more than 200 EUR each, while both Ireland and Luxembourg would lose more than 500 EUR. Greece and Spain would still have to contribute as well, yet, substantially less compared to the EU27 system.

[Table 6.3 about here.]

How does the situation change when moving to a union for the founding members of the euro area (EA12) in columns 3-4? At first glance, fiscal integration would become even more unlikely as half of the participating countries gains while the other half loses. The signs of EV_{T^*} for the countries are the same as in case of the EA17 system, however, magnitudes increase. The reason is that the EA12 countries are more similar in terms of income levels and the structure of tax-benefit systems compared to the EA17. This reduces the redistributive effect. In contrast, the benefits in terms of stabilization increase substantially.

This picture prevails when further narrowing down the scope of a fiscal union, looking at two subgroups of even more similar countries, as sometimes labeled in the political debate as a "North" and "South" euro area (columns 5-8). In the "North" euro area (EA-N), we include Austria, Belgium, Finland, the Netherlands, and Germany as the "leading" country in terms of population weight. The "South" euro area (EA-S) would be dominated by France and Italy and further includes Greece, Spain and Portugal.[17] In both unions, the median voter in three out of five countries would favor fiscal integration while the contributions for the other four countries in terms of EV_{T^*} are above 50 EUR only for the Netherlands. The stabilization gains are even higher for EA-N while more moderate for EA-S, given the lower income levels. Interestingly, the two countries that would not favor a "South" euro area are still Greece and Spain, which means that more households in these two countries still pay less net taxes under the national system compared to similar households in France, Italy and Portugal. This becomes obvious when looking at mean EVs for gross income deciles in Figure 6.7b). For Greece and Spain, EV_{T^*} values decrease over the income distribution and sharply for the highest deciles while in France and Italy, especially those deciles show up with high values of EV_{T^*}. For the "North" euro area in Figure 6.7a), this is true for Belgium and Finland. Generally, the adverse effect that high income deciles benefit at the expense of the lower ones within some countries is one of the questionable features of the averaging approach (EV_{T^*} across income deciles for EA17 and EA12 in Figures 6.5 and 6.6, respectively).

[Figures 6.5, 6.6, 6.7a) and 6.7b) about here.]

In sum, even narrowing down fiscal integration to more similar groups of countries does not lead to a fiscal union that would be favored by all participating countries, i.e. that would be Pareto improving. In the last step of our analysis we check the influence of the parameter assumptions for this result.

6.5.3 Sensitivity analyses

In the last two sections, the redistributive value of the equivalent variation clearly dominated the stabilizing value. In consequence, Pareto improving reforms where

[17]France could also be considered as a rather Continental European country that better fits the other group. However, for reasons of comparability we aimed at building two groups of countries that are sufficiently "strong" in terms of economic conditions as well as population weight such that they would able to form a viable fiscal union.

at least one country gains (in terms of the median voter) while no one loses seem to be very unlikely for our design of a fiscal union. However, this might change for different parameter assumptions in the underlying model. In the following, we provide accordant robustness checks, focusing on increasing parameters. Reconsider the decomposition of the overall change in expected utility in Section 6.3.3, i.e. (6.17a) to (6.17e). For an increasing shock probability α, the change in expected utility due to the after-shock net tax adjustment under the EU regime, (6.17c), will be increasing as well (given that $T_0 > T_1$), while the effect on the rest of the overall change in expected utility is twofold. In consequence, EV_{S^*} also increases and might turn a negative value of EV_{T^*} at some point into a positive one. The same is equivalently true for more negative shocks to gross income ΔX, where (6.17c) will be increasing due to $\Delta T_1 < 0$ compared to the baseline, and a higher coefficient of relative risk aversion, in which $U(C)$ is increasing.

In a first step, we set $\alpha = 0.1$, $\Delta X = -10\%$ and $\rho = 5$, in a second step $\alpha = 0.15$, $\Delta X = -15\%$ and $\rho = 10$. Clearly, a value of $\rho = 10$ might seem unrealistically high. However, we have sequentially tested the impact of further values between $\rho = 5$ and $\rho = 10$ with almost no significant impact.[18] The same is true when separately changing one of the other parameters while taking baseline values for the remaining two. In Table 6.4, we therefore only present two sets of results where all parameters are altered at the same time. For the first set of parameters, values for EV_{S^*} increase substantially in all scenarios of a fiscal union (from EU27 down to EA-N and EA-S). However, they are still not high enough to let those median voters benefit who lose in the baseline. The picture changes for the second set of parameters. Now, single countries in all unions start to benefit from fiscal integration due to high gains in terms of stabilization. Moving to a "North" and "South" euro area would be even Pareto improving as each single country reaches a positive value of EV_{T^*}.

[Table 6.4 about here.]

[18]There is a literature on empirical estimates of relative risk aversion. Depending on the context, findings differ greatly. For instance, Chetty (2006) provides estimates for an upper bound of $\rho < 2$ in a labor supply context using elasticity estimates of more than thirty studies. In contrast, in the finance literature, much higher values for constant relative risk aversion seem to be common, up to $\rho = 30$ (see e.g. Mehra and Prescott (1985) or Kandel and Stambaugh (1991)).

Finally, we analyze the influence of a more dramatic shock to gross income, closer to one that could be expected if individuals really got unemployed. Therefore, we calculate the mean replacement rate for the EU27 in 2007, $r = 0.65$, and set $\Delta X = -(1 - r) * 100 = -35\%$.[19] Again for reasons of comparability and since we consider illustrative calculations, we take the same value $\Delta X = -35\%$ for all fiscal federation scenarios in Table 6.5. The coefficient of relative risk aversion and the shock probability are specified as in the baseline (i.e. $\rho = 3$ and $\alpha = 0.08$). The influence of a 35%-shock to gross income is pretty similar to that of the second scenario in Table 6.4, though, EV values even increase to some extent. In the EU27, Spain and Denmark gain additionally now, i.e. a negative redistributive value of EV is more than counterbalanced through substantial gains in stabilization. The same is true for Greece in the EA17. Again, installing fiscal unions for EA-N and EA-S would be Pareto improving.

In sum, these results show that Pareto improving reforms - if taken as a criteria for political feasibility based on unanimity - seem to be possible only for smaller groups of more similar countries, and when expecting rather severe crisis scenarios or high levels of individual risk aversion.[20]

[Table 6.5 about here.]

6.6 Concluding discussion

The current debt crisis in the euro area has initiated an ongoing debate concerning deeper fiscal integration in Europe. In this chapter we analyzed the economic implications for a benchmark case of fiscal integration, the introduction of a common EU tax and transfer system. Based on the tax-transfer calculator EUROMOD and household microdata for all current 27 EU member states, we applied an expected utility approach and calculated individual equivalent variations of an EU-wide tax and transfer system relative to the baseline with the national systems. Additionally, we provided a decomposition into a "redistributive" and a "stabilization"

[19] Precisely, r is calculated as an average over (i) all relevant family types as specified in the OECD database on Benefits and Wages and (ii) all countries (except Bulgaria and Romania for which data is not available).

[20] A straightforward extension of the analysis in this section would be to numerically search for the country-specific minimal parameters that would let a country benefit from a fiscal federation.

component.

Our results show that 17 out of 27 countries, represented by their median voters, would benefit from fiscal integration in the EU27 in the baseline scenario, mainly driven by the redistributive component. The Eastern European countries would gain most with an top equivalent variation of 188 EUR per month in Hungary. Ireland and Luxembourg would be the largest contributors. Surprisingly at first glance, also many Southern European countries would lose. Generally, countries which benefit (lose) in terms of the redistributive component, tend to show relatively low (high) benefits in terms of the stabilizing component. Effects across gross income deciles within countries differ greatly and depend on income levels and the structures of existing national systems. We additionally considered smaller fiscal unions, namely for the current 17 members of the euro area, its 12 founding members as well as two further subgroups as sometimes discussed in the political debate under the label of a "North" and a "South" euro area. Moving to such groups of more similar countries generally reduces redistributive and increases the stabilizing effects. However, Pareto improving reforms where at least one country gains while no one loses seem to be possible only for rather severe crisis scenarios with substantial shocks to gross income and for high levels of individual risk aversion.

Our results should be interpreted taking into account the specific framework constructed and the simplifying assumptions made. Most importantly, this applies to the average design of the common tax system. Despite its appeal, results depend on this specific property and a design closer to political implementability should at least correct for 'adverse' redistributive effects within single countries, as they can occur here, i.e. that high income deciles gain at the expense of lower ones. One step further, a very interesting exercise would be to use a precise objective function and to calculate an optimal EU redistribution scheme (see e.g. Kopczuk, Slemrod and Yitzhaki (2005) for an approach to world redistribution). However, if political desirability of any (ex-ante) redistributive effects across countries is generally questioned, the setup of a pure insurance mechanism would be required. With respect to the shock scenarios, we have focused on shocks that affect countries and households proportionally and with the same probability for reasons of comparability. However, introducing heterogeneity across countries, households or even further subgroups, as for instance high and low educated individuals, would be a reasonable next step. Also, the expected utility framework that we used remained very simplified given that expectations are formed over two different situations only. To bring this closer to reality, one could at least think of simulating different counterfactual situations using existing empirical estimates for country specific shock probabilities and/or income volatility over time.

Also, our study abstracts from any behavioral effects and focuses on direct impacts of the simulated reforms only. However, one can immediately think of a range of behavioral margins that would be affected. This certainly includes labor supply, but also tax evasion behavior, cross-country migration or the adjustment of remaining national fiscal policies through the governments as a reaction to fiscal integration. For a discussion of these issues, we refer to Bargain et al. (2013b), who did account for the first aspect in their analysis. Additionally, we have assumed away any administration costs of installing a European fiscal federation, basically presuming that administrations work equally efficient in every country after the regime change and that there are no costs of adaption to the new tax-transfer regulations.

These caveats point to the fact that the reforms we simulate are rather meant as a conceptual experiment to clarify the impact of the general design of a fiscal union and to propose a consistent framework for an analysis at the individual level. However, common tax-transfer policies are a key element of existing fiscal unions and will certainly be introduced in the EU or EMU as well in the medium or long term. The political main motivation at this time is to provide insurance against asymmetric shocks. Yet, while always depending on the specific aim and design of the system, this might also include - intentionally or not - redistributive effects. In light of this, our results can be considered as providing insights in general issues of setting up a European fiscal union and might also apply.to forms and options of common fiscal policies that are different from a full integration of European tax-transfer systems.

6.7 Tables and figures

Table 6.1: Individual average monthly income and taxes (2007 EUR)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EU	1.000	2,046	1,402	318	536	210	644	644
AT	0.017	2,662	1,819	359	791	307	843	880
BE	0.021	2,621	1,680	528	692	280	941	862
BG	0.016	310	230	29	79	28	80	6
CY	0.002	1,847	1,661	122	250	186	187	550
CZ	0.022	837	578	68	275	85	259	150
DE	0.167	2,671	1,735	443	737	245	935	935
DK	0.011	3,189	2,298	1,032	274	415	892	1,037
EE	0.003	863	582	110	224	53	281	138
GR	0.022	1,455	1,138	158	317	158	317	435
ES	0.095	1,765	1,274	169	463	141	492	570
FI	0.010	2,797	1,841	612	658	314	956	899
FR	0.117	2,453	1,569	252	898	266	884	816
HU	0.021	598	386	88	226	102	212	1
IE	0.009	2,637	2,351	395	348	457	286	815
IT	0.117	2,270	1,521	376	650	277	748	695
LT	0.007	632	414	104	159	46	217	58
LU	0.001	3,749	2,905	458	827	440	844	1,408
LV	0.005	730	481	116	185	52	249	77
MT	0.001	1,140	965	100	174	98	176	223
NL	0.033	2,930	1,942	395	809	217	987	1,021
PL	0.082	636	455	85	187	90	182	98
PT	0.022	1,246	934	127	320	134	312	314
RO	0.046	278	205	40	73	39	74	-63
SE	0.017	2,960	1,848	609	843	339	1,112	996
SI	0.004	1,335	976	135	407	183	359	285
SK	0.012	637	456	35	216	70	180	61
UK	0.120	2,917	2,174	583	428	269	743	944

Note: (1) Population share; (2) gross income; (3) disposable income; (4) taxes; (5) SIC; (6) benefits; (7)=(4)+(5)-(6) net taxes; (8) net tax that the individual would have to pay under the estimated EU average tax system. *Source*: Own calculations based on EU-SILC and EUROMOD.

Table 6.2: Equivalent variations of median voters for EU27

	EV_T	EV_R	EV_S	EV_{T^*}	EV_{S^*}
EU	14.9	14.9	-0.0	18.8	3.5
AT	-27.4	-26.7	-0.5	-19.3	5.5
BE	44.6	45.5	-1.4	50.6	5.9
BG	58.8	58.9	-0.1	59.3	0.4
CY	-310.5	-311.6	1.7	-308.7	3.7
CZ	88.8	88.9	-0.1	90.7	1.6
DE	38.2	38.3	-0.2	43.8	5.2
DK	-131.7	-132.2	0.1	-122.6	7.3
EE	129.1	129.2	0.0	130.9	1.5
GR	-109.9	-110.6	0.5	-107.5	2.6
ES	-85.6	-86.0	0.5	-82.0	3.4
FI	40.6	40.7	-0.3	46.9	6.1
FR	82.0	82.3	-0.2	87.8	5.3
HU	186.2	186.8	-0.4	188.1	0.9
IE	-535.3	-535.5	0.6	-530.0	5.1
IT	54.2	54.6	-0.2	59.1	3.7
LT	138.6	138.9	-0.1	140.0	0.9
LU	-489.1	-490.4	0.8	-481.9	7.3
LV	154.3	154.0	-0.1	155.6	1.1
MT	-62.5	-63.3	0.8	-61.1	2.1
NL	-35.6	-35.8	0.1	-30.1	6.1
PL	54.1	54.1	-0.0	55.4	0.9
PT	0.4	0.5	0.2	3.7	1.9
RO	120.6	120.8	-0.1	121.6	0.4
SE	98.2	98.5	-0.3	105.5	6.6
SI	64.5	64.4	0.2	66.9	2.7
SK	105.7	106.0	-0.1	107.4	1.1
UK	-209.8	-210.6	0.7	-204.8	5.4

Note: (EV_T) Total value of EV; (EV_R) redistributive value of EV; (EV_S) stabilization value of EV; (EV_{T^*}) total value of EV under credit constraint; (EV_{S^*}) stabilization value of EV under credit constraint; all in monthly EUR. *Source*: Own calculations based on EU-SILC and EUROMOD.

Table 6.3: Equivalent variations of median voters for different euro areas

	EA17		EA12		EA-N		EA-S	
	EV_{T^*}	EV_{S^*}	EV_{T^*}	EV_{S^*}	EV_{T^*}	EV_{S^*}	EV_{T^*}	EV_{S^*}
AT	-90	6	-77	19	-10	20	.	.
BE	53	6	75	20	127	20	.	.
CY	-281	4	.	.	.	.	.	.
DE	33	5	54	17	33	18	.	.
EE	223	1	.	.	.	.	.	.
GR	-44	2	-24	8	.	.	-17	7
ES	-51	3	-35	11	.	.	-30	10
FI	9	6	28	21	37	22	.	.
FR	62	5	80	18	.	.	37	18
IE	-533	5	-511	17	.	.	.	.
IT	49	4	66	12	.	.	47	12
LU	-568	8	-557	26	.	.	.	.
MT	-54	2	.	.	.	.	.	.
NL	-98	6	-90	21	-53	21	.	.
PT	19	2	37	6	.	.	6	5
SI	136	3	.	.	.	.	.	.
SK	231	1	.	.	.	.	.	.

Note: (EV_{T^*}) Total value of EV under credit constraint; (EV_{S^*}) stabilization value of EV under credit constraint; both in monthly EUR. *Source*: Own calculations based on EU-SILC and EUROMOD.

Table 6.4: Equivalent variations of median voters for varying parameter assumptions

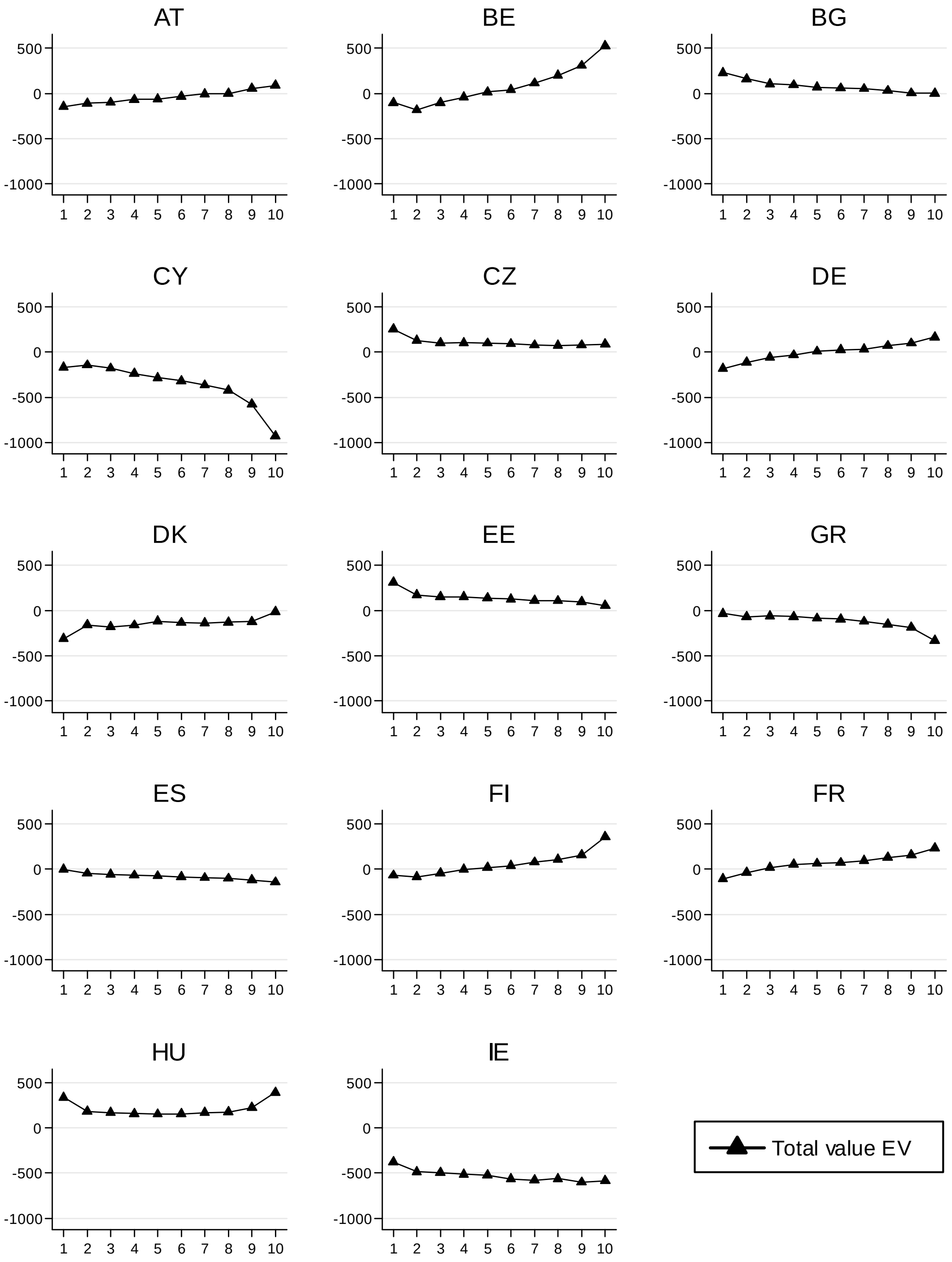
	$\rho = 5$, $\alpha = 0.1$, $\Delta X = -10\%$										$\rho = 10$, $\alpha = 0.15$, $\Delta X = -15\%$									
	EU27		EA17		EA12		EA-N		EA-S		EU27		EA17		EA12		EA-N		EA-S	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
AT	-5	20	-73	21	-75	21	-8	21	.	.	*75*	*95*	*14*	*102*	*12*	*102*	***83***	***101***	.	.
BE	68	22	69	23	77	23	130	23	.	.	153	111	155	114	165	113	***228***	***110***	.	.
BG	60	1	.	.	.	.	.	.	.	.	70	5	.	.	.	.	.	.	.	.
CY	-301	13	-273	13	.	.	.	.	.	.	-262	64	-236	62	.	.	.	.	.	.
CZ	96	5	.	.	.	.	.	.	.	.	123	25	.	.	.	.	.	.	.	.
DE	58	19	50	19	57	19	36	20	.	.	133	96	131	97	139	97	***113***	***99***	.	.
DK	-105	26	.	.	.	.	.	.	.	.	-4	130	.	.	.	.	.	.	.	.
EE	135	5	227	4	.	.	.	.	.	.	166	24	255	18	.	.	.	.	.	.
GR	-102	9	-38	9	-23	8	.	.	-16	8	-60	43	-3	39	*9*	*39*	.	.	***14***	***37***
ES	-72	12	-43	12	-34	12	.	.	-29	11	-16	60	*4*	*58*	*13*	*57*	.	.	***14***	***54***
FI	64	22	26	23	30	23	39	24	.	.	150	106	118	111	126	111	***135***	***116***	.	.
FR	104	19	78	20	83	20	.	.	39	20	190	95	163	97	167	97	.	.	***126***	***99***
HU	191	3	.	.	.	.	.	.	.	.	210	13	.	.	.	.	.	.	.	.
IE	-516	18	-518	19	-510	19	.	.	.	.	-464	87	-470	87	-462	87	.	.	.	.
IT	70	12	61	13	67	12	.	.	48	12	127	54	117	55	122	55	.	.	***101***	***55***
LT	144	3	.	.	.	.	.	.	.	.	164	14	.	.	.	.	.	.	.	.
LU	-462	28	-546	29	-555	29	.	.	.	.	-372	140	-445	149	-452	150	.	.	.	.
LV	160	4	.	.	.	.	.	.	.	.	184	16	.	.	.	.	.	.	.	.
MT	-56	7	-51	7	.	.	.	.	.	.	-35	33	-25	31	.	.	.	.	.	.
NL	-13	22	-83	23	-87	23	-52	23	.	.	*76*	*109*	*6*	*117*	*3*	*117*	***34***	***115***	.	.
PL	59	3	.	.	.	.	.	.	.	.	81	13	.	.	.	.	.	.	.	.
PT	11	7	26	6	38	6	.	.	7	6	40	31	55	28	71	27	.	.	***37***	***27***
RO	123	1	.	.	.	.	.	.	.	.	133	5	.	.	.	.	.	.	.	.
SE	124	24	.	.	.	.	.	.	.	.	228	118	.	.	.	.	.	.	.	.
SI	75	9	145	9	.	.	.	.	.	.	116	41	186	38	.	.	.	.	.	.
SK	111	4	234	3	.	.	.	.	.	.	132	17	255	11	.	.	.	.	.	.
UK	-190	20	.	.	.	.	.	.	.	.	-108	100	.	.	.	.	.	.	.	.

Note: ρ denotes the risk aversion parameter ($\rho = 3$ in the baseline), α the shock probability ($\alpha = 0.08$ in the baseline), ΔX the shock to gross income X in % ($\Delta X = -5\%$ in the baseline). (1) EV_{T^*}, total value of EV under credit constraint; (2) EV_{S^*}, stabilization value of EV under credit constraint; both in monthly EUR. Switch from negative to positive EV compared to baseline for single countries in *italics*, Pareto improving move to an EU system in ***bold-faced italics***. *Source*: Own calculations based on EU-SILC and EUROMOD.

Table 6.5: Equivalent variations of median voters for 35% income shock

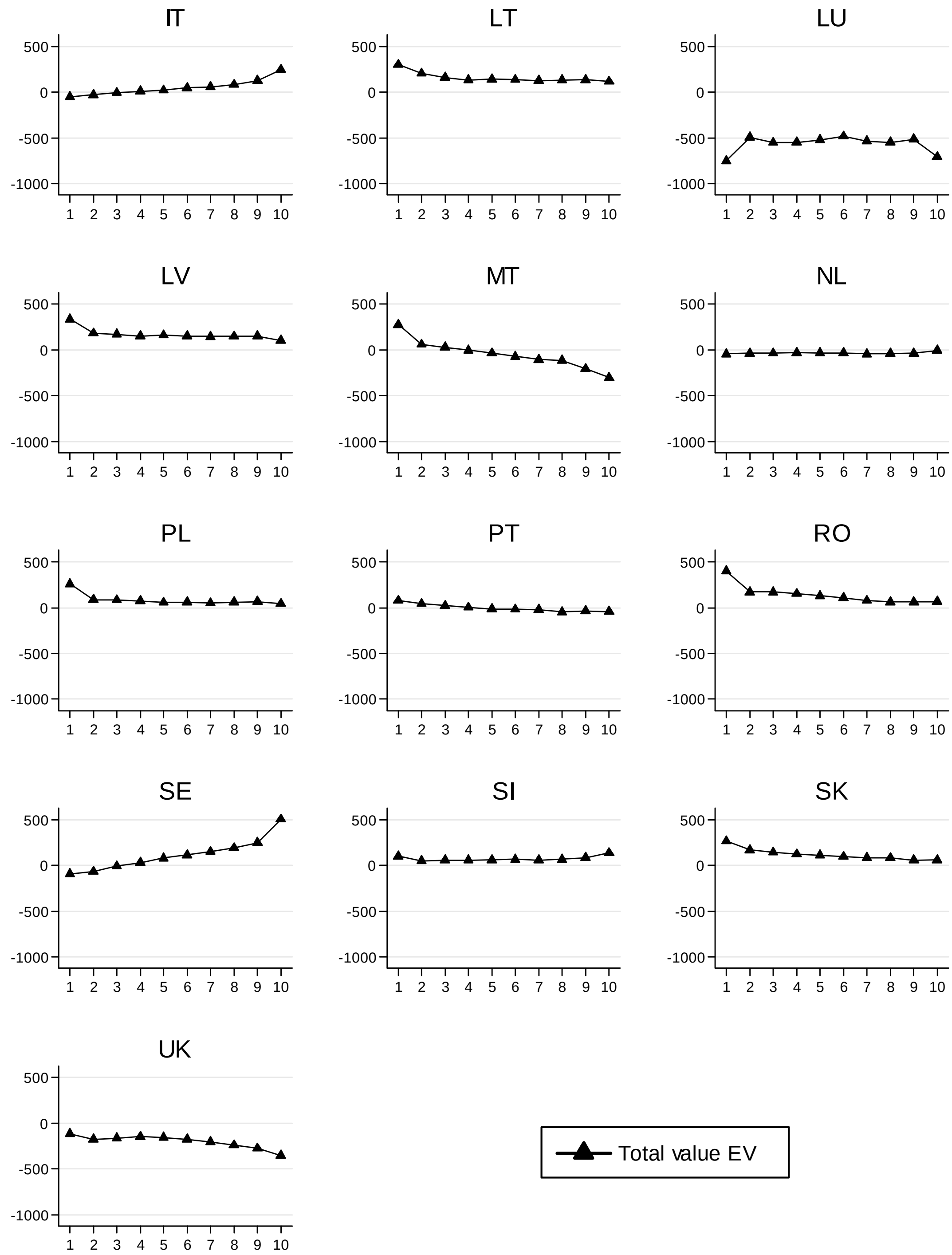
	$\rho = 3$, $\alpha = 0.08$, $\Delta X = -35\%$									
	EU27		EA17		EA12		EA-N		EA-S	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
AT	*105*	*127*	*49*	*138*	*44*	*138*	***119***	***133***	.	.
BE	202	160	201	163	214	162	***295***	***151***	.	.
BG	80	5	.	.	.	.	.	.	.	.
CY	-251	81	-227	79	.	.	.	.	.	.
CZ	138	30	.	.	.	.	.	.	.	.
DE	176	137	174	139	182	138	***151***	***142***	.	.
DK	*41*	*173*	.	.	.	.	.	.	.	.
EE	179	28	268	20	.	.	.	.	.	.
GR	-47	57	*11*	*50*	*23*	*48*	.	.	***26***	***45***
ES	*6*	*77*	*23*	*73*	*32*	*72*	.	.	***32***	***67***
FI	191	139	162	149	168	149	***183***	***152***	.	.
FR	236	125	206	130	211	131	.	.	***168***	***136***
HU	224	14	.	.	.	.	.	.	.	.
IE	-446	112	-450	112	-440	110	.	.	.	.
IT	147	66	137	66	143	66	.	.	***117***	***66***
LT	178	17	.	.	.	.	.	.	.	.
LU	-343	197	-408	219	-414	220	.	.	.	.
LV	202	19	.	.	.	.	.	.	.	.
MT	-27	41	-19	39	.	.	.	.	.	.
NL	*117*	*151*	*54*	*166*	*50*	*167*	***78***	***160***	.	.
PL	95	16	.	.	.	.	.	.	.	.
PT	50	38	64	34	83	33	.	.	***47***	***33***
RO	142	5	.	.	.	.	.	.	.	.
SE	283	157	.	.	.	.	.	.	.	.
SI	132	50	203	45	.	.	.	.	.	.
SK	142	20	264	12	.	.	.	.	.	.
UK	-72	136	.	.	.	.	.	.	.	.

Note: (1) EV_{T^*}, total value of EV under credit constraint; (2) EV_{S^*}, stabilization value of EV under credit constraint; both in monthly EUR. Switch from negative to positive EV compared to baseline for single countries in *italics*, Pareto improving move to an EU system in ***bold-faced italics***. *Source*: Own calculations based on EU-SILC and EUROMOD.



Note: Based on means for gross income deciles; monthly 2007 EUR.
Source: Own calculations based on EU-SILC and EUROMOD.

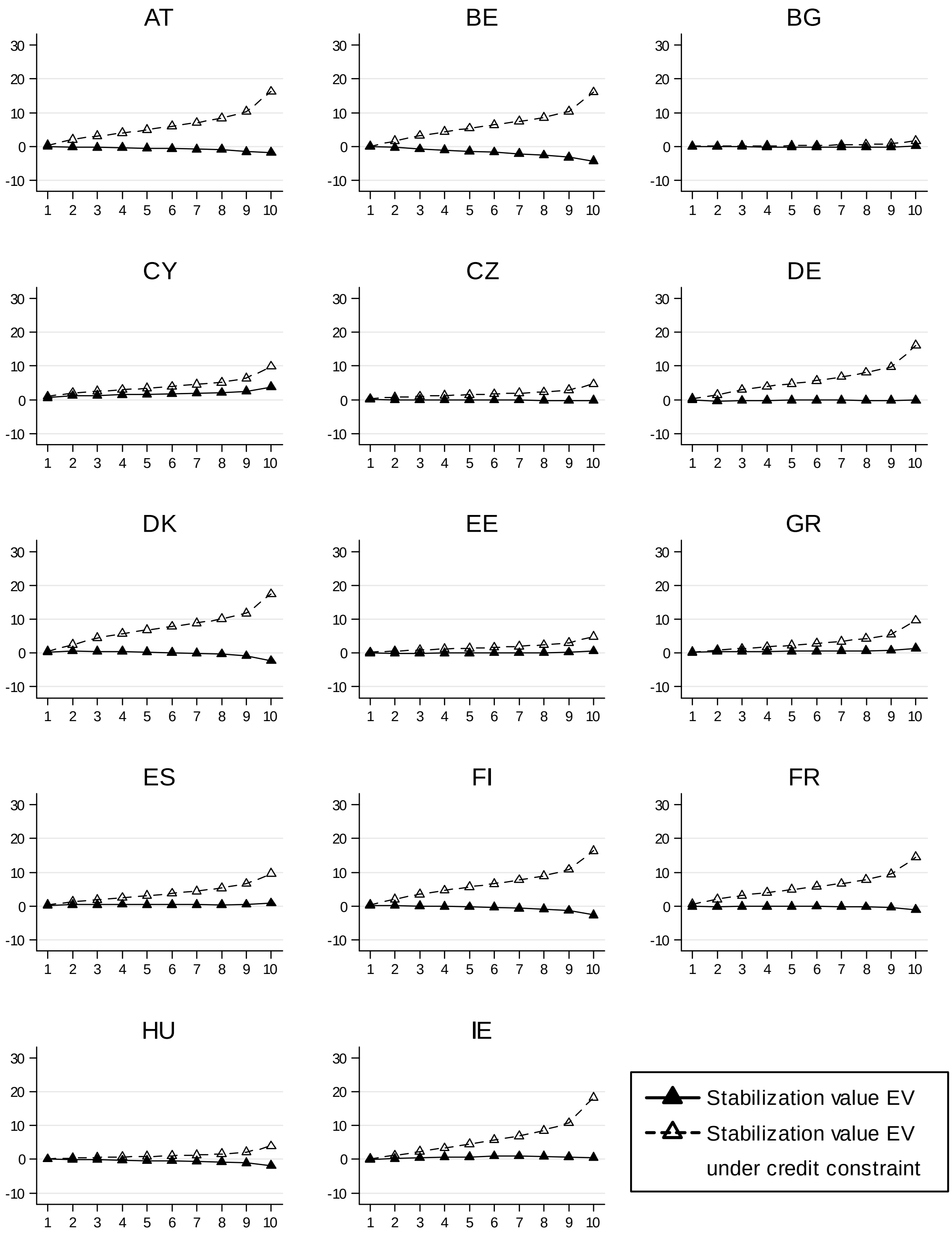
Figure 6.1: Equivalent variations across income deciles when moving to an EU27 average tax system



Note: Based on means for gross income deciles; monthly 2007 EUR.

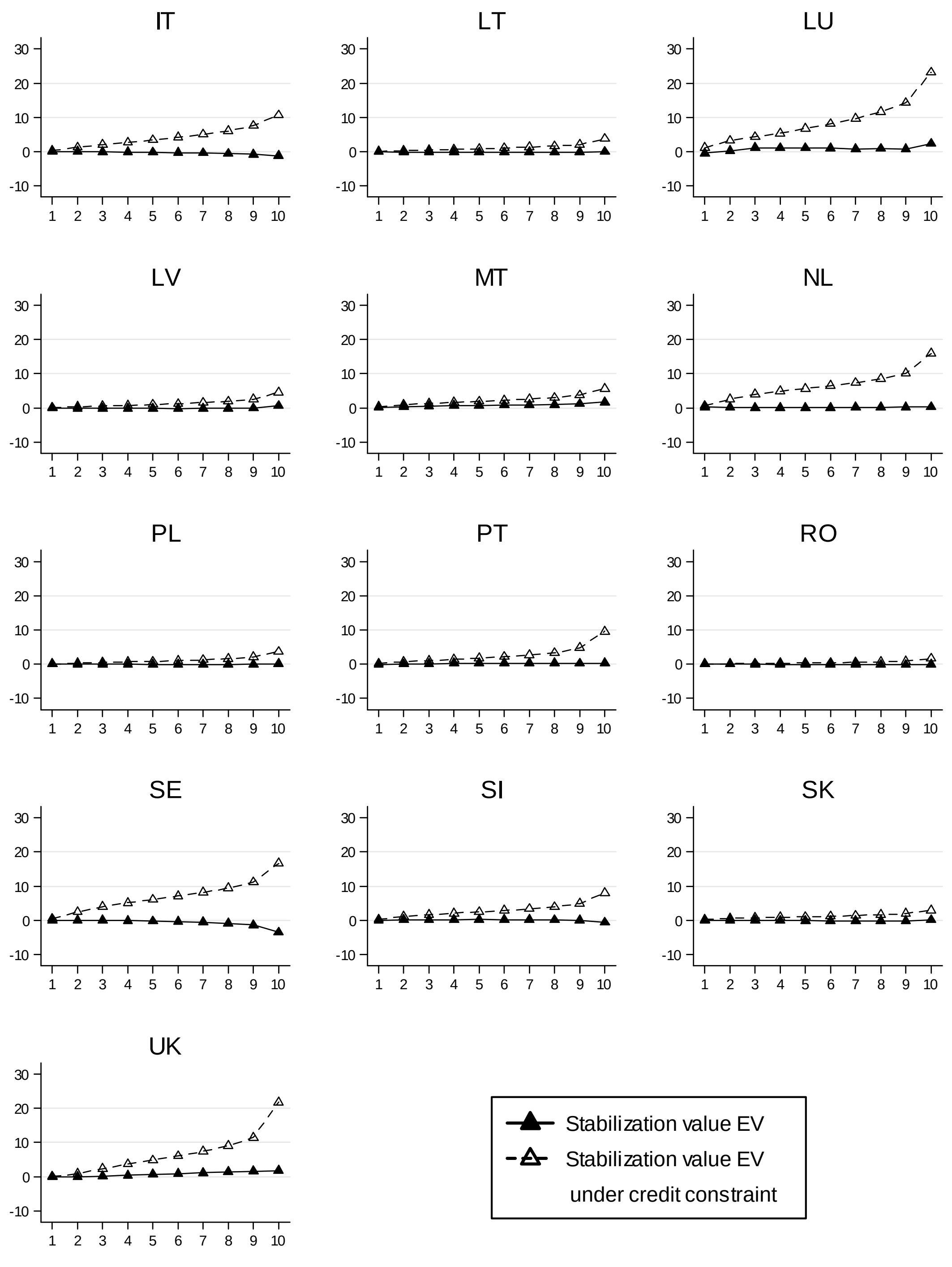
Source: Own calculations based on EU-SILC and EUROMOD.

Figure 6.2: Equivalent variations across income deciles when moving to an EU27 average tax system (ctd.)



Note: Based on means for gross income deciles; monthly 2007 EUR.
Source: Own calculations based on EU-SILC and EUROMOD.

Figure 6.3: Equivalent variations across income deciles when moving to an EU27 average tax system: stabilization value



Note: Based on means for gross income deciles; monthly 2007 EUR.
Source: Own calculations based on EU-SILC and EUROMOD.

Figure 6.4: Equivalent variations across income deciles when moving to an EU27 average tax system: stabilization value (ctd.)

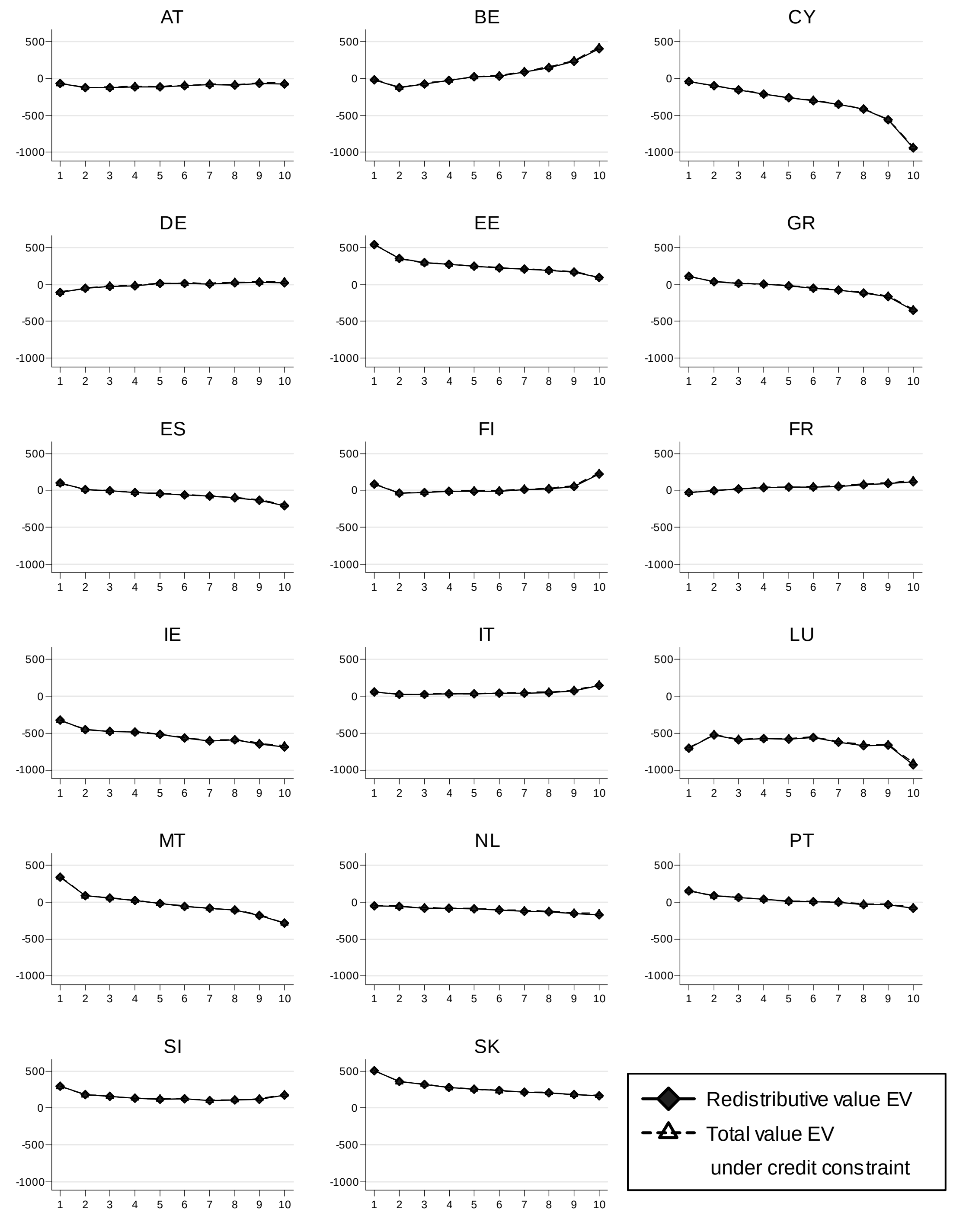
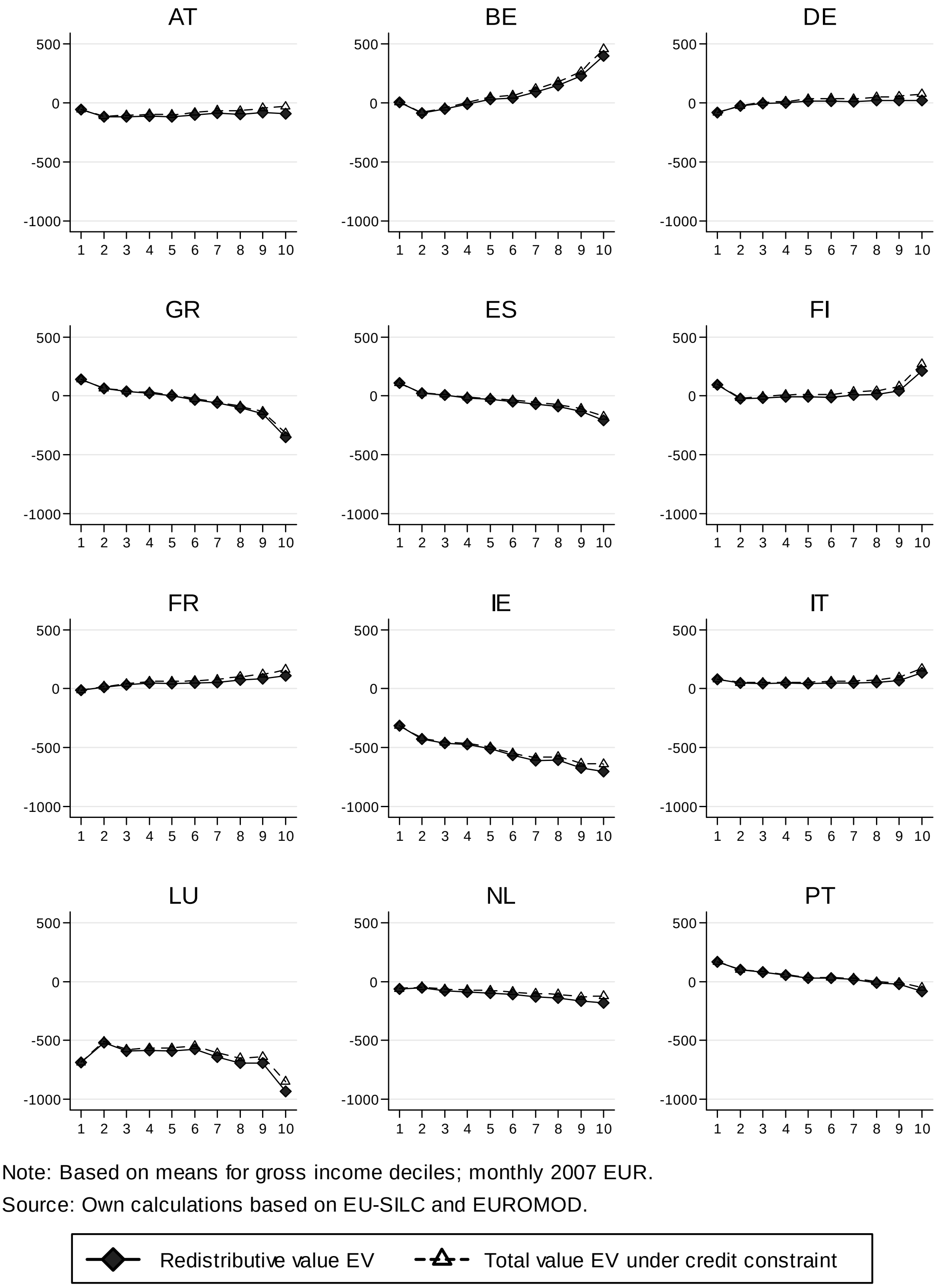


Figure 6.5: Equivalent variations across income deciles when moving to an EA17 average tax system



Note: Based on means for gross income deciles; monthly 2007 EUR.
Source: Own calculations based on EU-SILC and EUROMOD.

Figure 6.6: Equivalent variations across income deciles when moving to an EA12 average tax system

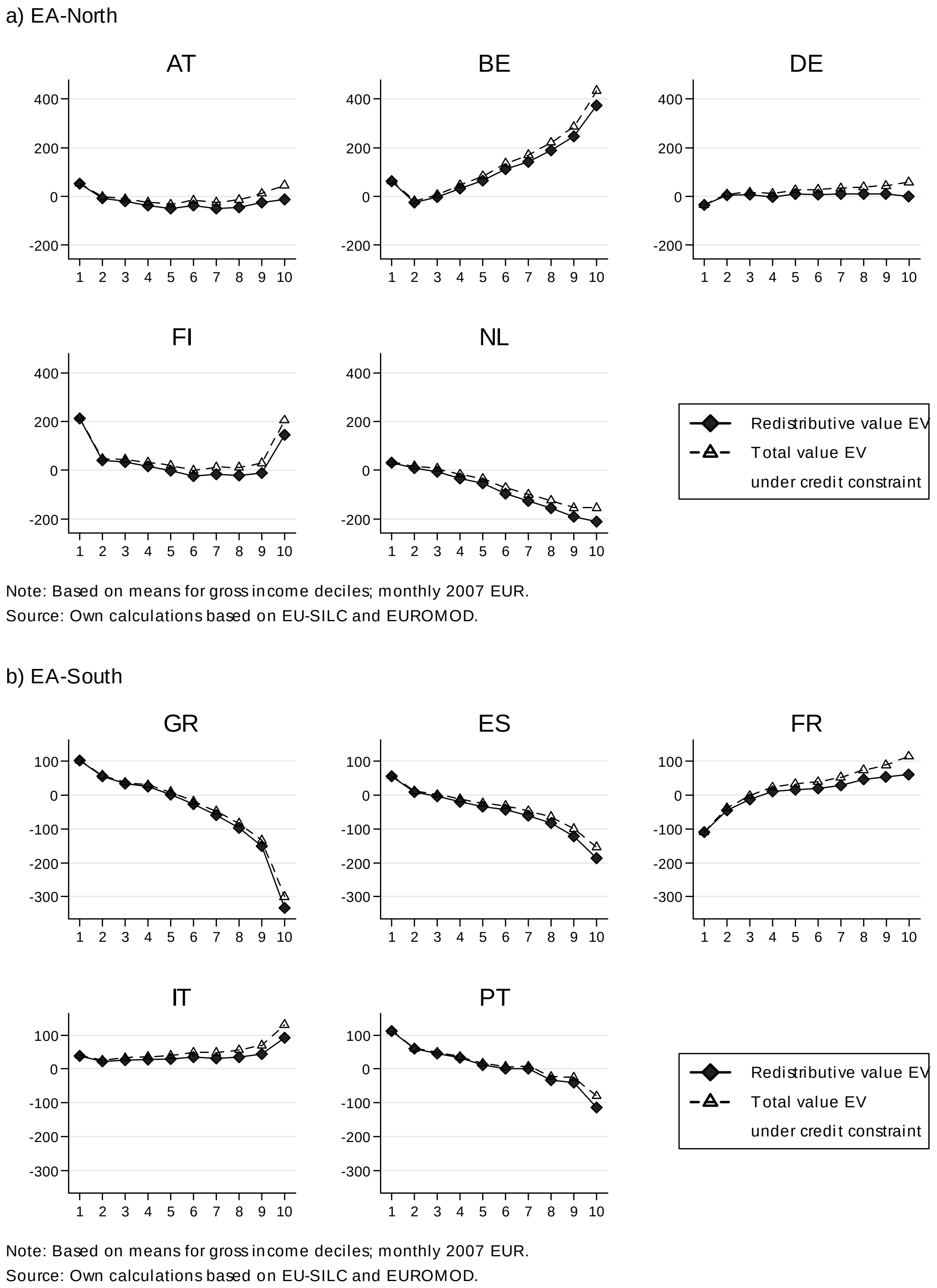
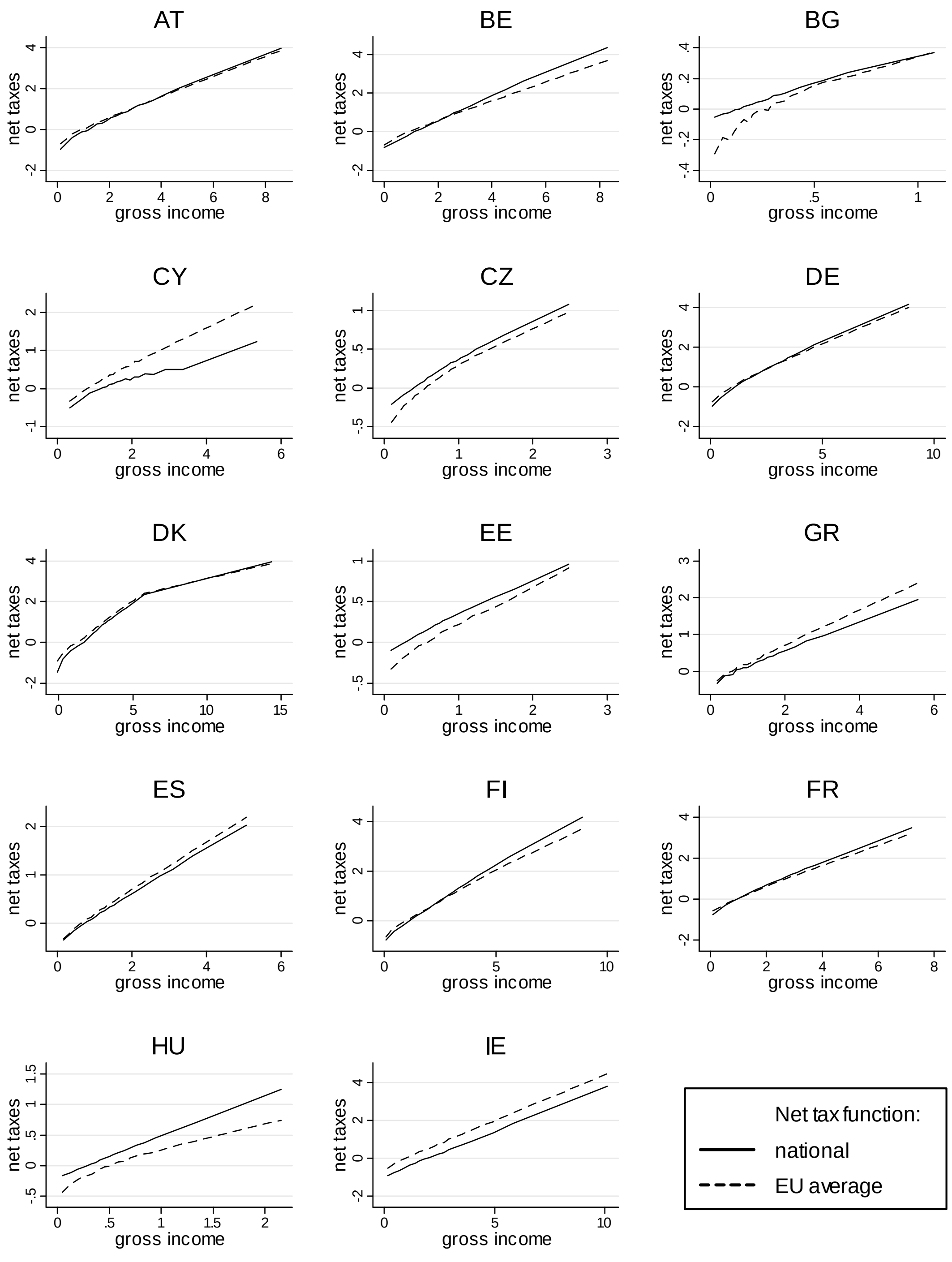


Figure 6.7: Equivalent variations across income deciles when moving to a “North” and a “South” EA average tax system

6.8 Appendix

On the following pages we first provide some additional results referred to in the chapter (net tax plots; detailed inequality and progression indices; income stabilization coefficients and average effective tax rates), and second, statistics on the validation of the estimated net tax functions (predictions with estimated national tax functions; main estimation output for estimated average tax functions).



Note: Based on means for gross income ventiles; monthly thousand EUR.

Source: Own calculations based on EU-SILC and EUROMOD.

Figure 6.8: Plots for estimated net tax function: national vs. EU27 average

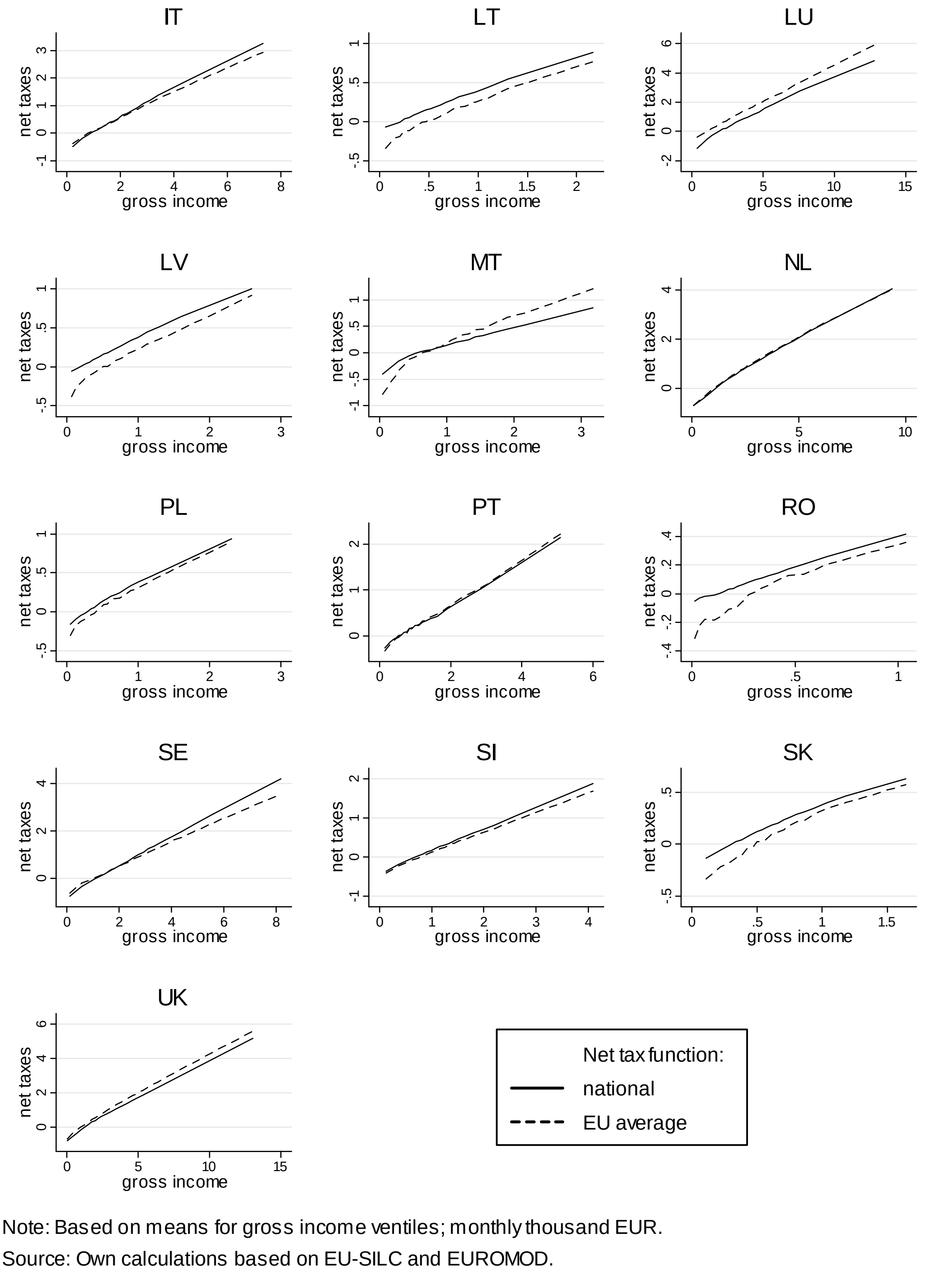


Figure 6.9: Plots for estimated net tax function: national vs. EU27 average (ctd.)

Table 6.6: Inequality and effective progression: national vs. EU average system

(a) Gini coefficients and Musgrave-Thin indices

	Gini(X)	Gini(Y_k)	Gini(Y_{EU})	MT	ΔMT
EU	0.475	0.381	0.368	1.179	2.1
AT	0.376	0.253	0.274	1.197	-2.8
BE	0.379	0.226	0.275	1.247	-6.3
BG	0.400	0.316	0.301	1.140	2.2
CY	0.303	0.247	0.220	1.081	3.5
CZ	0.341	0.233	0.211	1.164	2.9
DE	0.395	0.265	0.282	1.215	-2.4
DK	0.337	0.241	0.269	1.146	-3.7
EE	0.354	0.293	0.226	1.094	9.5
GR	0.410	0.322	0.311	1.149	1.6
ES	0.359	0.276	0.275	1.128	0.2
FI	0.373	0.244	0.273	1.206	-3.8
FR	0.355	0.244	0.255	1.171	-1.4
HU	0.417	0.239	0.228	1.306	1.5
IE	0.437	0.265	0.321	1.306	-7.7
IT	0.371	0.284	0.293	1.139	-1.3
LT	0.396	0.325	0.264	1.118	9.1
LU	0.364	0.247	0.292	1.184	-6.0
LV	0.410	0.356	0.274	1.093	12.6
MT	0.336	0.264	0.225	1.109	5.2
NL	0.357	0.264	0.269	1.146	-0.7
PL	0.420	0.305	0.299	1.200	0.7
PT	0.427	0.327	0.307	1.176	3.0
RO	0.455	0.343	0.291	1.206	7.9
SE	0.341	0.219	0.251	1.185	-4.1
SI	0.345	0.226	0.226	1.182	0.1
SK	0.314	0.219	0.192	1.138	3.5
UK	0.472	0.339	0.356	1.253	-2.7

(b) Generalized entropy indices

	$GE(0)$	$GE(0)w$	$GE(0)b$	$GE(1)$	$GE(1)w$	$GE(1)b$
National	0.304	0.143	0.160	0.278	0.164	0.113
EU average	0.255	0.145	0.110	0.258	0.173	0.085

Note: Gini(X) refers to inequality in gross market, Gini(Y_k) to inequality in disposable income under national systems, Gini(Y_{EU}) to inequality in disposable income under EU system. The MT index (Musgrave and Thin (1948)) is defined as MT=(1−Gini(Y))/(1−Gini(X)) and is a measure of redistribution/effective progression. ΔMT indicates the %-change in the MT index when moving from the national to the EU average system. By construction, a positive (negative) ΔMT coincides with a decrease (increase) in the Gini index. $GE(0)$ and $GE(1)$ are measures from the Generalized Entropy (GE) class of inequality indices (Shorrocks (1980)), denoted $GE(\alpha)$, with α being a parameter indicating more sensitivity towards changes at the top (bottom) of the income distribution the more positive (negative) α is. $GE(0)$ is also known as mean log deviation and $GE(1)$ as the Theil index (Theil (1967)). Both measures are decomposable into a weighted average of inequality within subgroups of a given population, plus inequality among those subgroups. Here, $GE(\alpha)w$ ($GE(\alpha)b$) is the within- (between-) country inequality and $GE(\alpha)w + GE(\alpha)b = GE(\alpha)$. *Source*: Own calculations based on EU-SILC and EUROMOD.

Table 6.7: Income stabilization coefficients and AETRs

	τ_k	τ_{EU}	$AETR_k^0$	$AETR_k^1$	$AETR_{EU}^0$	$AETR_{EU}^1$	ΔC_k	ΔC_{EU}
EU	0.49	0.49	0.31	0.31	0.31	0.31	-49.8	-49.9
AT	0.57	0.51	0.32	0.30	0.33	0.32	-56.2	-63.8
BE	0.63	0.49	0.36	0.34	0.33	0.32	-50.6	-68.6
BG	0.39	0.33	0.26	0.25	0.02	0.00	-9.3	-10.3
CY	0.28	0.49	0.10	0.09	0.30	0.29	-65.8	-46.7
CZ	0.48	0.47	0.31	0.30	0.18	0.16	-21.8	-22.2
DE	0.51	0.50	0.35	0.34	0.35	0.34	-61.3	-63.0
DK	0.52	0.50	0.28	0.27	0.33	0.32	-76.5	-78.7
EE	0.42	0.45	0.33	0.32	0.16	0.14	-25.0	-23.7
GR	0.38	0.47	0.22	0.21	0.30	0.29	-44.3	-38.4
ES	0.42	0.48	0.28	0.27	0.32	0.31	-49.5	-44.8
FI	0.55	0.51	0.34	0.33	0.32	0.31	-63.1	-68.8
FR	0.53	0.51	0.36	0.35	0.33	0.32	-58.0	-60.0
HU	0.63	0.45	0.35	0.34	0.00	-0.02	-10.9	-16.2
IE	0.46	0.49	0.11	0.09	0.31	0.30	-71.6	-67.0
IT	0.54	0.51	0.33	0.32	0.31	0.30	-42.1	-45.2
LT	0.44	0.42	0.34	0.34	0.09	0.07	-17.6	-18.4
LU	0.46	0.49	0.23	0.21	0.38	0.37	-101.1	-94.0
LV	0.43	0.43	0.34	0.34	0.11	0.09	-20.6	-20.5
MT	0.30	0.46	0.15	0.15	0.20	0.18	-38.5	-30.0
NL	0.48	0.49	0.34	0.33	0.35	0.34	-73.8	-72.4
PL	0.46	0.46	0.29	0.28	0.15	0.14	-15.2	-15.3
PT	0.44	0.47	0.25	0.24	0.25	0.24	-34.9	-33.0
RO	0.44	0.39	0.26	0.26	-0.22	-0.26	-7.8	-8.4
SE	0.55	0.51	0.38	0.37	0.34	0.33	-66.4	-72.6
SI	0.48	0.50	0.27	0.26	0.21	0.20	-34.8	-33.2
SK	0.44	0.44	0.28	0.27	0.10	0.08	-17.5	-17.6
UK	0.42	0.47	0.25	0.25	0.32	0.32	-85.9	-78.4

Note: Results for a negative 5%-shock to gross income X_i. $\tau = \sum_i(\Delta X_i - \Delta Y_i)/\sum_i \Delta Y_i$ with disposable income Y_i. $AETR = \sum_i(X_i - Y_i)/\sum_i X_i$. ($\tau_k$) Income stabilization coefficient of national tax systems; (τ_{EU}) income stabilization coefficient under EU average system; ($AETR_k^0$) national average effective tax rate before shock; ($AETR_k^1$) national AETR after shock; ($AETR_{EU}^0$) AETR under EU average system before shock; ($AETR_{EU}^1$) AETR under EU average system after shock; (ΔC_k) change in disposable income under national system; (ΔC_{EU}) change in disposable income under EU average system; ΔC_k and ΔC_{EU} in monthly EUR. *Source*: Own calculations based on EU-SILC and EUROMOD.

Table 6.8: Validation of estimated net tax functions

	AT			**BE**			**BG**			**CY**			**CZ**		
	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-erro
Mean	3058	3058	0.00	2822	2822	0.00	474	474	0.00	3264	3264	0.00	1049	1049	0.00
D1	1294	1277	-1.32	1057	1059	0.26	160	159	-1.10	1370	1368	-0.16	416	419	0.75
D2	1503	1522	1.25	1385	1400	1.12	210	214	1.61	1745	1754	0.51	576	577	0.13
D3	1879	1892	0.68	1872	1854	-0.97	268	267	-0.29	2099	2095	-0.23	712	711	-0.08
D4	2149	2143	-0.28	2052	2056	0.20	322	323	0.40	2376	2360	-0.66	804	798	-0.65
D5	2419	2410	-0.36	2323	2327	0.17	375	374	-0.42	2713	2717	0.14	882	883	0.08
D6	2763	2749	-0.51	2733	2723	-0.39	425	426	0.36	3057	3065	0.25	993	992	-0.14
D7	3081	3085	0.12	3157	3154	-0.10	506	503	-0.53	3450	3460	0.30	1107	1110	0.28
D8	3819	3823	0.11	3609	3607	-0.07	580	581	0.08	3950	3962	0.31	1265	1263	-0.23
D9	4655	4660	0.11	4057	4059	0.05	700	698	-0.24	4766	4744	-0.46	1472	1474	0.14
D10	7029	7030	0.02	5980	5986	0.10	1195	1197	0.15	7124	7126	0.03	2268	2268	0.02
D-ratio	5.43	5.51	1.36	5.66	5.65	-0.15	7.45	7.55	1.26	5.20	5.21	0.18	5.46	5.42	-0.73
Gini	0.322	0.318	-1.24	0.303	0.301	-0.83	0.341	0.337	-1.08	0.287	0.284	-1.14	0.286	0.282	-1.08
R2		0.987	0.987		0.991	0.991		0.973	0.973		0.953	0.953		0.983	0.983
N	4021	4021	4021	4347	4347	4347	2645	2645	2645	2280	2280	2280	7084	7084	7084
	DE			**DK**			**EE**			**GR**			**ES**		
	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-erro
Mean	2673	2673	0.00	3394	3394	0.00	975	975	0.00	2138	2138	0.00	2397	2397	0.00
D1	1251	1242	-0.65	1348	1336	-0.94	233	232	-0.68	550	569	3.52	834	858	2.82
D2	1257	1240	-1.32	1307	1311	0.24	403	408	1.04	1047	1060	1.30	1273	1265	-0.61
D3	1439	1475	2.46	1813	1842	1.56	540	540	-0.02	1285	1267	-1.38	1540	1538	-0.18
D4	1782	1759	-1.26	2240	2264	1.05	643	649	0.83	1447	1436	-0.81	1737	1744	0.39
D5	2090	2071	-0.89	2645	2626	-0.71	794	784	-1.27	1675	1666	-0.49	2043	2017	-1.32
D6	2455	2463	0.31	3222	3199	-0.70	901	902	0.09	1967	1955	-0.64	2266	2262	-0.17
D7	2815	2827	0.43	3856	3878	0.55	1074	1071	-0.29	2244	2262	0.78	2610	2597	-0.52
D8	3320	3323	0.10	4451	4448	-0.09	1238	1240	0.15	2636	2615	-0.81	2985	2990	0.17
D9	4035	4052	0.42	5156	5110	-0.89	1539	1541	0.18	3193	3206	0.41	3575	3580	0.16
D10	6286	6276	-0.15	7911	7939	0.35	2387	2386	0.00	5348	5355	0.14	5106	5119	0.26
D-ratio	5.03	5.05	0.50	5.87	5.94	1.30	10.23	10.30	0.68	9.73	9.41	-3.26	6.12	5.97	-2.48
Gini	0.333	0.328	-1.72	0.333	0.331	-0.68	0.349	0.347	-0.47	0.360	0.347	-3.57	0.301	0.295	-2.12
R2		0.973	0.973		0.986	0.986		0.985	0.985		0.948	0.948		0.949	0.949
N	8397	8397	8397	4092	4092	4092	3376	3376	3376	4123	4123	4123	8986	8986	8986
	FI			**FR**			**HU**			**IE**			**IT**		
	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-erro
Mean	2854	2854	0.00	2610	2610	0.00	722	722	0.00	4422	4422	0.00	2714	2714	0.00
D1	1018	1015	-0.25	1171	1131	-3.40	330	333	0.96	1760	1753	-0.39	918	967	5.28
D2	1202	1207	0.42	1425	1409	-1.15	446	443	-0.56	1963	1951	-0.62	1396	1403	0.53
D3	1689	1697	0.43	1560	1608	3.07	491	489	-0.30	2546	2599	2.08	1737	1708	-1.68
D4	1969	1976	0.33	1776	1832	3.13	552	552	0.04	3129	3152	0.73	2011	2000	-0.58
D5	2293	2288	-0.21	2121	2113	-0.40	639	634	-0.82	3524	3512	-0.33	2220	2222	0.10
D6	2764	2753	-0.40	2484	2482	-0.07	672	673	0.26	4256	4216	-0.93	2539	2524	-0.60
D7	3197	3195	-0.06	2801	2791	-0.36	742	747	0.70	4862	4839	-0.46	2879	2889	0.33
D8	3682	3679	-0.08	3194	3183	-0.37	854	853	-0.19	5600	5574	-0.47	3318	3297	-0.65
D9	4299	4296	-0.09	3904	3891	-0.35	1001	1005	0.42	6613	6636	0.35	3985	3981	-0.09
D10	6434	6443	0.13	5673	5672	-0.02	1496	1493	-0.25	9996	10016	0.20	6139	6152	0.22
D-ratio	6.32	6.35	0.38	4.85	5.02	3.50	4.53	4.48	-1.19	5.68	5.71	0.59	6.68	6.36	-4.81
Gini	0.321	0.318	-1.11	0.306	0.299	-2.10	0.293	0.282	-3.88	0.314	0.312	-0.80	0.327	0.314	-3.88
R2		0.984	0.984		0.964	0.964		0.973	0.973		0.986	0.986		0.945	0.945
N	7741	7741	7741	7243	7243	7243	5841	5841	5841	2941	2941	2941	13687	13687	13687

Table 6.9: Validation of estimated net tax functions (ctd.)

	LT			**LU**			**LV**			**MT**			**NL**		
	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error
Mean	770	770	0.00	5105	5105	0.00	892	892	0.00	1944	1944	0.00	3125	3125	0.00
D1	181	183	1.33	2438	2388	-2.04	181	181	-0.31	705	712	1.06	973	972	-0.14
D2	309	310	0.13	2903	2941	1.29	311	319	2.48	988	985	-0.31	1249	1232	-1.37
D3	421	420	-0.23	3271	3286	0.44	435	436	0.11	1211	1211	0.02	1715	1723	0.42
D4	523	514	-1.63	3877	3906	0.73	518	519	0.22	1444	1453	0.61	2130	2137	0.36
D5	598	600	0.38	4186	4189	0.08	631	631	0.03	1605	1603	-0.13	2588	2603	0.56
D6	704	702	-0.35	4724	4708	-0.34	795	785	-1.26	1852	1844	-0.47	3000	3009	0.30
D7	811	817	0.69	5311	5300	-0.21	918	912	-0.63	2148	2128	-0.95	3444	3431	-0.37
D8	982	981	-0.11	6102	6095	-0.12	1132	1135	0.28	2449	2460	0.43	3938	3937	-0.02
D9	1172	1178	0.51	7188	7183	-0.07	1452	1455	0.16	2845	2848	0.12	4628	4630	0.03
D10	2002	1999	-0.18	11069	11076	0.06	2548	2549	0.06	4209	4213	0.10	7588	7580	-0.10
D-ratio	11.07	10.90	-1.49	4.54	4.64	2.15	14.06	14.11	0.36	5.97	5.92	-0.95	7.79	7.80	0.04
Gini	0.366	0.361	-1.30	0.284	0.282	-0.82	0.404	0.400	-1.07	0.294	0.293	-0.50	0.331	0.330	-0.40
R2		0.980	0.980		0.986	0.986		0.975	0.975		0.971	0.971		0.988	0.988
N	3036	3036	3036	2851	2851	2851	3408	3408	3408	2429	2429	2429	7374	7374	7374

	PL			**PT**			**RO**			**SE**			**SI**		
	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error	EM	Predicted	%-error
Mean	918	918	0.00	1824	1824	0.00	413	413	0.00	2909	2909	0.00	1942	1942	0.00
D1	345	340	-1.59	724	705	-2.60	155	153	-1.37	1055	1044	-1.11	711	704	-0.88
D2	430	438	1.79	884	894	1.16	143	143	0.41	1355	1345	-0.77	1085	1091	0.49
D3	548	555	1.26	973	996	2.33	219	219	-0.01	1769	1829	3.37	1254	1259	0.41
D4	630	630	0.01	1173	1172	-0.12	276	280	1.62	2068	2079	0.52	1521	1520	-0.09
D5	723	714	-1.24	1331	1341	0.76	325	323	-0.80	2496	2460	-1.42	1687	1681	-0.39
D6	818	813	-0.58	1598	1571	-1.67	380	379	-0.24	2904	2893	-0.39	1888	1894	0.31
D7	948	944	-0.48	1796	1795	-0.07	439	437	-0.42	3308	3318	0.28	2128	2135	0.33
D8	1123	1125	0.24	2229	2241	0.53	529	534	0.96	3782	3791	0.23	2404	2398	-0.26
D9	1368	1375	0.53	2751	2753	0.09	662	660	-0.36	4330	4305	-0.58	2769	2765	-0.14
D10	2247	2246	-0.04	4788	4779	-0.19	1007	1007	-0.02	6025	6031	0.10	3978	3979	0.02
D-ratio	6.51	6.62	1.58	6.62	6.78	2.47	6.50	6.59	1.37	5.71	5.78	1.22	5.60	5.65	0.91
Gini	0.343	0.333	-2.94	0.358	0.351	-1.94	0.363	0.358	-1.44	0.297	0.293	-1.34	0.287	0.282	-1.77
R2		0.934	0.934		0.952	0.952		0.961	0.961		0.986	0.986		0.974	0.974
N	10073	10073	10073	2696	2696	2696	4830	4830	4830	5197	5197	5197	7059	7059	7059

	SK			**UK**		
	EM	Predicted	%-error	EM	Predicted	%-error
Mean	933	933	0.00	3541	3541	0.00
D1	379	378	-0.23	1265	1277	0.93
D2	569	569	-0.01	1361	1378	1.20
D3	635	639	0.56	1802	1800	-0.07
D4	705	705	-0.10	2151	2132	-0.86
D5	789	790	0.07	2585	2598	0.50
D6	896	895	-0.13	3109	3118	0.29
D7	994	993	-0.15	3687	3690	0.10
D8	1107	1112	0.50	4438	4402	-0.80
D9	1329	1325	-0.28	5442	5425	-0.32
D10	1934	1933	-0.08	9572	9591	0.20
D-ratio	5.11	5.12	0.15	7.56	7.51	-0.72
Gini	0.276	0.273	-1.16	0.369	0.366	-0.64
R2		0.974	0.974		0.997	0.997
N	3926	3926	3926	16159	16159	16159

*Note: Column EM indicates monthly disposable income as calculated by EUROMOD, column Predicted the accordant values as predicted with the respective net tax function, estimated separately for each country using the same specification. Monthly disposable income is presented for gross income deciles D1-D10 at the household level. D-ratio is the D10/D1-ratio. R2 is the R-squared of the estimated net tax function, N the number of observations used in the calculations. The %-error is calculated as the mean of the absoulte value of the difference between the EM and the predicted amount in per cent of the mean of the EM amount: %-error={(1/N)*Σ(y_predicted - y_EM)}/{(1/N)*Σy_EM}*100.*

Table 6.10: Main estimation output for European average tax functions

VARIABLES	(1) EU27	(2) EA17	(3) EA12	(4) EA-N	(5) EA-S
Employment income	0.462***	0.590***	0.579***	0.617***	0.402***
	(0.0166)	(0.0208)	(0.0222)	(0.0280)	(0.0301)
(Employment income)^2	2.551**	-6.370***	-7.048***	-15.52***	10.93***
	(1.172)	(1.553)	(1.653)	(2.186)	(2.813)
Capital income	-0.140	-0.251	-0.110	-0.787**	1.902***
	(0.175)	(0.207)	(0.217)	(0.309)	(0.349)
(Capital income)^2	123.1***	329.4***	312.2***	413.4***	-419.7**
	(27.78)	(44.74)	(46.98)	(102.4)	(174.1)
Priv. pension income	0.426	0.466	0.136	-1.529***	2.059***
	(0.260)	(0.366)	(0.385)	(0.492)	(0.657)
(Priv. pension income)^2	35.18	-111.9	87.08	1,873***	-2,869***
	(130.8)	(264.5)	(279.6)	(435.4)	(675.3)
Maint. costs	0.0193	0.741	0.892	2.244**	1.010
	(0.539)	(0.598)	(0.624)	(1.022)	(0.774)
(Maint. costs)^2	2,164***	2,964***	3,045***	1,765	4,772***
	(539.9)	(711.8)	(741.4)	(1,378)	(1,092)
N childr. age 0-2	-171.4***	-277.6***	-364.5***	-377.0***	-501.8***
	(20.44)	(31.30)	(34.51)	(54.31)	(38.31)
N childr. age 3-6	-139.3***	-247.8***	-361.1***	-322.2***	-506.4***
	(17.70)	(26.51)	(29.48)	(46.86)	(33.01)
N childr. age 7-12	20.05	-83.40***	-219.2***	-280.9***	-269.0***
	(14.83)	(24.07)	(26.94)	(41.61)	(29.81)
N childr. age 13-17	76.11***	-40.67*	-121.9***	-342.7***	-177.1***
	(14.50)	(23.22)	(26.27)	(42.59)	(29.62)
N childr. age 18+	68.01***	54.70**	-12.01	-411.6***	-1.273
	(13.33)	(22.24)	(25.35)	(44.09)	(27.75)
(N childr. age 0-2)^2	-64.48***	16.28	30.02**	78.27***	-11.89
	(10.29)	(14.29)	(15.29)	(22.82)	(16.74)
(N childr. age 3-6)^2	-8.043	50.58***	60.83***	47.79***	46.75***
	(7.522)	(10.02)	(10.62)	(13.61)	(12.42)
(N childr. age 7-12)^2	-17.00***	-4.518	5.990	-4.323	-38.91***
	(4.411)	(6.805)	(7.426)	(10.48)	(8.478)
(N childr. age 13-17)^2	-35.71***	-2.341	-0.905	34.08***	-9.212
	(5.056)	(7.398)	(8.467)	(12.51)	(9.206)

(N childr. age 18+)^2	5.123	11.92*	12.28*	117.6***	-53.57***
	(3.578)	(6.246)	(6.973)	(13.89)	(7.115)
N adults age 16-25	312.1***	230.1***	135.0***	-33.36	-121.0***
	(15.93)	(26.39)	(29.90)	(48.34)	(33.47)
N adults age 26-35	173.0***	117.0***	33.61	-187.2***	-93.47***
	(14.39)	(23.85)	(26.84)	(47.12)	(28.63)
N adults age 36-45	114.3***	124.1***	52.70*	-142.4***	-118.0***
	(15.24)	(24.63)	(27.85)	(48.42)	(29.78)
N adults age 46-55	198.9***	148.5***	54.55*	-113.6**	-166.4***
	(16.77)	(26.90)	(30.38)	(50.72)	(33.05)
N adults age 56-65	185.4***	86.00***	-19.85	-177.6***	-160.7***
	(19.46)	(30.03)	(33.72)	(54.48)	(36.46)
N adults age 66-75	217.4***	136.1***	64.78	-279.8***	-193.0***
	(30.85)	(44.90)	(49.31)	(83.33)	(49.52)
N adults age 76+	303.0***	221.1***	137.6**	-11.97	-143.0**
	(38.59)	(54.19)	(59.67)	(118.9)	(59.72)
(N adults age 16-25)^2	-53.68***	-48.66***	-44.33***	-63.97***	40.06***
	(5.570)	(9.496)	(10.11)	(13.41)	(12.07)
(N adults age 26-35)^2	20.98***	22.62***	12.02	39.11***	15.47*
	(4.234)	(6.977)	(7.559)	(10.45)	(8.176)
(N adults age 36-45)^2	38.23***	30.45***	18.14***	29.85***	37.56***
	(4.609)	(5.965)	(6.378)	(8.764)	(7.395)
(N adults age 46-55)^2	-0.990	-0.718	-5.303	14.32*	16.11**
	(4.768)	(6.237)	(6.692)	(8.566)	(7.610)
(N adults age 56-65)^2	-26.02***	-7.151	-7.121	5.142	-42.65***
	(6.353)	(7.890)	(8.438)	(11.48)	(9.152)
(N adults age 66-75)^2	-30.39*	29.99	40.99*	237.5***	52.68***
	(16.01)	(21.27)	(22.88)	(45.12)	(20.44)
(N adults age 76+)^2	-58.49**	-28.54	-2.931	128.7*	34.29
	(22.81)	(29.78)	(32.13)	(69.84)	(28.84)
N civil servants in hh	26.74***	-21.52***	-76.17***	-338.7***	-106.1***
	(5.055)	(6.924)	(7.623)	(17.46)	(7.335)
N disabled in hh	-78.69***	-343.9***	-341.8***	-395.0***	-265.6***
	(6.114)	(10.10)	(10.74)	(12.66)	(12.14)
N months in unempl. in hh	-4.351***	-19.75***	-19.54***	-13.69***	-15.04***
	(0.436)	(0.573)	(0.613)	(0.713)	(0.751)
N immigrants in hh	-40.55***	-2.518	-4.190	-45.08***	-0.344
	(3.820)	(4.688)	(4.967)	(8.379)	(5.001)
N women in hh	22.15***	14.82***	7.409*	-12.05**	-10.95**

	(2.981)	(3.813)	(4.067)	(5.133)	(4.601)
Hours worked hh-head	17.68***	7.852***	6.639***	10.05***	0.638
	(0.319)	(0.402)	(0.424)	(0.549)	(0.460)
Hours worked hh-head's partn.	4.471***	-4.605***	-7.082***	-11.62***	-4.367***
	(0.414)	(0.549)	(0.594)	(0.928)	(0.627)
Hh-head married	133.6***	80.65***	60.17***	4.085	17.34*
	(7.248)	(9.169)	(9.726)	(13.22)	(10.40)
Hh-head sep./divorced	14.55**	-8.382	-16.97**	-45.55***	47.47***
	(5.929)	(7.306)	(7.750)	(8.137)	(9.997)
Hh-head early ret.	-158.2***	-327.1***	-334.1***	-95.11***	-521.2***
	(11.85)	(13.93)	(14.77)	(18.30)	(16.17)
Hh-head inactive/unemp.	15.30**	13.18	24.85**	60.51***	-36.26***
	(7.764)	(9.375)	(9.858)	(11.88)	(10.87)
Hh-head student/other	55.58***	0.693	22.99*	99.64***	-26.88*
	(10.09)	(11.50)	(12.06)	(14.01)	(14.68)
Hh-head's partn. early ret.	-27.36***	78.02***	59.11***	48.77***	23.79*
	(9.287)	(11.62)	(12.38)	(17.27)	(14.02)
Hh-head's partn. inactive/unemp.	-267.5***	-393.8***	-455.4***	-530.3***	-408.5***
	(13.61)	(17.19)	(18.45)	(27.66)	(18.62)
Hh-head's partn. student/other	-57.14***	61.99***	45.02***	-126.0***	93.67***
	(8.230)	(10.36)	(11.61)	(15.71)	(13.13)
Hh is homeowner	146.5***	106.5***	70.60***	104.3***	36.78***
	(4.253)	(5.387)	(5.746)	(7.333)	(6.770)
Hours worked 1st add. hh-mem.	0.999***	1.682***	0.527*	3.486***	-0.868***
	(0.207)	(0.269)	(0.307)	(0.589)	(0.289)
1st add. hh-mem. married	-85.93***	17.41	41.19	-110.7***	124.4***
	(17.25)	(24.01)	(26.22)	(42.16)	(26.98)
1st add. hh-mem. sep./divorced	-128.4***	-19.45	76.58***	194.8***	16.08
	(15.74)	(22.60)	(24.71)	(64.73)	(23.63)
1st add. hh-mem. early ret.	-111.4***	-376.3***	-436.0***	-106.9	-456.4***
	(31.63)	(45.79)	(50.22)	(84.09)	(53.16)
1st add. hh-mem. inactive/unemp.	-111.9***	-256.2***	-212.4***	143.8*	-300.4***
	(30.18)	(43.47)	(47.72)	(75.11)	(51.04)
1st add. hh-mem. student/other	-170.3***	-369.7***	-301.1***	143.3**	-324.5***
	(28.21)	(40.98)	(45.09)	(70.87)	(48.93)

...

+ up to 4th additional household member

+ all demographic variables interacted with all income variables

...

Constant	-886.2***	-477.5***	-248.6***	-46.84	95.72
	(40.72)	(54.43)	(58.97)	(76.65)	(67.34)
Obs.	155,842	93,477	74,407	31,880	36,735
*R*2	0.981	0.965	0.970	0.987	0.979

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. EU27 indicates the estimated model for the current 27 member states of the EU; EA17 for the current 17 member states of the euro area; EA12 for the 12 founding members of the euro area and EA-N (EA-S) for a hypothetical "North" ("South") euro area as defined in the text. *Source*: Own calculations based on EU-SILC and EUROMOD.

Chapter 7

Concluding remarks

The aim of this thesis was to enrich the knowledge about European tax-transfer systems while also providing analyses that point into possible directions of future developments or that shed light on aspects which might become increasingly important for future policy design. All classical functions of state tax-transfer policies – providing redistribution that is also efficient, and stabilization – were captured. After a brief introduction into the method of counterfactual simulations including labor supply estimations, we started by assessing the redistributive preferences that are implicit in European tax and transfer systems when accounting for actual efficiency constraints in form of labor supply responses to taxation. Subsequently, Chapter 3 was concerned with the eventual objective of redistributive systems, namely individual well-being, and considered how the assessment of individual welfare in Europe might change when allowing for individual heterogeneity in consumption-leisure preferences. Chapter 4 analyzed to what extent European tax-transfer systems reduce inequality in opportunities, a concept that is increasingly considered to be more important than classical income inequality. In Chapter 5, the focus shifted to the stabilizing function of tax-transfer systems. Motivated by the experiences from the recent economic crisis, a prospective scenario of a European 'fiscal union' was analyzed, focussing on its stabilizing properties but also considering redistributive effects. Chapter 6 extended this analysis in a direct way and brought redistributive and stabilizing effects together in a consistent evaluation framework based on individual expected utility. This allows to pose the interesting question under which constellations a European fiscal federation could be beneficial for all member countries. The main results and resulting policy implications and/or possible directions for future research can be summarized as follows.

"To what extent do redistributive preferences – revealed through the tax-transfer system – differ across countries when accounting for actual differences in labor supply responses to taxation?"

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 reflect a very low inequality aversion close to utilitarian views (similar to the US). 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.

"To what extent do cross-country comparisons of individual welfare differ when accounting for possible heterogeneity in consumption-leisure preferences?"

Our results suggest that differences in consumption-leisure preferences – and their normative treatment – might matter substantially when interpersonally evaluating welfare in a European context. Precisely, under criteria that tend to evaluate agents with a relatively higher (lower) willingness-to-work to be better off compared to agents with a lower (higher) willingness-to-work, households from apparently "work-loving (work-averse) countries" rank higher on average. The reranking of households between nations when moving from the former to the latter types of welfare criteria is substantial and a decomposition analysis shows that cross-country differences in estimated consumption-leisure preferences are indeed driving this result. This might suggest that the respect for preference heterogeneity should precede any attempts to compare individual well-being across countries on the basis of a SWF, as e.g. used in optimal taxation analyses, or other forms of aggregated indices. Yet, our calculations should be considered as illustrative since we kept the empirical framework of this chapter simple.

"Are tax-transfer systems in Europe reducing inequality of opportunity and, if yes, how does its extent compare to the reduction in income inequality?"

Differences in opportunities are still widespread in Europe both within and across countries. Europe seems to be divided between the Continental and the Nordic countries on the one hand, where equality of opportunity is relatively high, and the Anglo-Saxon and Eastern European countries on the other hand, where the degree of equality of opportunity is relatively low. The tax and transfer schemes, however, reduce inequality in opportunities, with social benefits typically playing the key role. The full tax-benefit schemes are generally more successful at equalizing opportunities rather than outcomes while greater differences can be observed when looking at the tax-benefit instruments separately.

"What would have been the economic effects in terms of income redistribution and macroeconomic stabilization, if i) a European tax-transfer system or ii) a European fiscal equalization mechanism would have been introduced together with the monetary union?"

Depending on the specific scenario analyzed, the introduction of an EU tax-transfer system would have increased the disposable income of a small majority of households in Europe and simultaneously would have led to significant redistribution between countries. The stabilizing effects of an EU tax-transfer system would have been rather moderate. Regarding the system of fiscal equalization, where differences between the taxing capacity of individual countries and the average EU taxing capacity are fully neutralized, we would have observed massive transfers of tax revenue from high to low income countries. However, the fiscal equalization mechanism could have had a destabilizing effect for some countries.

"What would be the integrated individual value in terms of redistributive and stabilizing effects when introducing a European tax-transfer system and what are the preconditions for a Pareto improving introduction?"

Using recent data before the crisis, we find that 17 out of the 27 current EU member countries, represented by their median voters, would benefit from an EU tax-transfer system in terms of equivalent variations which is mainly driven by its redistributive component. The Eastern European countries would gain most, Ireland and Luxembourg would be the largest contributors. Surprisingly at first glance, also many Southern European countries would lose. Generally, countries which benefit (lose) in terms of the redistributive component, tend to show relatively low (high) benefits in terms of the stabilizing component. Moving to smaller groups of more similar countries, as e.g. the current eurozone members, generally reduces redistributive and increases the stabilizing effects. However, Pareto improving reforms where at least one country gains while no one loses seem to be possible only for rather severe crisis scenarios with substantial shocks to gross income, or for high levels of individual risk aversion.

To sum up the main findings of this thesis, we first conclude that it is important to account for efficiency constraints when assessing the inequality aversion implicit in European tax-benefit systems. With view to the limitations in our analysis, future research should focus on including other policies (non-cash benefits, public goods), further behavioral margins (migration, tax evasion, educational choices) as well as political economy aspects. Second, respecting individual preferences might be of increasing relevance in welfare evaluation, and hence, also for policy design. Yet, various data needs to be explored and further empirical research to be carried out in order to properly identify individual tastes over the various dimensions of life. Third, while tax-transfer systems generally reduce inequality of opportunity, differences in opportunities are still widespread in Europe. The issue of equal opportunities might become even more important for policy design in view of the ongoing European integration. Further research should focus on the causal mechanisms behind observed family background and, with view to the assessment of redistributive policies, especially on the long-run impact over the life cycle. Fourth, the stabilizing effects of introducing a European 'fiscal union' could be too small to "counterbalance" its redistributive consequences and a Pareto improving reform might be possible only in rather severe crisis scenarios. This suggests that generating political support for deeper fiscal integration may be difficult with view to current or prospective voting rules of the Council of the European Union. However this result partly depends on the specific design of the system under analysis. If political desirability of any (ex-ante) redistributive effects across countries is generally questioned, the setup of a pure insurance mechanism would be required and could be an interesting topic to study for future research.

Bibliography

Aaberge, R. and Colombino, U. (2012). Accounting for family background when designing optimal income taxes: a microeconometric simulation analysis, *Journal of Population Economics* **25**(2): 741–761.

Aaberge, R. and Colombino, U. (2013). Using a microeconometric model of household labour supply to design optimal income taxes, *Scandinavian Journal of Economics* **115**(2): 449–475.

Aaberge, R., Colombino, U. and Strøm, S. (1999). Labor supply in Italy: an empirical analysis of joint household decisions, with taxes and quantity constraints, *Journal of Applied Econometrics* **14**(4): 403–422.

Aaberge, R., Colombino, U. and Strøm, S. (2000). Labor supply responses and welfare effects from replacing current tax rules by a flat tax: Empirical evidence from Italy, Norway and Sweden, *Journal of Population Economics* **13**(4): 595–621.

Aaberge, R., Colombino, U. and Strøm, S. (2004). Do more equal slices shrink the cake? An empirical investigation of tax-transfer reform proposals in Italy, *Journal of Population Economics* **17**: 767–785.

Aaberge, R., Colombino, U. and Wennemo, T. (2002). Heterogeneity in the elasticity of labor supply in Italy and some policy implications, CHILD Working Paper No. 21/2002.

Aaberge, R., Dagsvik, J. and Strøm, S. (1995). Labor supply responses and welfare effects of tax reforms, *Scandinavian Journal of Economics* **97**(4): 635–659.

Acemoglu, D., Golosov, M. and Tsyvinski, A. (2010). Dynamic Mirrlees taxation under political economy constraints, *Review of Economic Studies*

77(3): 841–881.

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

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

Alesina, A. and Angeletos, G.-M. (2005). Fairness and redistribution, *American Economic Review* **95**(4): 960–980.

Alesina, A. and Giuliano, P. (2011). Preferences for redistribution, *in* J. Benhabib, M. Jackson and A. Bisin (eds), *Handbook of Social Economics*, Vol. 1B, Elsevier, Amsterdam, pp. 93–132.

Alesina, A. and Glaeser, E. (2004). *Fighting Poverty in the US and Europe: A World of Difference*, Oxford University Press, Oxford.

Alesina, A., Glaeser, E. and Sacerdote, B. (2005). Work and leisure in the United States and Europe: why so different?, *NBER Macroeconomics Annual* **20**: 1–64.

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

Andor, L. (2012). A strong employment agenda-the pathway to economic recovery, dinner speech at the Conference "Jobs for Europe: The Employment Policy Conference", Brussels, 6 September 2012, European Commission, SPEECH/12/588.

Arneson, R. . (1989). Equality and equal opportunity for welfare, *Philosophical Studies* **56**(1): 77–93.

Asdrubali, P., Sorensen, B. and Yosha, O. (1996). Channels of interstate risksharing: United States 1963-1990, *Quarterly Journal of Economics* **111**: 1081–1110.

Atkinson, A. (2002a). Social inclusion and the European Union, *Journal of Common Market Studies* **40**(4): 625–643.

Atkinson, A. (2002b). 1 per cent of EUR 10,000 billion, *in* P. Townsend and D. Gordon (eds), *World Poverty: New Policies to Defeat an Old Enemy*, Policy Press, Bristol, pp. 401–441.

Atkinson, A. (2011). The restoration of welfare economics, *American Economic Review: Papers and Proceedings* **101**(3): 157–161.

Atkinson, A. (2013). Reducing income inequality in Europe, paper prepared for the IZA/VEF Workshop: 'A European Labor Market with Full Employment, More Income Security and Less Income Inequality in 2020', July 2013, Bonn.

Auerbach, A. and Feenberg, D. (2000). The significance of federal taxes as automatic stabilizers, *Journal of Economic Perspectives* **14**(3): 37–56.

Banks, J., Disney, R., Duncan, A. and Van Reenen, J. (2005). The internationalisation of public welfare policy, *Economic Journal* **115**: C62–C8.

Bargain, O., Caliendo, M., Haan, P. and Orsini, K. (2010). Making work pay' in a rationed labour market, *Journal of Population Economics* **21**(1): 323–351.

Bargain, O., Decoster, A., Dolls, M., Neumann, D., Peichl, A. and Siegloch, S. (2013a). Welfare, labor supply and heterogeneous preferences: evidence for Europe and the US, *Social Choice and Welfare* (forthcoming).

Bargain, O., Dolls, M., Fuest, C., Neumann, D., Peichl, A., Pestel, N. and Siegloch, S. (2013b). Fiscal union in Europe? Redistributive and stabilizing effects of a European tax-benefit system and fiscal equalization mechanism, *Economic Policy* (forthcoming).

Bargain, O., Dolls, M., Neumann, D., Peichl, A. and Siegloch, S. (2013c). Comparing inequality aversion across countries when labor supply responses differ, *International Tax and Public Finance* (forthcoming).

Bargain, O. (ed.) (2007). *Micro-Simulation in Action - Policy Analysis in Europe Using EUROMOD*, Vol. 25 of *Research in Labour Economics*, Emerald, Bingley.

Bargain, O., Orsini, K. and Peichl, A. (2012). Comparing labor supply elasticities in Europe and the US: new results, IZA Discussion Paper No. 6735.

Bayoumi, T. and Masson, P. (1995). Fiscal flows in the United States and Canada: lessons for monetary union in Europe, *European Economic Review* **39**(2): 253–274.

Becker, G., Philipson, T. and Soares, R. (2005). The quantity and quality of life and the evolution of world inequality, *Amercian Economic Review* **95**: 277–291.

Beetsma, R. and Bovenberg, L. (1998). Monetary Union without fiscal coordination may discipline policymakers, *Journal of International Economics* **45**: 239–258.

Beetsma, R. and Giuliodori, M. (2010). The macroeconomic costs and benefits of the EMU and other monetary unions: an overview of recent research, *Journal of Economic Literature* **48**(3): 603–641.

Begg, I. (2005). Funding the European Union. Making sense of the EU budget - a Federal Trust report on the union's budget, The Federal Trust, London.

Begg, I. (2011). An EU tax - overdue reform or federalist fantasy?, Friedrich Ebert Stiftung - International Policy Analysis.

Bernoth, K. and Engler, P. (2013). A transfer mechanism as a stabilizing tool in the EMU, *DIW Economic Bulletin* **1**: 3–8.

Bertola, G. (2013). Policy coordination, convergence, and the rise and crisis of EMU imbalances, European Economy, Economic Papers No. 490, European Commission.

Biewen, M. and Juhasz, A. (2012). Understanding rising income inequality in Germany, *Review of Income and Wealth* **58**(4): 622–647.

Björklund, A., Eriksson, T., Jäntti, M., Raaum, O. and Österbacka, E. (2002). Brother correlations in earnings in Denmark, Finland, Norway and Sweden compared to the United States, *Journal of Population Economics* **15**(4): 757–772.

Björklund, A. and Jäntti, M. (2009). Intergenerational income mobility and the role of family background, *in* W. Salverda, B. Nolan and T. Smeeding (eds), *The Oxford Handbook of Economic Inequality*, Oxford University Press., Oxford, pp. 491–521.

Blackorby, C. and Donaldson, D. (1988). Money metric utility: a harmless normalization?, *Journal of Economic Theory* **46**: 120–129.

Blackorby, C., Laisney, F. and Schmachtenberg, R. (1993). Reference-price-independent welfare prescriptions, *Journal of Public Economics* **50**: 63–76.

Blanchard, O. (2004). The economic future of Europe, *Journal of Economic Perspectives* **18**: 3–26.

Blanchet, D. and Fleurbaey, M. (2013). *Beyond GDP: Measuring Welfare and Assessing Sustainability*, Oxford University Press, Oxford.

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

Blundell, R., Duncan, A., McCrae, J. and Meghir, C. (2000). The labour market impact of the working families' tax credit, *Fiscal Studies* **21**(1): 75–103.

Blundell, R. and MaCurdy, T. (1999). Labor supply: a review of alternative approaches, *in* O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Vol. 3A, Elsevier, Amsterdam, pp. 1559–1695.

Blundell, R. and Shephard, A. (2012). Employment, hours of work and the optimal taxation of low income families, *Review of Economic Studies* **79**(2): 481–510.

Boadway, R. (2004). The theory and practice of equalisation, *CESifo Economic Studies* **50**(1): 211–254.

Bordo, M., Markiewicz, A. and Jonung, L. (2011). A fiscal union for the euro: some lessons from history, NBER Working Paper No. 17380.

Bourguignon, F., Ferreira, F. and Menéndez, M. (2007a). Inequality of opportunity in Brazil, *Review of Income and Wealth* **53**(4): 585–618.

Bourguignon, F., Ferreira, F. and Walton, M. (2007b). Equity, efficiency and inequality traps: a research agenda, *Journal of Economic Inequality* **5**(2): 235–256.

Bourguignon, F. and Spadaro, A. (2006). Microsimulation as a tool for evaluating redistribution policies, *Journal of Economic Inequality* **4**(1): 77–106.

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

Bowles, S. and Gintis, H. (2002). The inheritance of inequality, *Journal of Economic Perspectives* **16**(3): 3–30.

Brun, B. C. and Tungodden, B. (2004). Non-welfaristic theories of justice: is "the intersection approach" a solution to the indexing impasse?, *Social Choice and Welfare* **22**: 49–60.

Brunello, G. and Checchi, D. (2007). Does school tracking affect equality of opportunity? New international evidence, *Economic Policy* **22**: 781–861.

Buiter, W., Corsetti, G. and Roubini, N. (1993). Excessive deficits: sense and nonsense in the Treaty of Maastricht, *Economic Policy* **16**: 57–90.

Bundesregierung (2012). Regierungserklärung von Bundeskanzlerin Angela Merkel zum Europäischen Rat vom 18. und 19. Oktober in Brüssel, Berlin, 18 October 2012.

Büttner, T. (2006). The incentive effect of fiscal equalization transfers on tax policy, *Journal of Public Economics* **90**: 477–497.

Callan, T., van Soest, A. and Walsh, J. (2009). Tax structure and female labor supply: evidence from Ireland, *Labour* **23**(1): 1–35.

Casella, A. (2005). Redistribution policy: a European model, *Journal of Public Economics* **89**: 1305–1331.

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

Causa, O., Dantan, S. and Johansson, Ä. (2009). Intergenerational social mobility in European OECD countries, OECD Economics Department Working Paper No. 709.

Checchi, D. and Peragine, V. (2010). Inequality of opportunity in Italy, *Journal of Economic Inequality* **8**(4): 429–450.

Checchi, D., Peragine, V. and Serlenga, L. (2008). Income inequality and opportunity inequality in Europe, *Rivista di Politica Economica* **98**(5): 263–292.

Checchi, D., Peragine, V. and Serlenga, L. (2010). Fair and unfair income inequalities in Europe, IZA Discussion Paper No. 5025.

Chetty, R. (2006). A new method of estimating risk aversion, *American Economic Review* **96**(5): 1821–1834.

Christiansen, V. and Jansen, E. (1978). Implicit social preferences in the Norwegian system of indirect taxation, *Journal of Public Economics* **10**: 217–245.

Clark, A. E. and Oswald, A. J. (1994). Unhappiness and unemployment, *Economic Journal* **104**(424): 648–659.

Cnossen, S. (2001). Tax policy in the European Union: a review of issues and options, *FinanzArchiv* **58**: 466–558.

Cogneau, D. and Mesplé-Somps, S. (2008). Inequality of opportunity for income in five countries of Africa, *in* J. Bishop and B. Zheng (eds), *Research on Economic Inequality*, Vol. 16, Elsevier, Oxford, pp. 99–128.

Cohen, G. (1989). On the currency of egalitarian justice, *Ethics* **99**(4): 906–944.

Corneo, G. and Grüner, H. (2002). Individual preferences for political redistribution, *Journal of Public Economics* **83**(1): 83–107.

Coughlin, P. (1992). *Probabilistic Voting Theory*, Cambridge University Press, Cambridge.

Creedy, J. and Hérault, N. (2012). Welfare-improving income tax reforms: a microsimulation analysis, *Oxford Economic Papers* **64**(1): 128–150.

Cunha, F. and Heckman, J. (2007). The technology of skill formation, *American Economic Review* **97**(2): 31–47.

Dagsvik, J. (1994). Discrete and continuous choice, Max-Stable processes, and independence from irrelevant attributes, *Econometrica* **62**(5): 1179–1205.

Dagsvik, J., Locatelli, M. and Strøm, S. (2009). Tax Reform, sector-specific labor supply and welfare effects, *Scandinavian Journal of Economics* **111**(2): 299–321.

Dagsvik, J. and Strøm, S. (2006). Sectoral labor supply, choice restrictions and functional form, *Journal of Applied Econometrics* **21**(6): 803–826.

De Grauwe, P. (2009). *The Economics of Monetary Union*, 8 edn, Oxford University Press, New York.

Decoster, A. and Haan, P. (2010). Empirical welfare analysis in random utility models of labour supply, KU Leuven, CES Discussion Paper Series No. 10.30.

Decoster, A. and Schokkaert, E. (1989). Equity and efficiency of a reform of Belgian indirect taxes, *Recherches Économiques de Louvain* **55**(2): 155–176.

Delors, J. (1989). Regional implications of economic and monetary integration, *in* C. for the Study of Economic and M. Union (eds), *Report on Economic and Monetary Union in the European Community*, European Commission, Luxembourg.

Diamond, P. (1980). Income taxation with fixed hours of work, *Journal of Public Economics* **13**(1): 101–110.

Dixit, A. and Lambertini, L. (2003). Symbiosis of monetary and fiscal policies in a monetary union, *Journal of International Economics* **60**(2): 235–247.

Dolls, M., Fuest, C. and Peichl, A. (2012). Automatic stabilizers and economic crisis: US versus Europe, *Journal of Public Economics* **96**: 279–294.

Duclos, J.-Y. (2000). Gini indices and the redistribution of income, *International Tax and Public Finance* **7**: 141–162.

Dullien, S. and Fichtner, F. (2013). A common unemployment insurance system for the euro area, *DIW Economic Bulletin* **1**: 9–14.

Dullien, S. and Schwarzer, D. (2005). The Eurozone under serious pressure - regional economic cycles in the Monetary Union need to be stabilised, SWP Comments 2005/C22.

Dunnzlaff, L., Neumann, D., Niehues, J. and Peichl, A. (2011). Equality of opportunity and redistribution in Europe, *Inequality of Opportunity: Theory and Measurement*, Vol. 19 of *Research on Economic Inequality*, Bingley, pp. 99–129.

Dustmann, C. (2004). Parental background, secondary school track choice, and wages, *Oxford Economic Papers* **56**(2): 209–230.

Dworkin, R. (1981a). What is equality? Part 1: equality of welfare, *Philosophy and Public Affairs* **10**(3): 185–246.

Dworkin, R. (1981b). What is equality? Part 2: Equality of resources, *Philosophy and Public Affairs* **10**(4): 283–345.

ECOFIN (2012). Statement by Commissioner Šemeta on an EU Financial Transactions Tax ECOFIN Council, 9 October 2012, European Commission, MEMO.12.762.

Eichengreen, B. (1990). One money for Europe? Lessons from the US currency union, *Economic Policy* **10**: 117–187.

Eichengreen, B. and Wyplosz, C. (1998). The Stability Pact: more than a minor nuisance?, *Economic Policy* **26**: 65–113.

Eissa, N. and Hoynes, H. (2011). Redistribution and tax expenditures: the earned income tax credit, *National Tax Journal* **64**(2): 689–730.

Eissa, N. and Hoynes, H. W. (2004). Taxes and the labor market participation of married couples: the earned income tax credit, *Journal of Public Economics* **88**(9-10): 1931–1958.

Eissa, N., Kleven, H. J. and Kreiner, C. T. (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.

Eissa, N. and Liebman, J. (1996). Labor supply response to the earned income tax credit, *Quarterly Journal of Economics* **111**(2): 605–637.

Enderlein, H., Bofinger, P., Boone, L., de Grauwe, P. and et al. (2012). Completing the Euro - a road map towards fiscal union in Europe, Report of the "Tommaso Padoa-Schioppa Group", Notre Europe Studies.

Engler, P. and Voigts, S. (2013). A transfer mechanism for a monetary union, FU Berlin School of Business & Economics Discussion Paper No. 2013/2.

Engwerda, J., van Arle, B. and Plasmans, J. (2002). Cooperative and non-cooperative fiscal stabilisation policies in the EMU, *Journal of Economic*

Dynamics and Control **26**: 451–481.

Ericson, P. and Flood, L. (2009). A microsimulation approach to an optimal Swedish income tax, IZA Discussion Paper No. 4379.

EUROMOD (2008). EUROMOD statistics on distribution and decomposition of disposable income, accessed at www.iser.essex.ac.uk/euromod/earlier-versions-statistics, using EUROMOD version no. D21 (July 2013).

European Commission (2007). Opportunities, access and solidarity: Towards a new social vision for 21st century Europe, Commission of the European Communities, Brussels.

European Commission (2008). The social situation in the European Union 2007: social cohesion through equal opportunities, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2012). Public finances in EMU 2012, European Economy 4, European Commission.

Eurostat (2008a). Description of SILC user database secondary target variables: Module 2005, intergenerational transmission of poverty, Version 2005.2 from 01.03.08. Eurostat, Unit E2, Luxembourg. Retrieved on May 23, 2010.

Eurostat (2008b). Description of SILC user database variables: Cross-sectional and longitudinal, Version 2006.1 from 01.03.08. Eurostat, Unit F3, Luxembourg. Retrieved May 23, 2010.

EUROSTAT (2013). Taxation trends in the European Union, 2013 edition.

Evers, M. (2012). Federal fiscal transfer rules in monetary unions, *European Economic Review* **56**(3): 507–525.

Fatás, A. (1998). Does EMU need a fiscal federation?, *Economic Policy* **13**: 163–203.

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

Fehr, E. and Schmidt, K. (1999). A theory of fairness, competition and cooperation, *Quarterly Journal of Economics* **114**: 817–868.

Ferreira, F. and Gignoux, J. (2011). The measurement of inequality of opportunity: theory and an application to Latin America, *Review of Income and Wealth* **57**(4): 622–657.

Fleurbaey, M. (2006). Social welfare, priority to the worst-off and the dimensions of individual well-being, *in* F. Farina and E. Savaglio (eds), *Inequality and Economic Integration*, London: Routledge.

Fleurbaey, M. (2007). Social choice and the indexing dilemma, *Social Choice and Welfare* **29**: 633–648.

Fleurbaey, M. (2008). *Fairness, Responsibility and Welfare*, Oxford University Press.

Fleurbaey, M. (2009). Beyond GDP: the quest for a measure of social welfare, *Journal of Economic Literature* **47**: 1029–1075.

Fleurbaey, M. (2011). Willingness-to-pay and the equivalence approach, *Revue d'économie politique* **121**(1): 35–58.

Fleurbaey, M. (2013). Equal opportunity, reward and respect for preferences: reply to Roemer, *Economics and Philosophy* **28**(2): 201–216.

Fleurbaey, M. and Gaulier, G. (2009). International comparisons of living standards by equivalent incomes, *Scandinavian Journal of Economics* **111**: 597–624.

Fleurbaey, M. and Maniquet, F. (2006). Fair income tax, *Review of Economic Studies* **73**(1): 55–83.

Fleurbaey, M. and Maniquet, F. (2007). Help the low-skilled or let the hardworking thrive? A study of fairness in optimal income taxation, *Journal of Public Economic Theory* **9**(3): 467–500.

Fleurbaey, M. and Maniquet, F. (2010). Compensation and responsibility, *in* K. Arrow, A. Sen and K. Suzumura (eds), *Handbook of Social Choice and Welfare*, Vol. 2, North-Holland, pp. 507–604.

Fleurbaey, M. and Maniquet, F. (2011). *A Theory of Fairness and Social Welfare*, Cambridge University Press.

Fleurbaey, M. and Peragine, V. (2013). Ex ante versus ex post equality of opportunity, *Economica* **80**(317): 118–130.

Fleurbaey, M. and Tadenuma, K. (2009). Universal social orderings, CCES Discussion Paper Series No.9.

Fleurbaey, M. and Trannoy, A. (2003). The impossibility of a Paretian egalitarian, *Social Choice and Welfare* **21**: 243–263.

Fong, C. (2001). Social preferences, self-interest, and the demand for redistribution, *Journal of Public Economics* **82**(2): 225–246.

Forni, M. and Reichlin, L. (1999). Risk and potential insurance in Europe, *European Economic Review* **43**: 1237–1256.

Foster, J. and Shneyerov, A. (2000). Path independent inequality measures, *Journal of Economic Theory* **91**(2): 199–222.

Frenette, M., Green, D. and Milligan, K. (2007). The tail of the tails: Canadian income inequality in the 1980s and 1990s, *Canadian Journal of Economics* **40**(3): 734–764.

Fuest, C., Niehues, J. and Peichl, A. (2010). The redistributive effects of tax benefit systems in the enlarged EU, *Public Finance Review* **38**(4): 473–500.

Fuest, C. and Peichl, A. (2012). European fiscal union: What is it? Does it work? And are there really 'no alternatives'?, *CESifo Forum* **13**(1): 3–9.

Fuest, C., Peichl, A. and Schaefer, T. (2008). Is a flat tax reform feasible in a grown-up democracy of Western Europe? A simulation study for Germany, *International Tax and Public Finance* **15**(5): 620–636.

Galí, J. and Perotti, R. (2003). Fiscal policy and monetary integration in Europe, *Economic Policy* **18**: 534–572.

Girouard, N. and André, C. (2005). Measuring cyclically-adjusted budget balances for OECD countries, OECD Economics Department Working Papers No. 434.

Goodhart, C. (1998). The two concepts of money: implications for the analysis of optimal currency areas, *European Journal of Political Economy* **14**(3): 407–432.

Goodhart, C. and Smith, S. (1993). Stabilization, *European Economy, Reports and Studies* **5**: 417–455.

Gordon, R. and Cullen, J. (2011). Income redistribution in a Federal system of governments, *Journal of Public Economics* **96**(11-12): 1100–1109.

Haan, P. and Steiner, V. (2006). Labor market effects of the German tax reform 2000, *in* C. Dreger, H. Galler and U. Walwei (eds), *Determinants of Employment: The Macroeconomic View*, Nomos, Baden-Baden, pp. 101–117.

Hammond, G. and von Hagen, J. (1998). Regional insurance against asymmetric shocks: an empirical study for the European Community, *Manchester School* **66**: 331–353.

Hodler, R. (2009). Redistribution and inequality in a heterogeneous society, *Economica* **76**: 704–718.

Hoynes, H. (1996). Welfare transfers in two-parent families: labor supply and welfare participation under AFDC-UP, *Econometrica* **64**(29): 295–332.

Hoynes, H. and Luttmer, E. (2011). The insurance value of state tax-transfer programs, *Journal of Public Economics* **95**: 1466–1484.

HWWI-PWC (2013). Chancen und Risiken einer Fiskalunion, Studienreihe Politik und Wirtschaft.

Immervoll, H. (2004). Average and marginal effective tax rates facing workers in the EU. A micro-level analysis of levels, distributions and driving factors, EUROMOD Working Paper Series No. EM6/04.

Immervoll, H. (2007). Minimum wages, minimum labour costs and the tax treatment of low-wage employment, OECD Social, Employment and Migration Working Paper No. 46.

Immervoll, H., Kleven, H., Kreiner, C. and Saez, E. (2007). Welfare reform in European countries: a microsimulation analysis, *Economic Journal* **117**(516): 1–44.

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

Italiener, A. and Vanheukelen, M. (1993). Proposals for community stabilization mechanisms: some historical applications, *European Economy: Reports and Studies* **5**: 493–510.

Jenkins, S. and Van Kerm, P. (2009). The measurement of economic inequality, *in* W. Salverda, B. Nolan and T. Smeeding (eds), *The Oxford Handbook of Economic Inequality*, Oxford University Press, Oxford, pp. 40–67.

Jones, C. and Klenow, P. (2010). Beyond GDP? Welfare across countries and time, NBER Working Paper No. 16352.

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

Kanbur, R. and Tuomala, M. (2011). Charitable conservatism, poverty radicalism and inequality aversion, *Journal of Economic Inequality* **9**(3): 417–431.

Kandel, S. and Stambaugh, R. (1991). Asset returns and intertemporal preference, *Journal of Monetary Economics* **27**: 39–71.

Kassenboehmer, S. and Schmidt, C. (2011). Beyond GDP and back: What is the value-added by additional components of welfare measurement?, IZA Discussion Paper No. 5453.

Keane, M. and Rogerson, R. (2012). Reconciling micro and macro labor supply elasticities: a structural perspective, *Journal of Economic Literature* **50**(2): 464–476.

Keen, M. (1993). The welfare economics of tax co-ordination in the European Community, *Fiscal Studies* **14**: 15–36.

Kenen, P. (1969). The theory of optimum currency areas: an eclectic view, *in* R. Mundell and A. Swoboda (eds), *Monetary Problems of the International Economy*, University of Chicago Press, Chicago/London, pp. 41–59.

King, M. (1983). Welfare effects of tax reforms using household data, *Journal of Public Economics* **21**: 183–214.

Kopczuk, W., Slemrod, J. and Yitzhaki, S. (2005). The limitations of decentralized world redistribution: an optimal taxation approach, *European Economic*

Review **49**: 1051–1079.

Kymlicka, W. (2002). *Contemporary Political Philosophy - An Introduction*, 2 edn, Oxford University Press, Oxford.

Lambert, P., Millimet, D. and Slottje, D. (2003). Inequality aversion and the natural rate of subjective inequality, *Journal of Public Economics* **87**(5): 1061–1090.

Le Cacheux, J. (2007). Funding the EU budget with a genuine own resource: the case for a European tax, Notre Europe Studies.

Lefranc, A., Pistolesi, N. and Trannoy, A. (2008). Inequality of opportunities vs. inequality of outcomes: are Western societies all alike?, *Review of Income and Wealth* **54**(4): 513–546.

Lefranc, A., Pistolesi, N. and Trannoy, A. (2009). Equality of opportunity and luck: definitions and testable conditions, with an application to income in France, *Journal of Public Economics* **93**(11-12): 1189–1207.

MacDougall, D. (1977). Report of the study group on the role of public finances in European integration, General Report 1, *Technical report*, Commission of the European Communities, Brussels.

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

Marrero, G. and Rodríguez, J. (2010a). Inequality of opportunity and growth, ECINEQ Working Paper No. 154.

Marrero, G. and Rodríguez, J. (2010b). Inequality of opportunity in Europe: economic and policy facts, ECINEQ Working Paper No. 172.

Marzinotto, B., Sapir, A. and Wolff, G. (2011). What kind of fiscal union?, Bruegel Policy Briefs 06, November.

Masson, P. (1996). Fiscal dimensions of EMU, *Economic Journal* **106**(437): 996–1004.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior, *in* P. Zarembka (ed.), *Frontiers in Econometrics*, Academic Press, New York, pp. 105–142.

Mehra, R. and Prescott, E. (1985). The equity premium: a puzzle, *Journal of Monetary Economics* **15**: 145–161.

Mirrlees, J. (1971). An exploration in the theory of optimum income taxation, *Review of Economic Studies* **38**(2): 175–208.

Mitchell, D. (1991). *Income transfers in ten welfare states*, Aldershot, Avebury.

Mélitz, J. and Vori, S. (1993). National insurance against unevenly distributed shocks in a European Monetary Union, *Recherches Économiques de Louvain* **59**: 81–104.

Mundell, P. (1961). A Theory of optimum currency areas, *American Economic Review* **51**(4): 657–665.

Musgrave, R. (1959). *The Theory of Public Finance: A Study of Public Economy*, McGraw-Hill, New York.

Musgrave, R. and Thin, T. (1948). Income tax progressions, 1929-1948, *Journal of Political Economy* **56**: 498–514.

Neumann, D. (2013). Benefiting from a European fiscal union? Redistribution vs stabilization, mimeo.

Nickell, S. (1997). Unemployment and labor market rigidities: Europe versus North America, *Journal of Economic Perspectives* **11**(3): 55–74.

Nickell, S., Nunziata, L. and Ochel, W. (2005). Unemployment in the OECD since the 1960s: what do we know?, *Economic Journal* **115**(500): 1–27.

Obstfeld, M. and Peri, G. (1998). Regional nonadjustment and fiscal policy, *Economic Policy* **26**: 204–259.

OECD (2008). Growing unequal? Income distribution and poverty in OECD countries, OECD Publishing.

OECD (2011). Divided we stand: Why inequality keeps rising, OECD Publishing.

OECD (2013). Taxing wages 2013, OECD Publishing.

Ooghe, E. and Peichl, A. (2011). Fair and efficient taxation under partial control: theory and evidence, CESifo Working Paper No. 3518.

Paes de Barros, R., Ferreira, F., Molinas Vega, J. and Saavedra Chanduvi, J. (2009). Measuring inequality of opportunities in Latin America and the Caribbean, The World Bank, Washington DC.

Pechman, J. (1973). Responsiveness of the federal income tax to changes in income, *Brookings Papers on Economic Activity* **2**: 385–421.

Pechman, J. (1987). *Federal Tax Policy*, 5 edn, Brookings Institution, Washington.

Peichl, A. and Siegloch, S. (2012). Accounting for labor demand effects in structural labor supply models, *Labour Economics* **19**(1): 129–138.

Pencavel, J. (1977). Constant-utility index numbers of real wages, *American Economic Review* **67**(2): 91–100.

Peragine, V. (2004). Ranking income distributions according to equality of opportunity, *Journal of Economic Inequality* **2**(1): 11–30.

Pignataro, G. (2012). Equality of opportunity: policy and measurement paradigms, *Journal of Economic Surveys* **26**(5): 800–834.

Piketty, T. (1995). Social mobility and redistributive politics, *Quarterly Journal of Economics* **110**(3): 551–584.

Piketty, T. and Saez, E. (2003). Income inequality in the United States, 1913-1998, *Quarterly Journal of Economics* **CXVIII**(1): 1–39.

Piketty, T. and Saez, E. (2013). Optimal labor income taxation, *Handbook of Public Economics*, Vol. 5, North Holland, Amsterdam, p. forthcoming.

Pistolesi, N. (2009). Inequality of opportunity in the land of opportunities, 1968-2001, *Journal of Economic Inequality* **7**(4): 411–433.

Prescott, E. C. (2004). Why do Americans work so much more than Europeans?, *Federal Reserve Bank of Minneapolis Quarterly Review* **28**(1): 2–13.

Preston, I. and Walker, I. (1999). Welfare measurement in labour supply models with nonlinear budget constraints, *Journal of Population Economics* **12**(3): 343–361.

Ramos, X. and Van de gaer, D. (2012). Empirical approaches to inequality of opportunity: principles, measures and evidence, IZA Discussion Paper No. 6672.

Rawls, J. (1971). *A Theory of Justice*, Oxford University Press, Oxford.

Roberts, K. (1980). Price-independent welfare prescriptions, *Journal of Public Economics* **13**(3): 277–298.

Roemer, J. (1993). A pragmatic theory of responsibility for the egalitarian planner, *Philosophy and Public Affairs* **22**(2): 146–166.

Roemer, J. (1998). *Equality of Opportunity*, Harvard University Press, Cambridge, MA.

Roemer, J. (2004). Equal opportunity and intergenerational mobility-going beyond intergenerational income transition matrices, *in* M. Corak (ed.), *Generational Income Mobility in North America and Europe*, Cambridge University Press, Cambridge, UK.

Roemer, J. (2006). Economic development as opportunity equalization, Cowles Foundation Discussion Papers No. 1583.

Roemer, J. (2013). On several approaches to equality of opportunity, *Economics and Philosophy* **28**(2): 156–200.

Roemer, J., Aaberge, R., Colombio, U., Fritzell, J., Jenkins, S., Lefranc, A. and et al. (2003). To what extent do fiscal regimes equalize opportunities for income acquisition among citizens?, *Journal of Public Economics* **87**(3-4): 539–565.

Ross, T. (1984). Uncovering regulator's social welfare weights, *Rand Journal of Economics* **15**: 152–155.

Sachs, J. and Sala-i Martín, X. (1992). Fiscal federalism and optimum currency areas: evidence from Europe and the United States, *in* M. M. Canzoneri, V. Grilli and P. Masson (eds), *Establishing a Central Bank: Issues in Europe and Lessons from the US*, Cambridge University Press, Cambridge, pp. 195–227.

Saez, E. (2002). Optimal income transfer programs: intensive versus extensive labor supply responses, *Quarterly Journal of Economics* **117**(3): 1039–1073.

Saez, E. and Stantcheva, S. (2012). Endogenous social welfare weights for optimal tax theory, Mimeo.

Schneider, F. and Enste, D. (2000). Shadow economies: sizes, causes and consequences, *Journal of Economic Literature* **38**(1): 77–114.

Schuknecht, L., Moutot, P., Rother, P. and Stark, J. . (2011). The stability and growth pact: crisis and reform, Occasional Paper Series No. 129, European Central Bank 09/2011.

Sen, A. (1985). *Commodities and Capabilities*, North-Holland, Amsterdam.

Shorrocks, A. (1980). The class of additively decomposable inequality measures, *Econometrica* **48**(6): 613–625.

Singhal, M. (2008). Quantifying preferences for redistribution, Paper presented at the AEA Annual Meeting January 2009.

Slesnick, D. T. (1991). Aggregate deadweight loss and money metric social welfare, *International Economic Review* **32**: 132–146.

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*, Basil Blackwell, Oxford.

Stiglitz, J., Sen, A. and Fitoussi, J.-P. (2009). Report by the Comission on the Measurement of Economic Performance and Social Progress, Technical Report.

Sutherland, H. (2001). EUROMOD: an integrated European benefit-tax model, EUROMOD Working Paper No. EM9/01.

Sutherland, H. (2007). EUROMOD: the tax-benefit microsimulation model for the European Union, *in* A. Gupta and A. Harding (eds), *Modelling Our Future: Population Ageing, Health and Aged Care*, Vol. 16 of *International Symposia in Economic Theory and Econometrics*, Elsevier, pp. 483–488.

Sutherland, H. and Figari, F. (2013). EUROMOD: the European Union tax-benefit microsimulation model , EUROMOD Working Paper Series No. EM8/13.

Theil, H. (1967). *Economics and Information Theory*, North Holland, Amsterdam.

Uhlig, H. (2003). One money, but many fiscal policies in Europe: what are the consequences, *in* M. Buti (ed.), *Monetary and Fiscal Policy in EMU: Interaction and Coordination*, Cambridge University Press, Cambridge, pp. 29–56.

Van de gaer, D. (1993). *Equality of opportunity and investment in human capital*, PhD thesis, Catholic University of Louvain, Belgium.

van den Noord, P. (2000). The size and role of automatic fiscal stabilisers in the 1990s and beyond, OECD Economics Department Working Papers No. 230.

van Rompuy, H. (2012). Towards a genuine economic and monetary union, Interim Report, The President of the European Council, Brussels, 12 October 2012.

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

van Soest, A., Das, M. and Gong, X. (2002). A Structural labour supply model with flexible preferences, *Journal of Econometrics* **107**: 345 – 374.

von Hagen, J. (1992). Fiscal arrangements in a monetary union: evidence from the US, *in* D. Fair and C. de Bossieu (eds), *Fiscal Policy, Taxation and the Financial System in an Increasingly Integrated Europe*, Kluwer, Boston, MA.

von Hagen, J. and Wyplosz, C. (2008). EMU's decentralized system of fiscal policy, European Economy, Economic Papers No. 306, European Commission.

Werning, I. and Farhi, E. (2012). Fiscal unions, NBER Working Paper No. 18280.

Whiteford, P. (2008). How much redistribution do governments achieve? The role of cash transfers and household taxes, *Growing Unequal? Income Distribution and Poverty in OECD Countries*, OECD, Paris, pp. 97–121.

Wigger, B. and Wartha, U. (2003). How to allocate the power to tax in Europe?, *in* M. Holler, H. Kliemt, D. Schmidtchen and M. Streit (eds), *European Governance*, number 22 in *Jahrbuch für Neue Politische Ökonomie*, Mohr Siebeck, Tübingen, pp. 173–190.

Wildasin, D. (1991). Income redistribution in a common labor market, *American Economic Review* **81**(4): 757–774.

Yitzhaki, S. (1979). Relative deprivation and the Gini coefficient, *Quarterly Journal of Economics* **93**(2): 321–324.

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