Income Inequality, Inequality of Opportunity and Redistributive Policies

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Chapter 1

Introduction

1.1 Motivation and key questions

Although periods of sustained economic growth are generally associated with reductions in absolute poverty, such reductions do not necessarily bring about an equitable distribution of incomes. For example, in Germany, average real incomes have increased by around 10 percent over the last 25 years. However, while only a slight income increase occurred at the bottom of the income distribution, incomes of the richest 10 percent of the population have increased considerably.[1] This phenomenon of an increasing dispersion of incomes is not unique to Germany. A recent OECD (2011) report shows that income inequality has increased in most developed countries over the last two decades (see Figure 1.1.1). In fact, according to the International Social Survey Programme (IISP) 2009, the majority of respondents in European countries agree that *"differences in income are too large"* and *"it is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes."* Therefore, economic and social cohesion are high on the political agenda of most developed welfare states, and most people agree that public policies can play a key role in redistributing income. However, as the considerable variations in inequality levels illustrated in Figure 1.1.1 show, welfare states differ dramatically in terms of the extent to which they reach this goal. Therefore, understanding fiscal and social policy design and the corresponding distributive outcomes is of crucial importance not only to public economics but also for well-designed redistributive policymaking.

In this book, we examine redistributive policies and income inequality and

[1] Source: SOEP micro data. Real income for the poorest (richest) 10 percent of the population in 1983 was less than €11,549 (more than €48,976) and less than €12,001 (more than €55,788) in 2008 (in 2005 prices).

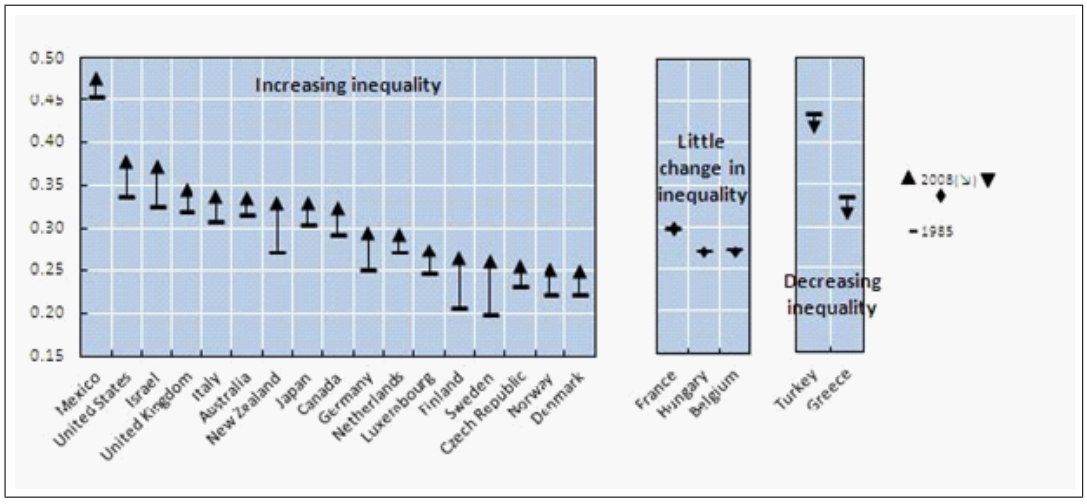

Figure 1.1.1: Gini coefficients of income inequality in the mid-1980s and late 2000s
Source: OECD (2011). Note: For the Czech Republic and Hungary, instead of data for the mid-1980s, data for the early 1990s are used.

their interdependencies from a cross-national perspective. The book will contribute to the debate about the distribution and redistribution of income in various ways. First, we analyze the size and structure of effective redistribution in a broad sample of European welfare states. Besides answering the question of how different components of the tax and transfer system contribute to disposable income inequality, we also investigate whether the findings are sensitive to the underlying measurement method. In the second chapter, we extend this analysis by also considering indirect taxes and investigating the development of redistributive effects over time. Based on two detailed case studies of Germany and the United Kingdom, we theoretically and empirically evaluate whether the structure of fiscal policies has changed over the last two decades. The analysis provides a comprehensive dynamic analysis of effective progressivity and redistribution by including all major fiscal elements: direct taxation, pay roll taxes, indirect taxes, and social benefits.

The first two chapters focus only on the first-order effects of redistributive policies, ignoring the possible subsequent behavioral effects of these policies. In the third chapter, we try to identify the causal effect of redistributive spending policies on income inequality and discuss possible second-order effects. In contrast to previous analyses, for the cross-country analysis in the last chapter, we investigate the concept of unequal opportunities rather than outcome inequalities. While the first chapters of this book only rely on cases from the European Union (EU), here we compare Germany and the United States because of the distinct differences

between Europeans and Americans in attitudes toward inequality, social mobility, and redistribution (Alesina and Glaeser (2004), Alesina and Angeletos (2005)). We present and discuss a new approach for measuring equality of opportunity (EOp) and analyze the impact of tax benefit systems on opportunities instead of outcomes.

In the remainder of the introduction, we will proceed as follows. In Section 1.2, we will briefly describe inequality, redistribution, and inequality of opportunity (IOp) and their interdependencies. Then, in Section 1.3, we will contextualize the different chapters and summarize their main results.

1.2 Conceptual foundations

In this section, we introduce general conceptual issues related to the distribution and redistribution of income. More precisely, we define the three major concepts with which the book is concerned: economic inequality, redistribution, and EOp.

1.2.1 Economic inequality

> » *...with the hope that when they grow up they will find less of it no matter how they decide to measure it* « Amartya Sen (1973, dedication to his children)

With the seminal publications of Atkinson (1970, 1975) and Sen (1973), the issue of economic inequality became part of the economic research agenda. By now, a substantial body of research has been accumulated on the measurement, causes, and consequences of inequality. Especially with the availability of comparable national micro datasets with representative household income data, researchers have made great progress in empirical studies focusing on economic inequality and in the concepts, methods, and models used.[2] Especially when measuring economic inequality in an international context or over time, several conceptual issues have to be taken into account. "*Ideally income would be measured on a post-tax and transfer basis consistent with the Haig-Simons income concept of real consumption plus (or minus) change in net worth. Income would include both cash and non-cash components, would be adjusted for economies of scale in consumption using an appropriate equivalence scale, and would cover the period over which families can smooth consumption by lending or borrowing*" (Gottschalk and Smeeding,

[2]See Jenkins and Micklewright (2007) for a broad overview over the historical development of studies on the issue of economic inequality.

1997: 637).[3] In general, this benchmark income concept can only be approximated in empirical inequality research. Nevertheless, this benchmark operationalization hints at three major issues that have to be considered when assessing economic inequality: the economic variable of interest, the time period, and the demographic reference unit.

In the following, we delineate on which conceptual definitions of economic inequality the subsequent analyses are based. As in almost all other studies, we fall short of Haig-Simons's comprehensive definition and apply income as the only resource variable of interest. Our choice of income as a measure of well-being is primarily justified by the better availability of comparable micro data on incomes, as compared to data on consumption and total assets. In contrast to Haig-Simons's definition, we do not attempt to capture lifetime utility but we generally restrict our reference period to one year. Thus, as an important limitation, we cannot take into account the lifetime distribution of resources and can only provide annual snapshots of the distribution of incomes. This annual view, however, is also suggested by the Expert Group on Household Income Statistics (2001) because it is the natural accounting period for the majority of income sources. Our reference unit will be the household (or individuals within households), and in order to account for possible economies of scales within households, household incomes are adjusted by equivalence scales.[4]

Beside these conceptual issues, we must point out that one can aggregate the distribution of incomes into a measure of inequality in numerous ways. Here we only introduce the most popular and most frequently used inequality measure, the Gini coefficient (Gini (1914)). We also rely on this inequality measure in the majority of subsequent analyses.[5] The Gini coefficient is derived with the help of the Lorenz curve, which orders the population by magnitude of income (starting with the lowest). Then, the cumulative proportion of total income received by income units is plotted against the cumulative proportion of the population. The Gini coefficient then measures the area between the Lorenz curve and the 45° line as a fraction of the total area under the the 45° line: $G = \frac{A}{A+B}$ (see Figure 1.2.1).

[3] Gottschalk and Smeeding (1997) refer to the income concepts developed by Haig (1921) and Simons (1938).

[4] Throughout the book, we will rely on different equivalence scales, which are explained at the relevant places. For more information on equivalence scales, see Buhmann et al. (1988).

[5] In the remainder of the book, further inequality measures are formally introduced. See e.g. Jenkins (1991), Cowell (2000), Jenkins and Van Kerm (2009), and Ochmann and Peichl (2006) for comprehensive overviews on the measurement of economic inequality.

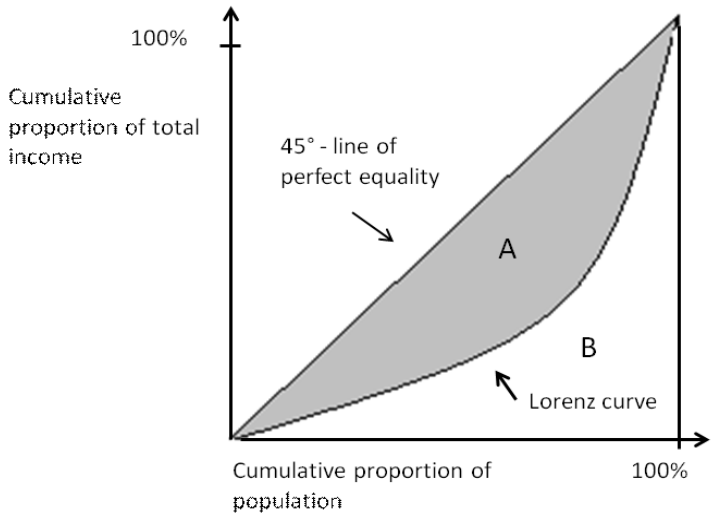

Figure 1.2.1: Graphical representation of the Gini coefficient
Source: Lambert (2001).

The Gini coefficient is one in the case of maximum inequality and zero when all incomes are equal (45° line). With regard to the sensitivity of the distribution scale, the Gini coefficient attaches most weight to the income of the middle classes. The Gini coefficient has the disadvantage that it might indicate the same value of inequality for two distinct distributions in the case of intersecting Lorenz curves.

When comparing income distributions across countries and over time, another major concern is the underlying data sources. Atkinson and Brandolini (2001: 772) comment on the pitfalls of using secondary inequality data: "*Gini coefficients of income inequality may be published for a range of countries, but there is no agreed basis of definition. [. . .] We cannot therefore be sure whether results of comparative or econometric analyses obtained using such data are genuine or a product of data differences.*" Therefore, all subsequent distributional measures are computed from micro data to ensure the comparability of their conceptualization.

1.2.2 Redistribution

> » *Because it taxes and it spends, the welfare state is by definition redistributive, but the degree to which this is associated with more equality is an open empirical question* « Esping-Andersen and Myles (2009: 639)

In order to assess the distributional impact of public policies, we must first clarify what is meant by redistribution and how it is measured. At first glance,

redistribution seems to be an easy, rather concrete term. As Lambert (2001: 37) states, "*Transferring income from rich to poor is an act of redistribution, in anyone´s language.*" Although this is obviously true, redistribution can still encompass different things and there is no uncontroversial way to measure it. We will start by narrowing down what we mean when we speak of redistribution and develop a general definition of redistribution that is relevant for our research.

This book is particularly concerned with the distributional impact of fiscal policies. Thus, we will focus only on redistribution by the government, more specifically redistribution induced by the tax and transfer systems. Accordingly, private transfers are not taken into account. Another important restriction of our definition will be the one-dimensionality of redistribution because we will only consider monetary redistribution. Due to data constraints, the redistributive effects of the public provision of services, such as education and health care, are not taken into account, despite the fact that those are important components of social policies in many affluent countries (Huber and Stephens (2001)).

Finally and most importantly, policies reflect different objectives, and different types of redistribution are achieved. Besides the redistribution from rich to poor, social policies seek to provide income maintenance or insurance in the face of adverse risks (e.g., unemployment, sickness, and disability) or redistribution across the life cycle (e.g., retirement pensions). As outlined above, the view we take is static in the sense that we cannot take into account lifetime redistribution.[6] Thus, we focus exclusively on the annual actual amount of redistribution, meaning how much reduction in income inequality is achieved in a country per year. Therefore, we are most interested in the redistribution from rich to poor – although, as will become clear throughout the subsequent chapters, we will not be able to fully disentangle redistributive effects from lifetime redistribution. Summing up, in the remainder of the book, when we speak of redistribution, we refer to the (annual) reduction in income inequality achieved by the national design of tax benefit systems.

The standard approach of measuring (effective) redistribution is the comparison of inequality measures before and after government intervention (or before and after a single tax benefit instrument).[7] This approach, however, can be problematic because the pre-government distribution of incomes is not independent of changes

[6] In a related paper on the distributional outcomes of welfare states, we discuss and empirically assess the lifetime redistribution achieved by public pensions. See Kammer et al. (2011).

[7] Further approaches to empirically assess redistribution (and progressivity) and studies that apply these different methods are introduced in Chapters 2 and 3.

in tax benefit systems. Notwithstanding this problem, there is strong political interest in the redistributive effects of the fiscal system, and empiricists try to measure them. This book is part of this research program and seeks to contribute to the understanding and measurement of the redistribution achieved by different tax benefit instruments. In particular, Chapter 4 discusses possible second-order effects of redistributive policies on the pre-government distribution of incomes.

1.2.3 Equality of outcomes versus equality of opportunity

> » *We know that equality of individual ability has never existed and never will, but we do insist that equality of opportunity still must be sought.* « Franklin D. Roosevelt (1936)

While in recent decades most economists have observed an increase in income inequality in the bulk of developed countries, fewer agree about whether governments should do something about it. One argument for why the government should care about inequality rests on the philosophical doctrine of *utilitarianism*, whose main idea lies in the maximization of the total utility of a society.[8] Together with the (intuitive) assumption that income has diminishing marginal utility and the (restrictive) assumption that everyone has the same utility function, it follows that any transfer from rich to poor would increase social welfare. Given these assumptions, an equal distribution of incomes would maximize total utility. However, this immediately evokes the main counterargument against promoting perfect equality. The utilitarian distribution principle offers people no incentive to work. The main idea of the incentive argument is that without redistributive government intervention, total income would be larger, and in the end, everybody would be better off (*trickle-down-effect*).[9]

Martin Feldstein restates this idea as follows: *"According to official statistics, the distribution of income [in the United States] has become increasingly unequal during the past two decades. A common reaction in the popular press, in political debate, and in academic discussions is to regard the increased inequality as a problem that demands new redistributive policies. I disagree. I believe that inequality as such is not a problem and that it would be wrong to design policies to reduce it. What policy should address is not inequality but poverty"* (Feldstein, 1999:

[8] See Bentham (1789).

[9] Further arguments against inequality derive from pure self-interest considerations and relate to the possible negative consequences of inequality (e.g., crime and the instability of political institutions). However, robust evidence on inequality as the driving force behind these outcomes is still missing.

33). This is compatible with the Rawlsian view about distributive justice, which, in contrast to the utilitarian distribution principle, requires that any distributive principle should maximize the income of the least well-off (Rawls (1971)). This begs the question of whether we should actually worry about an unequal distribution of income or if it is enough to provide a social safety net for the poor. Rawls derives his conclusion by ruling out envy as a legitimate motivation for thinking about distributive issues. However, Milanovic (2007) argues that envy might simply represent people's impression that differences in income are to a large part undeserved because incomes are mainly determined by luck and external circumstances. If we ignore the negative connotation of envy, we might also view this as a sense of justice.[10] Thus, regarding income inequality, of major concern are fairness considerations, which are related to the origins of income differences. Indeed, the evidence shows that individuals are more willing to accept income differences that are due to individual effort (or laziness) rather than exogenous circumstances. Also, preferences for redistribution are systematically correlated with beliefs about the relative importance of effort and luck in the determination of outcomes.[11] This is in line with most modern theories of distributive justice, which distinguish between ethically acceptable inequalities (e.g., due to differences in effort) and unfair inequalities (e.g., due to endowed characteristics and luck). By now, many philosophers see EOp as the appropriate currency of egalitarian justice.[12]

While the traditional notion of equality of outcomes refers to an equal distribution of economic outcomes (e.g., well-being and income), the EOp theory, in contrast, distinguishes between *circumstances* and *effort* as determinants of outcomes. Starting with seminal works by Roemer (1993, 1998), Van de gaer (1993), and Fleurbaey (1995), economists have become increasingly interested in this normatively appealing concept. By now, a vast number of researchers have conceptualized EOp and tried to measure it.[13] Since EOp theory only defends compensation for inequalities due to circumstances, EOp policy aims at leveling the playing field by compensating individuals for any deficits due to circumstances and ensuring that only effort affects achievement. Thus, the empirical assessment of questions such as whether redistributive policies are actually effective in promoting

[10] See Kenworthy (2008) for a more detailed discussion of these issues.
[11] See Fong (2001), Konow (2003), Alesina and Giuliano (2011), and Gaertner and Schokkaert (2011).
[12] See Sen (1980, 1985, 1992), Dworkin (1981a,b), Arneson (1989), Cohen (1989), Roemer (1993, 1998, 2002), and Fleurbaey (2008).
[13] See Chapter 5 for a broad overview of the EOp literature.

EOp and whether improvements in terms of outcome equality are also associated with advances regarding EOp are of particular interest. Indeed, in a related work on a broad set of European countries, we found that the equalizing impacts of the tax benefit system on IOp differ substantially from those observed in the traditional notion of inequality of outcomes (see Dunnzlaff et al. (2011)). The last part of the book builds on this earlier work and contributes to the EOp literature in two major ways: First, we introduce a new approach of empirically measuring EOp, and second, we analyze the effect of public policies on these measures.

1.3 The agenda

In the following, we will summarize the content and main contribution of the following four chapters. For each chapter, we will sketch the methods used and outline the main results. Chapter 6 will briefly draw conclusions.

1.3.1 Chapter 2: Redistributive tax benefit systems

In this chapter, we provide a comprehensive descriptive analysis of the equalizing effects of different taxes and benefits based on two approaches. We derive and compare redistributive effects based on both the standard sequential accounting approach, which is briefly mentioned in Section 1.2.2, and the factor source decomposition approach suggested by Shorrocks (1982, 1983). Thus, we investigate not only the redistributive importance of tax benefit instruments across countries but also whether our findings are sensitive to the measurement method used. Since the analysis is based on the EU-25, it is also interesting to see how the new member states, mostly from Central and Eastern Europe, compare to the well-established welfare states of Western Europe.

The results suggest that tax and transfer systems substantially reduce income inequality in all EU member states. However, the two measurement approaches yield very different, partly contradictory, results. Inequality analysis based on the sequential accounting approach suggests that benefits are the most important source of inequality reduction in most European tax and transfer systems, whereas the factor source decomposition approach suggests that benefits play a negligible role and sometimes even contribute slightly positively to inequality. On the contrary, here taxes and social contributions are by far the most important contributors to income inequality reduction. The differing results can be attributed to the different normative focus of the two approaches. While the Shorrocks

approach provides a unique decomposition rule for any inequality measure, the approach violates the normatively intuitive axiom that equally distributed transfers reduce aggregate inequality.

With respect to country differences, we find that the new EU member states do not differ greatly from traditional Western European welfare states. Instead, the majority of Central Eastern European countries naturally group together with traditional Continental Western European welfare states. The Baltic flat tax countries, however, emerge as a distinct group characterized by very small welfare states, as compared to other European countries.

1.3.2 Chapter 3: The development of fiscal redistribution

While the previous chapter takes a purely cross-sectional perspective, this chapter focuses on the structural changes in the composition of national fiscal systems from the mid-1980s to today. However, it draws on findings from the previous analysis and applies the standard approach to measure the redistributive effects of taxes and benefits. Besides the dynamic perspective, one important contribution is the inclusion of indirect taxes in the analysis of the redistributive effects of welfare states.

The analysis begins with a detailed review of established political economic theories on the development of fiscal redistribution. The political economy literature frequently argues that increasing international integration and competitive pressures also affect welfare policies. The consequences are reflected in a cut back of tax progressivity. However, there is no consistent evidence of a retrenchment of welfare states. Grounding our analysis in compensation theory as well as tax competition and tax mix arguments, we deduce our guiding *substitution hypothesis*, which predicts that redistributive capacities shift from taxation to spending, meaning that the redistributive effects of taxes and benefits are empirical substitutes.

To empirically test the substitution hypothesis, we conduct a micro-data based analysis of effective progressivity and redistribution by including all major fiscal elements: direct taxation, pay roll taxes, indirect taxes, and benefits. In addition to the standard approach of measuring redistribution, we also apply a transplant-and-compare procedure to account for the impact of changing pre-government incomes. Since indirect tax payments are not available for a broad set of countries, our analysis is restricted to the two cases of Germany and the United Kingdom. For Germany, we use an imputation procedure to approximate the distribution of indirect tax payments across households for different years.

This analysis reveals two important results. First, we find that the regressive structure of indirect taxation (and social insurance contributions) absorbs the redistributive effects from progressive income taxation in both countries. Second, we find some evidence for the substitution hypothesis in Germany. Here, increasingly regressive tax systems are indeed accompanied by more redistributive benefits. We do not observe this shift in the United Kingdom.

1.3.3 Chapter 4: Social spending and income inequality

In the previous chapters, we generally abstracted from behavioral effects induced by redistributive policies. In this chapter, we relax this restrictive assumption. Using a dynamic panel approach based on European countries and the period 1993-2007, we investigate whether a more generous welfare state is indeed causally related to more equality in the distribution of incomes or whether the first-order equalizing effects we found in the previous (cumulative) cross-sectional analyses are offset by reverse behavioral effects in the long run. Besides the overall effect of social spending, we also investigate which kind of benefits are most effective in reducing income inequality by examining the specific structure and characteristics of benefits.

The chapter starts with a theoretical part in which we elaborate on possible behavioral second-order responses induced by redistributive social policies, which might offset inequality reducing first-order effects. In this context, the different objectives of social spending policies are also discussed. Regarding the estimation strategy, we apply the System GMM dynamic panel estimator and the presumably random incidence of certain diseases to account for the inherent endogeneity of social policies with regard to inequality levels.

The regression results unambiguously suggest that more social spending effectively reduces inequality levels. The result is robust with respect to the instrument count and different data restrictions. Looking at the structure of benefits, unemployment benefits and public pensions in particular are responsible for the inequality-reducing impact. More targeted benefits, however, do not significantly reduce income inequality. Rather, their positive effect on pre-government income inequality hints at substantial disincentive effects.

1.3.4 Chapter 5: Inequality of opportunity

So far, the empirical analyses were all based on the traditional inequality of outcomes approach. However, individuals might be more willing to accept income differences that are due to individual effort rather than exogenous circumstances. Therefore, in this chapter, we introduce the concept of EOp and analyze the equalizing impact of public policies on opportunities rather than outcomes.

Previous estimates of unfair IOp are only lower bounds because of the unobservability of the full set of relevant circumstances. In the conceptual framework at the beginning of the chapter, we develop a new estimator based on a fixed effects panel model, which also allows for the identification of an upper bound for IOp. The empirical application of the new estimator is based on Germany and the United States, two countries that differ considerably in their attitudes toward inequality and redistribution and which provide appropriate panel data with sufficient information on parental background and other external circumstances.

We find significant and robust differences between lower and upper bound IOp estimates for both countries. Therefore the analysis suggests that existing lower bound estimates for IOp might demand for too little redistribution in order to equalize unfair inequalities. When using periodical incomes, IOp shares in the United States are significantly lower than in Germany. Hence, EOp is indeed higher in the "land of opportunity." Interestingly, we find no significant difference between IOp shares in gross and net earnings in the two countries. This indicates that there is no differential effect of the tax benefit system on unequal opportunities in our sample (i.e., no tagging on circumstances). However, we identify public policies as a useful tool to change IOp: A policy simulation reveals that the abolishment of joint taxation in favor of individual taxation significantly reduces IOp.

Chapter 2

Redistributive tax benefit systems

In this chapter we analyze the redistributive effects of tax benefit systems in the enlarged European Union. The analysis reveals that different approaches of measuring redistribution might lead to very different results regarding the equalizing effects of different tax benefit instruments.[14]

2.1 Introduction

Inequality is usually measured in terms of disposable income, which is determined by i) the pre-tax income distribution and ii) various redistributive policies. From a policy perspective, it is important to understand to what extent the differences in inequality levels between countries are driven by differences in the market income distribution and to what extent they are driven by different designs of the welfare state. Although one of the main objectives of the European Union (EU) is to enhance economic and social cohesion, there are still sizeable differences across member states in the levels of within country income inequality. This is true especially since the enlargements of the EU in 2004 and 2007, when in total twelve additional countries, mostly from Eastern Europe, joined the EU. With respect to the recent EU enlargement it is particularly interesting to see how the new member states compare to the well-established welfare states of Western Europe.

The purpose of this chapter is to investigate the impact of taxes and benefits on disposable income inequality and to compare the contribution of these two components across twenty-four EU member states. Our results suggest that the measured contributions of taxes and benefits on overall inequality strongly depend on the measurement concept used. These differences in results can be explained

[14] This chapter is based on Fuest et al. (2010).

by different normative concepts underlying the two approaches.

The analysis of income inequality, the design of the welfare state, and the size of redistribution have a long tradition in economic and social science literature. Especially regarding the analysis of the development of income inequality across countries and time, a large number of empirical studies exists (see Anand and Segal (2008) for a recent overview). Due to data limitations, the development of redistribution across countries and time is not as extensively analyzed as inequality. However, since the availability of comparable micro data sets there has been much progress in analyzing redistributive effects in cross-country comparisons.

When assessing the overall distributional impact of different tax benefit instruments, one can generally distinguish between two different approaches in the literature. The majority of micro studies measures effective redistribution of the tax benefit system by taking either the relative or absolute change of inequality measures of the pre-government and post-government income distribution (e.g., Mitchell (1991), Immervoll et al. (2005), Mahler and Jesuit (2006), Whiteford (2008)). Based on a certain income accounting framework, this approach *sequentially* applies different tax benefit instruments and compares the status-quo with the counterfactual distribution without the instrument in question. In the following, we will refer to this approach as the *sequential approach* of measuring effective redistribution.

Another means of assessing the impact of different income components such as taxes and transfers on income inequality is the factor source decomposition approach, suggested by Shorrocks (1982, 1983). As total disposable income can be exhaustively decomposed into different pre-tax income sources as well as taxes, social insurance contributions and benefits, it is possible to calculate the contribution (equalizing or disequalizing effect) of each factor to overall inequality in the status quo. Here the inequality contribution of each factor component is determined *simultaneously*. With this decomposition approach it is not only possible to determine the impact of taxes and transfers but also the inequality contribution of self-employment and capital income to total income (e.g., Jenkins (1995), Jäntti (1997), Frässdorf et al. (2011)).

Obviously, different approaches can lead to different results, which in turn would imply different policy implications. Therefore, we use EU-SILC (Statistics on Income and Living Conditions) micro data of 2007 to compare the two approaches with regard to the redistributive effects of tax benefit systems. The 2007 wave is the first to provide information on both gross and net incomes for all twenty-five EU member states (except Malta). Thus, not only do we investigate

the redistributive importance of tax benefit instruments across countries, but we also investigate whether our findings are sensitive to the measurement method employed. Particularly, we identify the relative positions of the new member states in the inequality ordering of EU countries.

Our results suggest that tax and transfer systems substantially reduce income inequality in all EU member states. But the two measurement approaches described above yield very different, partly contradictory results, especially concerning the relative importance of different tax benefit instruments. Inequality analysis based on the sequential accounting approach suggests that benefits are the most important factor reducing inequality in the majority of countries. The factor source decomposition approach, however, suggests that benefits play a negligible role and sometimes even slightly increase inequality. According to this methodology, taxes and social insurance contributions are by far the most important contributors to reducing income inequality. We explain these partly contradictory results by the different normative focuses of the two approaches and show that many benefits seem to have objectives other than reducing disposable income inequality.

The remainder of the chapter is organized as follows: Section 2.2 describes the data and methodologies employed in this study. In Section 2.3, we provide some descriptive statistics about inequality levels in EU countries and household income composition. Section 2.4 presents the results of the redistributive effects of tax benefit instruments based on both, the sequential and the decomposition approach and differences in the findings are discussed. Section 2.5 concludes.

2.2 Data and methodology

2.2.1 Data

The EU-SILC micro data set provides harmonized and comparable multidimensional micro data of households and individuals in European countries.[15] Since 2005, the dataset covers the EU-twenty-five member states (except Malta) and it is the largest comparative survey of European income and living conditions. Our analysis is based on the 2007 EU-SILC wave which is the first to include gross income information for all countries. The sample size varies from 3,505 households in Cyprus to 20,982 households in Italy. The survey is representative for the whole

[15] For more information on the EU-SILC methodologies, definitions, coverage as well as the national questionnaires see http://forum.europa.eu.int/Public/irc/dsis/eusilc/library.

population in each country due to the construction of population weights.

In the remainder, we refer to our total sample of countries as the "EU-24" or simply the "EU". To the fifteen old EU member states before the EU enlargement in 2004 we refer to as "EU-15"[16] and to the nine New Member States shortly as "NMS"[17]. Furthermore, we categorize countries according to their geographical position into Continental (AT, BE, DE, FR, LU, NL), Northern (DK, FI, SE), Southern (CY, ES, GR, IT, PT), Anglo-Saxon (IE, UK), Central Eastern (CZ, HU, PL, SI, SK) and Baltic (EE, LT, LV) countries, as illustrated in Figure 2.2.1. The geographical clustering of the EU-15 countries nicely corresponds to the famous welfare state typology of the political and social science literature (Esping-Andersen 1990, later modified by Ferrera 1996), which we will refer to later on. The subgroups of Central Eastern and Baltic countries add up to the group of Eastern European countries.

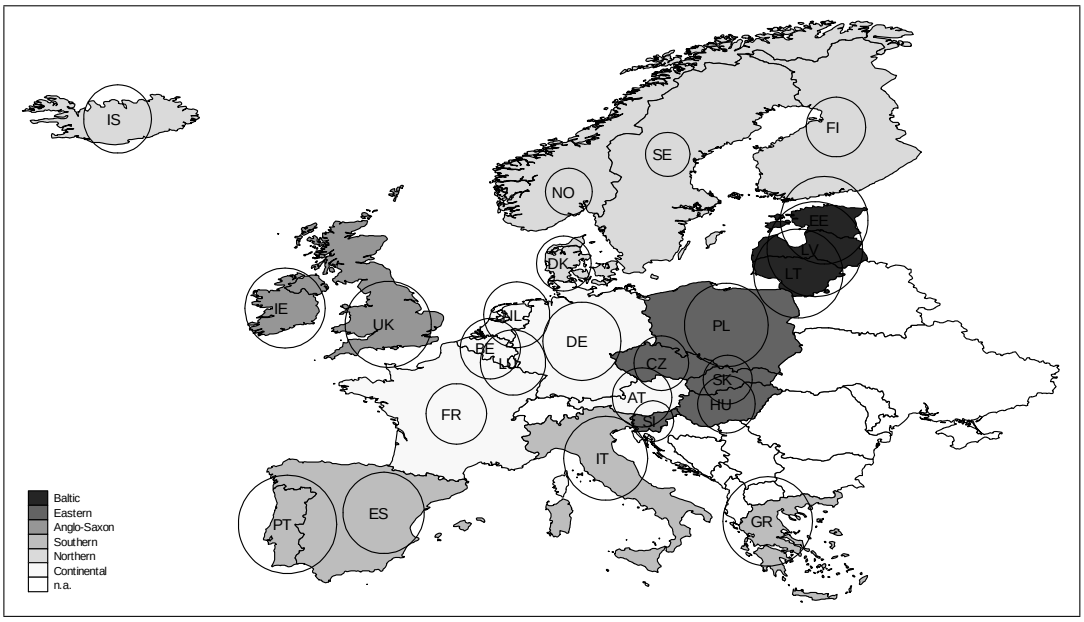

Figure 2.2.1: Income inequality in EU countries and regions

Source: Own calculations based on EU-SILC. The size of the circles represents the level of inequality in DPI in the corresponding country.

In our application, total equivalent disposable household income (DPI) is exhaustively decomposed into its household equivalent components: factor income (wages and salaries, income from self-employment and capital incomes), personal

[16] Austria (AT), Belgium (BE), Denmark (DK), Germany (DE), Greece (GR), Spain (ES), Finland (FI), France (FR), Ireland (IE), Italy (IT), Luxembourg (LU), Netherlands (NL), Portugal (PT), Sweden (SE), United Kingdom (UK).

[17] Cyprus (CY), Czech Republic (CZ), Estonia (EE), Hungary (HU), Lithuania (LT), Lativa (LV), Poland (PL), Slovenia (SI), Slovakia (SK).

income taxes (PIT), social insurance contributions, social benefits and public pensions, based on the following identity:

$$DPI = \underbrace{(factor\ income + SIC\ employer)}_{expanded\ factor\ income} - PIT - SIC + benefits + public\ pensions \tag{2.2.1}$$

We use household equivalent incomes to compensate for different household structures and possible economies of scales within households.[18] In the remainder of the chapter we always refer to the equivalent measures of household income components unless explicitly noted otherwise. To make incomes comparable across countries, we adjust national income amounts by the multilateral current purchasing power parities provided by Eurostat database. Note that our concept of expanded factor income (EFI) includes social insurance contributions paid by the employer as they can be very different across countries.[19] For the sake of simplicity we refer to the total amount of social insurance contributions paid by the employee and the employer simply as "SIC". We consider the role of public pensions separately because one can argue that public pensions are not really part of the redistributive system but should rather be seen as deferred earnings or the result of compulsory savings.[20] This function of public pensions is particularly true for countries which apply insurance-based systems. Furthermore, the analysis only allocates those taxes and benefits that can be reasonably attributed to households. Therefore, corporate taxes as well as some types of government expenditures such as expenditures on defense are not considered. Due to data limitations, indirect taxes and in-kind benefits cannot be taken into account, either. Thus, in the remainder, we merely advert to cash benefits when speaking of social benefits and to personal income taxes in the cases of taxes. We provide further information on the exact definition and computation of all income components in the data appendix.

[18] For each person, the equivalent (per-capita) DPI is its household DPI 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 fourteen or older and 0.3 to each child aged less than fourteen. Summing up the individual weights gives the household specific equivalence factor.

[19] Ankrom (1993) also follows this approach. He argues that ignoring employers' social insurance contributions would implicitly assume that the wage elasticity of labour supply is infinite. However, empirical analyses rather suggest the opposite and therefore this can significantly bias the results of the effectiveness of tax and transfer systems.

[20] Pensions in EU-SILC generally follow the ESSPROS classification of Eurostat which includes all mandatory pension programmes and does not distinguish between pre-funded and pay-as-you-go systems. Further information on this interpretation of the function of pensions may be found in the ESSPROS Manual (Eurostat (1996)).

2.2.2 Sequential accounting approach

Consider a population of n persons (or households), $i = 1, ...n$, with x_i as the income of individual i, $\overline{x}$ is the average income and a population weight w_i ($N = \sum_{i=1}^{n} w_i$).The generalized entropy (GE) class of inequality indices (Shorrocks (1980)) is given by the following expression:

$$I_\alpha = \frac{1}{\alpha(\alpha-1)} \int_0^\infty \frac{x_i}{\overline{x}} \left[\left(\frac{x_i}{\overline{x}} \right)^\alpha - 1 \right] dF \tag{2.2.2}$$

where F is the CDF of income and α is a parameter indicating the sensitivity toward social concern for a particular part of the income distribution.[21]

To determine the effective distributional impact of different tax benefit instruments, we first use what we call the *sequential* approach to analyzing the distributional impact of different policy instruments. For this approach we have to define different income concepts at different stages of redistribution. Following Mitchell (1991) and Whiteford (2008), among others, we apply an accounting framework for household income, where different income components are added sequentially. Accordingly, the sum of wages and salaries, self-employment income, capital income and in our case also employers' social insurance contributions equal "expanded factor income (EFI)" and "market income (MI)" is the EFI and public pensions. MI plus all different types of social benefits is "gross income (GI)", subtracting personal income taxes is "post-tax income" and finally subtracting employees' and employers' social insurance contributions (SIC) is "DPI". With this accounting framework, a number of measures of the redistributive impact of the tax benefit system can be constructed by comparing inequality measures at different stages of household income. For instance, the relative redistribution achieved by social benefits equals the percentage change in the inequality of MI relative to the inequality of GI:

$$\frac{GE(\alpha)_{MI} - GE(\alpha)_{GI}}{GE(\alpha)_{MI}} \tag{2.2.3}$$

The impact of personal income taxes is evaluated by comparing the inequality of the distribution of GI and post-tax income and so on.

However, this framework is static and linear which results in a number of limitations. For example, there are no interactions between the different stages of redistribution. In reality, however, in some countries benefits are also taxable.

[21] See, e.g., Cowell and Kuga (1981). The more positive (negative) is, the more sensitive is to changes at the top (bottom) of the income distribution.

As a result, the order in which different components are accounted influences the measurement of their relative contribution to redistribution. For example, by first adding benefits to factor income, we necessarily overestimate the redistributive effects of benefits in countries in which such benefits are taxable (Ferrarini and Nelson (2003); Mahler and Jesuit (2006)). Due to this sensitivity of the redistributive measures with regard to the definition of pre-instrument income, Immervoll et al. (2005) follow a slightly different approach which we also apply as a robustness check of our results. For each tax or benefit they start from the hypothetical situation without the instrument in question (DPI - instrument) and ask by how much inequality is reduced by introducing it.

2.2.3 Factor source decomposition approach

As total (disposable) income is generally composed of several sources of income, it is useful to express total inequality in DPI as the sum of these factors' contributions (Shorrocks 1982, 1983). The exact decomposition procedure depends on the measure of inequality used, but whichever measure is used must naturally be decomposable and it must be defined for zero incomes. In practice, the easiest measure to implement with these properties is GE(2) which can also be expressed as half the squared coefficient of variation *CV:*

$$\begin{aligned} GE(2) &= \frac{1}{2}\left(\sum_{i=1}^{n}\left[\frac{w_i}{N}\left(\frac{x_i}{\overline{x}}\right)^2\right]-1\right) \\ &= \frac{1}{2}\left(\frac{\sqrt{Var(x)}}{\overline{x}}\right)^2 = \frac{1}{2}\frac{Var(x)}{\overline{x}^2} = \frac{1}{2}(CV)^2 \end{aligned} \tag{2.2.4}$$

Suppose DPI x can be written as the sum of $f = 1, ..., K$ different sources of income x_f: $x = \sum_{f=1}^{K} x_f$; ρ_f is the correlation between x and x_f; and $\mu_f = \frac{\overline{x}_f}{\overline{x}}$ is f's factor share.

$$I_2 = GE(2) = \sum_{f=1}^{K}\rho_f\mu_f\sqrt{GE_2 GE_2^f} = \sum_{f=1}^{K}s_f I_2 = \sum_{f=1}^{K}S_f \tag{2.2.5}$$

where GE_2^f denotes the inequality in factor source f and S_f the (absolute) contribution of factor f to total (DPI) inequality. Note that income source f provides a disequalizing effect if $S_f > 0$, and an equalizing effect if $S_f < 0$. $s_f = S_f/I_2$ is the relative contribution of f to total inequality and indicates the importance of f.

2.3 Descriptive evidence

2.3.1 Income distribution and redistribution

To illustrate the variation in inequality among EU member states we compute a number of distributional measures. Note, that here we use the Gini coefficient as our measure of inequality because of its readily intuitive interpretation and its use in comparable micro studies. When first looking at the former EU-15 countries as one single economic unit, irrespective in which country the individuals live, we find an overall inequality level in EFI of 0.51 and of 0.31 in DPI. Adding the nine additional EU member states yields inequality levels of 0.53 and 0.34, respectively. This highlights a notable increase in overall inequality as a result of the enlargement of the EU. The substantial variation in inequality, particularly since the recent enlargement, is also confirmed when looking at the inequality levels in EFI, MI and DPI within the different member states, which are illustrated in Figure 2.3.1.

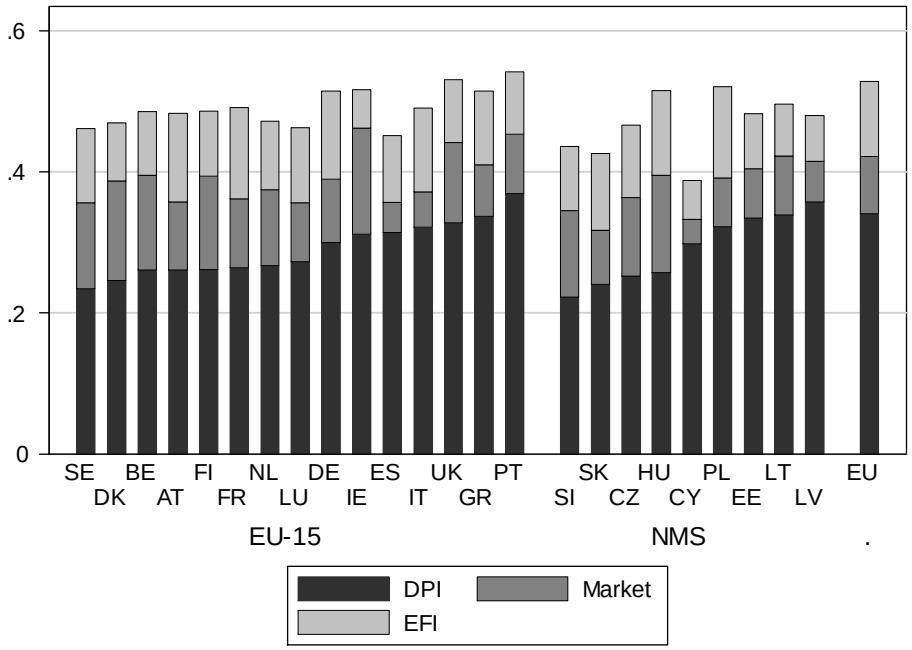

Figure 2.3.1: Gini income inequality and absolute redistribution

Source: Own calculations based on EU-SILC. Countries are sorted in ascending order of the inequality in DPIs.

The distance between the inequality in EFI and the inequality in DPIs shows the very different extent of redistribution schemes across EU member states, here illustrated by the absolute difference in Gini coefficients. Overall redistribution is particularly high in the Nordic countries, some Continental countries as well as

in Hungary and Slovenia. These countries achieve substantially better equality rankings in DPI as opposed to EFI. On the contrary, effective redistribution is rather low in Cyprus and in the Baltic States.

Looking at the inequality of EFI, huge disparities among the European countries emerge, with Gini coefficients ranging from 0.31 in the Slovak Republic to 0.54 in Portugal. EFI inequality is comparatively high in the Anglo-Saxon countries as well as in Lithuania, Germany, Greece, Portugal and Hungary, with Gini coefficients larger than 0.50. Rather low inequality levels can be found in Cyprus, the Slovak Republic and Slovenia. Particularly within the group of Eastern European countries there are substantial differences in EFI inequality levels. The group encompasses countries with very high EFI inequality such as Hungary and Poland but also countries with comparatively low EFI inequality such as the Slovak Republic and Slovenia. The differences among the Gini coefficients of EFI and the Gini coefficients of MI demonstrates the different strength of the redistributive character of public pensions across European countries. It emerges that public pensions have huge redistributive power in the Continental countries such as France, Germany and Austria, who now achieve a substantially higher rank in terms of DPI equality. This is also true for Poland and the Czech Republic. On the other hand, the inclusion of public pensions leads to a significantly lower equality ranking for the Baltic states and Denmark.[22] Looking at the inequality of DPI, it should be noted that DPI inequality is significantly lower than the EFI inequality, indicating a substantial degree of redistribution in all countries. Also, the ranking of countries according to EFI inequaltiy as opposed to DPI inequalitly changes substantially. Here the group of Nordic countries can be identified as having very low DPI inequality (around 0.25), and the Central Eastern European countries Slovenia, the Slovak and the Czech Republic also display low DPI inequality. On the other hand, the distribution of post-government income is comparatively unequal in the Baltic, Southern and Anglo-Saxon countries (>0.30).

These findings reveal that with regard to DPI inequality, the importance of public pension schemes and overall redistribution, the EU-15 countries can almost perfectly grouped according to their geographical region and the welfare state typology of the political and social science literature. This is also reflected in the similar size of circles in Figure 2.2.1 across regions, which represent the level of DPI inequality in the respective country. In contrast, EFI inequality levels yield a

[22] As in most of the countries the largest part of SIC serves as financing source of public pensions, it could be argued that taking into account the financing side of public pensions, however, qualifies the importance of public pensions in reducing income inequality.

very heterogeneous country clustering of EU-15 countries. Interestingly, the Eastern European member states do not really form a homogeneous group of countries. There appear to be three distinct groups. First, there are the Baltic States which are characterized by high EFI inequality, low redistribution and high inequality in DPIs. In this regard, they are similiar to the Southern European countries, still, their level of redistribution is substantially lower than in the Southern European countries. Second, Hungary and Poland show high EFI inequalities, more extensive redistribution schemes and therefore comparatively lower inequality in DPIs. Third, Slovenia, the Slovak and Czech Republics represent low inequality in EFI, above-average redistribution and very low inequality in DPIs. Therefore, with regard to inequality and overall redistribution levels, they are similar to the Nordic and Continental countries.

2.3.2 Composition of household income

As a next step we investigate in how far the importance of different components of the redistributive system varies across European countries. Figure 2.3.2 illustrates the composition of total DPI in terms of factor income, personal income taxes, SIC, social benefits and public pensions. Here, we also show the importance of employers' social insurance contributions in DPI separately in order to visualize our concept of EFI. It should be noted that this perspective does not allow us to identify government budget deficits or surpluses because major parts of government spending and financing are not considered. According to Immervoll et al. (2005), results as in Figure 2.3.2 can be interpreted as showing how much factor income is necessary to achieve a certain level of DPI and how much is deducted by taxes and contributions and added by benefits. If the share of factor income is around 100%, then the state approximately 'gives' the same amount of benefits as he 'takes' in form of contributions and personal income taxes.[23]

If we look at unadjusted factor income without the social insurance contributions of the employer, the majority of countries reveals shares in factor income close to 100%. The share of unadjusted factor income is significantly larger than 105% only in Denmark and the Netherlands, which means that in these countries the sum of deductions outweighs the sum of benefits. In Cyprus, France, Hungary and the Slovak Republic the share is less than 95%, therefore on average people receive more benefits than they pay as contributions and taxes. If we consider

[23] Note that indirect taxes are not taken into account here. This explains why it is possible for the share of factor income in total income to be less than 100%.

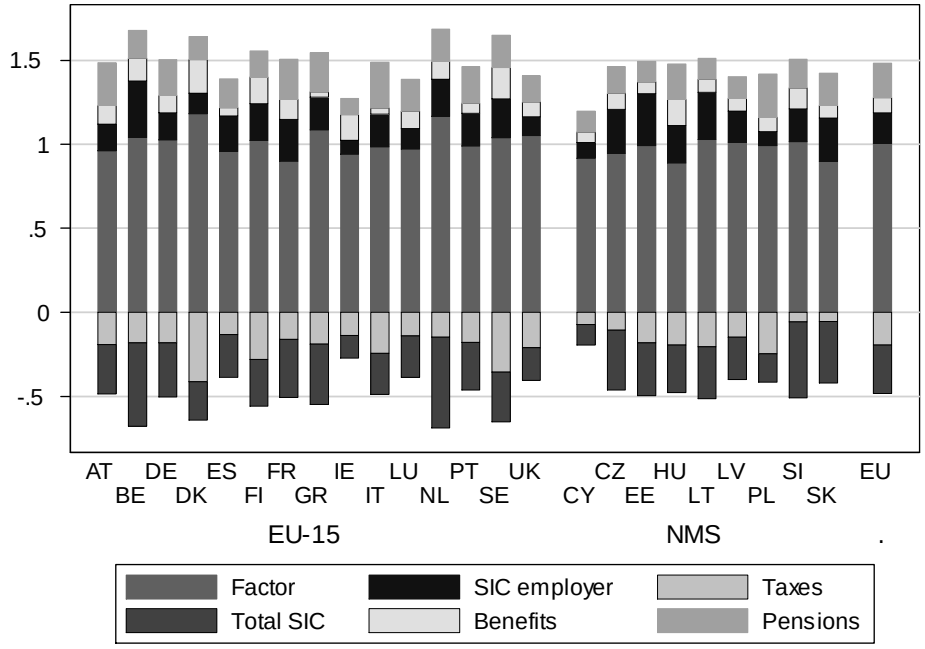

Figure 2.3.2: Factor shares of tax benefit instruments

Source: Own calculations based on EU-SILC. Note: here we consider the social insurance contributions by employers and original income separately whereas in the factor shares μ_f in Table 2.4.2 these two are included in "factor income".

the social insurance contributions by the employer as part of factor income (EFI), in all countries except Cyprus the share of EFI is significantly higher than 100%. Also, the economic weight of employers' social insurance contributions varies substantially across countries: from a share of 8.3% in Ireland to 33.2% in Belgium. With respect to the overall importance of the other sources of income, total social insurance contributions (SIC) make up a greater proportion of DPI than personal income taxes in almost all the countries in our sample. On average their share in DPI is about ten percentage points higher. Exceptions are the Nordic countries and Poland where personal income taxes play a more important role. The high share of SIC may seem surprising but is explained by the fact that contributions include both, employer and employee contributions. On the benefit side, with an average share of 18% the economic weight of public pensions exceeds the importance of the rest of social benefits (on average 10%). The opposite is true only in Denmark and Ireland. Also, Figure 2.3.2 suggests that personal income taxes generally have a higher economic weight than social benefits. Here the only exceptions are Ireland, Slovenia and the Slovak Republic. Looking at the importance of particular income components across countries, the share of public pensions in DPI is particularly high (greater than 20%) in some Continental countries (AT,

FR, DE) as well as in the Southern European countries Italy, Greece and Portugal, whereas it is rather low in Ireland, Cyprus and the Baltic States. Social benefits are most important in the Nordic countries, in Hungary and Ireland. They only make up a small part of DPI in Southern European countries. With regard to the burden side, the share of personal income taxes is particularly high in the Nordic countries, and it is low in the Central Eastern European countries (SI, SK, CZ) as well as in Cyprus. SIC, on the contrary, are most important in the Continental countries (NL, BE, FR, DE), which is again in line with the welfare state typology referred to earlier. The share of SIC is also relatively high in Slovenia, the Slovak and Czech Republic, whose share of personal income taxes is rather low.

Overall, the importance of different tax benefit components, as measured by the various components of DPI, is consistent with the clustering of the EU-15 countries, as described in the political and social science welfare state typologies. However, as before, the Eastern European countries do not seem to form a homogeneous or distinct group. With regard to the importance of tax benefit components in DPI, Slovenia, the Slovak and Czech Republic reveal similarities, as does the group of the Baltic states. Poland and Hungary do not really fit into either of these two groups but seem to fit rather well in to the group of EU-15 welfare states. However, this analysis only considers the economic importance of tax benefit instruments in DPI and does not take into account their particular distribution across households and therefore their redistributive impact on the distribution of incomes. We take up this analysis in the following section.

2.4 Inequality contribution of tax benefit instruments

In this section, we look at the redistributive importance of the different tax benefit instruments across countries. We use the GE(2) measure to analyze the redistributive impact of tax benefit instruments because it is naturally decomposable and also defined for zero incomes. Furthermore, we apply two different approaches to measuring the redistributive impact of taxes and benefits. First, we use the sequential accounting approach which is based on the income accounting framework outlined above. Second, we apply the factor source decomposition approach suggested by Shorrocks (1982, 1983) which determines the contribution of each tax benefit instrument to inequality in DPIs simultaneously. Finally, we compare the results and discuss the differences between these two methodologies.

2.4.1 Sequential accounting approach

To analyze the redistributive impact of tax benefit instruments based on the sequential accounting approach, we first compute the GE(2) inequality measures for the different income concepts defined above. The results are presented on the left hand side of Table 2.4.1. By taking the percentage change between each of the consecutive inequality measures, we then compute the relative redistributive effect of the different tax benefit instruments. When comparing the GE(2) inequality measures with the Gini coefficients in Section 2.3, there are some important differences in the rankings of the countries. Particularly for the GE(2) measure of DPI inequality, it stands out that Denmark and Finland - which could be considered as rather equal with regard to the Gini Coefficients - now belong to the group of unequal countries. In addition, the Anglo-Saxon countries, Cyprus and Estonia also have worse equality rankings. On the other hand, the Southern countries Spain, Greece and Italy display relatively more equal distributions of income, when using the GE(2) inequality measure. It might seem surprising that the inequality in DPI in the Nordic countries such as Denmark and Finland is higher than in Italy and Spain. The reason for the difference is the fact that the GE(2) measure is particularly sensitive to changes at the top of the income distribution.[24]

However, we are not interested here in the redistributive effect of the tax benefit system as a whole, but in the relative contribution of each of the main tax benefit instruments to redsitribution, such as public pensions, social benefits, personal incomes taxes and SIC. The amount of redistribution achieved by a certain tax benefit instrument is measured as the percentage change between two adjacent income concepts. The results are presented in the right hand side of Table 2.4.1, which shows the relative redistributive effect of different tax benefit instruments for the twenty-four EU member states in our sample.

Regarding the total redistributive importance of the different instruments, public pensions are responsible for most of the reduction in income inequality of EFIs.[25]

[24] There are more observations at the very top of the distribution for the Nordic countries, and the spread of these observations is also larger than in the case of the other member states. In order to address this problem we applied top-coding and trimming to the data and recomputed all measures. The ranking of the countries with respect to the level of DPI inequality moves in the direction of the results reported for the Gini coefficient in Section 2.3.1. The results for the redistributive effect as well as the inequality contributions in the next section, however, remain qualitatively the same. Therefore, we decided to report the results for the uncoded data as any coding is always somewhat arbitrary. Furthermore, we have also conducted the analysis for both approaches using the Gini coefficient as a sensitivity check. The results are qualitatively the same and can be obtained from the authors upon request.

[25] Note that a large part of the redistributive effect of public pensions is due to a pure re-ranking of individuals. A majority of pensioners in our data are assigned zero factor incomes. Public

Exceptions are the Anglo-Saxon countries as well as Denmark and Slovenia. With respect to the other redistributive instruments, in half of the countries social benefits play a more important role than personal income taxes, in the other half it is the other way round. Also, the results suggest that SIC are least important in redistributing income in almost all EU member states. In some countries SIC are counter-equalizing implying a regressive incidence. The regressive impact is particularly strong in those countries where there is an earnings threshold for contribution purposes, such as Germany, Cyprus and the UK. Only in Slovenia do contributions play the most important role in redistributing income. In Belgium, France, Lithuania and Poland they are more important than personal income taxes. With respect to the redistributive importance of single tax benefit instruments across countries, public pensions are particularly important (around 40%) in Continental countries (FR, AT, DE) as well as in the Slovak Republic, Poland and Italy. On the other hand, public pensions lead to comparatively low inequality reductions in Cyprus, the Anglo-Saxon countries and in the Baltic States. Benefits have high redistributive effects in the Nordic countries, Ireland and Hungary; the opposite is true for the Southern European countries and the Baltic States. Inequality reduction induced by personal income taxes is relatively high (greater than 25%) in the UK, Hungary and Italy, and relatively low (smaller than 10%) in Poland, Cyprus and Denmark. Finally, SIC have high redistributive effects in Slovenia, France, Belgium and Hungary. In constrast, they lead to substantial increases in inequality (smaller than negative 10%) in Germany, Cyprus and Estonia.

Although we find some hints of country clustering in the case of public pensions and social benefits, we cannot really identify distinct welfare state groups on the burden side of the redistributive system. In fact, we find a rather arbitrary ranking of countries. Note, that the redistributive importance of instruments across countries does not fully correspond to the economic weight of these instruments as discussed in the previous section. On the contrary, this sequential approach to redistributional analysis suggests that public pensions are the most important source of inequality reduction. Furthermore, about half of the countries achieve more redistribution with benefits than with taxes and vice versa, and contributions even increase inequality in almost half of the countries in our sample.

As argued above, the results for the redistributive impact of individual tax

pensions merely restore their position in the pre-retirement income ranking and this re-ranking effect makes up a large part of the pension effect on income inequality (see Whiteford (2008) for a discussion).

benefit instruments may be sensitive to the sequence in which instruments are accounted for in the income accounting framework.[26] Therefore we also follow the approach suggested by Immervoll et al. (2005), and for each instrument start from the hypothetical situation without a given instrument (DPI - instrument) and ask how much inequality is reduced by adding this instrument. Using this approach instead of the sequential approach, however, does not qualitatively change the results reported above. As expected, it lowers the size of the redistributive effect of benefits, but the relative importance of instruments in reducing inequality remains unchanged.

2.4.2 Decomposition approach

This section reports the results of the inequality decomposition analysis by factor components, i.e. determining the relative inequality contribution s_f of the different tax benefit instruments to total inequality. The results of this methodology are illustrated in Figure 2.4.1. Comparing Figure 2.4.1 with the results in Table 2.4.1, it is evident that the decomposition results substantially differ from those based on the sequential accounting approach. In almost every country in our sample, personal income taxes and SIC lead to the highest reduction in income inequality. The contribution of benefits to reducing income inequality is negligible.

Interestingly, while personal income taxes and SIC have a significant equalizing effect in all countries, the effect of social benefits and public pensions is not so clear across countries. Whereas taxes and contributions reduce income inequality by on average about 30%, social benefits do not seem to have any significant impact on inequality (smaller than 5% in all countries except in Cyprus and Sweden), also the influence of public pensions is comparatively small. In fact, in the majority of countries public pensions have a disequalizing effect on DPI inequality; on average they increase inequality by 6%. The positive effect of public pensions on inequality is particularly large (greater than 20%) in Austria, Portugal and Cyprus. According to this factor source decomposition approach, public pensions only have a significant equalizing impact in the Czech Republic, Estonia, Denmark and Lithuania.

Benefits positively contribute to the DPI inequality in at least seven countries. The disequalizing effect of benefits is particularly evident in the Baltic States and

[26] As outlined by Burniaux et al. (1998: 15), the "adding in" of different income components also implies that the inequality due to the correlation of income sources is arbitrarily attributed to the income share which is added last.

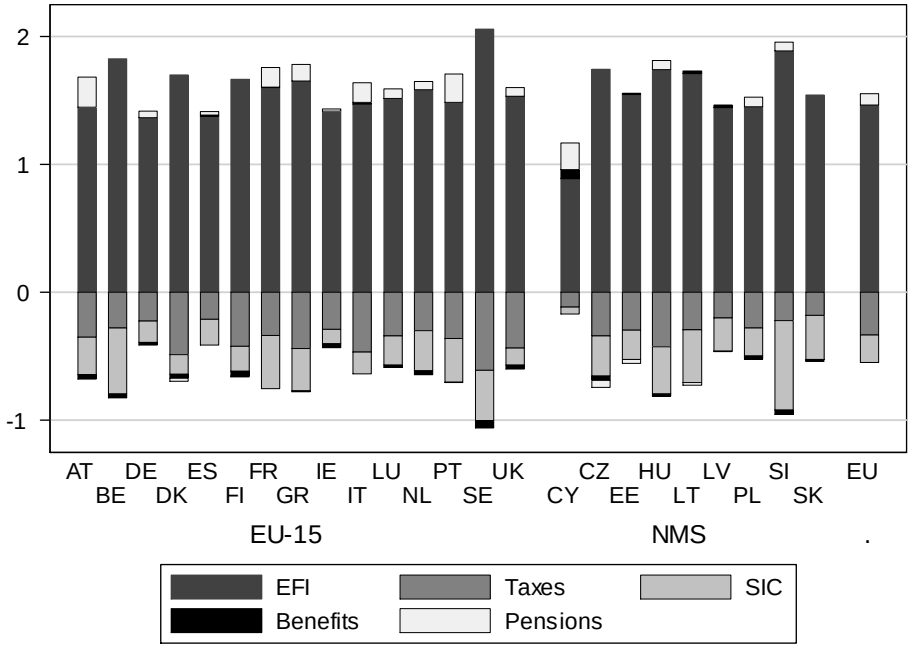

Figure 2.4.1: Relative inequality contribution of tax benefit instruments

Source: Own calculations based on EU-SILC. Note that values above (below) 0 represent a disequalizing (equalizing) impact on income inequality in DPIs. The size of the different bars correspond to the relative inequality contributions s_f in Table 2.4.2.

Cyprus. Benefits only have notable equalizing effect (greater 3%) in the Nordic countries, Slovenia, the Czech Republic, Austria and the Netherlands. On the burden side, the equalizing effect of personal income taxes is highest in the Nordic Countries. However, in Greece, Italy, Hungary, Poland and the UK taxes account for an inequality reduction of more then 40%, according to the Shorrocks decomposition method. The equalizing effect of personal income taxes is comparatively small in Cyprus, Latvia and the Slovak Republic. Regarding the inequality contribution of SIC, the equalizing effect is particularly high (greater than 40%) in Slovenia, Belgium, France and Latvia. The effect is small in Portugal, Cyprus, Denmark and the Anglo Saxon countries.

Again, we find some evidence of a welfare state clustering of countries. Specifically the Nordic countries reveal similarities in the size of the redistributive contribution of the different tax benefit instruments. Also the Anglo-Saxon countries and the Baltic states seem to form a rather homogeneous group with regard to the total inequality contribution of the different tax benefit instruments.

	GE(2) Inequality					Redistributive Effects of Instruments % change in GE(2)			
	EFI	Market	Gross	Post-tax	DPI	Pensions	Benefits	Taxes	SIC
EU-24	0.65	0.44	0.37	0.31	0.31	31.86	14.77	18.30	-1.34
EU-15									
AT	0.47	0.29	0.23	0.19	0.16	39.20	20.57	18.11	11.95
BE	0.42	0.29	0.22	0.19	0.15	31.75	23.44	11.37	20.87
DE	0.53	0.33	0.27	0.23	0.26	38.05	19.00	14.69	-13.65
DK	0.62	0.47	0.33	0.30	0.28	24.87	30.17	9.52	4.22
ES	0.36	0.24	0.22	0.19	0.20	34.48	8.69	11.05	-0.78
FI	0.57	0.41	0.30	0.24	0.25	28.48	25.92	20.31	-6.05
FR	0.58	0.35	0.28	0.24	0.18	39.93	18.93	13.87	24.86
GR	0.63	0.42	0.40	0.31	0.27	32.40	5.54	22.39	14.11
IE	0.67	0.54	0.39	0.30	0.30	18.52	28.50	22.17	0.04
IT	0.52	0.32	0.31	0.23	0.24	38.25	4.28	25.02	-3.01
LU	0.48	0.31	0.25	0.19	0.18	34.95	18.83	24.96	3.53
NL	0.48	0.33	0.27	0.22	0.24	30.87	18.69	16.36	-5.88
PT	0.75	0.55	0.49	0.40	0.34	27.35	9.79	19.79	13.04
SE	0.45	0.29	0.21	0.16	0.13	34.65	29.37	20.72	18.87
UK	0.73	0.56	0.46	0.33	0.36	23.19	16.92	28.31	-7.73
NMS									
CY	0.38	0.34	0.32	0.29	0.32	10.09	6.35	9.33	-12.38
CZ	0.45	0.30	0.24	0.19	0.17	33.40	18.41	22.88	7.48
EE	0.70	0.54	0.50	0.42	0.46	22.74	8.44	15.81	-11.44
HU	0.57	0.36	0.27	0.20	0.16	37.03	23.76	26.46	19.43
LT	0.50	0.38	0.34	0.30	0.25	23.26	9.68	13.94	16.91
LV	0.47	0.37	0.33	0.30	0.28	21.73	9.79	10.44	6.64
PL	0.63	0.37	0.31	0.31	0.26	40.65	16.54	1.98	13.35
SI	0.37	0.24	0.19	0.15	0.09	33.70	21.44	19.24	40.05
SK	0.31	0.18	0.15	0.13	0.12	41.01	15.52	12.81	10.06

Table 2.4.1: GE(2) inequality measures and redistributive instruments

Source: Own calculations based on EU-SILC.

2.4.3 Discussion of the results

When comparing both approaches, they lead to the same estimates of DPI inequality. However, the two approaches lead to somewhat contradictory results with respect to the importance of benefits for redistributing income, which would imply very different policy implications. Why do we find substantial differences in the redistributive importance of tax benefit instruments across the two approaches, although both approaches are based on the same inequality measure? Both approaches are used in the literature, and our results are in line with the respective studies. In fact, studies analyzing the impact of tax benefit instruments based on the standard approach generally find that benefits are the most important source of inequality reduction in European countries (e.g., Immervoll et al. (2005), Mahler and Jesuit (2006), Whiteford (2008)). On the other hand, the results of the factor source decomposition (e.g. Jenkins (1995), Jäntti (1997) and Burniaux et al. (1998)) suggest that taxes have a larger contribution to DPI inequality.

First, an important difference between the two approaches is that the accounting approach applies tax benefit instruments sequentially; whereas, the decomposition approach accounts for them simultaneously. Second, in order to further investigate the sources of the differences, we present the different components which determine the relative inequality contribution of Shorrocks decomposition analysis. As equation 2.2.5 suggests, the size of a factors relative inequality contribution (s_f) depends on its within factor inequality (I_2^f), the income share (μ_f) of the corresponding factor source f and its correlation with DPI (ρ_f). From Table 2.4.2 it becomes evident that, in those countries where benefits positively contribute to inequality, the correlation coefficient ρ_f has a positive sign. The opposite is true for the other countries, where they have an equalizing effect. However, the correlation between DPI and benefits is weak. For example, if the EU is seen as a single economic unit, the correlation is almost equal to zero, i.e. the benefits are fairly evenly distributed across households. The correlation between DPI and public pensions is rather small as well. Personal income taxes, on the other hand show a substantial negative correlation with DPIs in all countries. Furthermore, the income share of benefits is smaller than that of taxes or contributions, in absolute terms. However, the within inequality for benefits (and public pensions) is as high as that for tax payments which can be explained by the large share of people not paying taxes (receiving benefits). The within inequality of SIC is much lower for most countries and closer to that of EFI. This further break-down of the decomposition results reveals that the negligible effect of social benefits on income

inequality is due to the fact that they are hardly correlated with income in most countries. Only the liberal welfare states of Ireland and the UK that mainly rely on means-tested benefits show a significant negative correlation between benefits and DPI (combined with a low factor share).

Our finding that social benefits account for a positive or negligible share of total inequality in most countries - as revealed by the inequality decomposition above - is perfectly consistent with our previous finding that benefits on the whole reduce income inequality - as revealed by the sequential accounting approach to distributional analysis in Section 2.4.1. In a related context, Stark et al. (1986) illustrate similar results with a simple chemical experiment in which a highly concentrated solution is mixed with a less (but still positively) concentrated one. Although the resulting mixture will be less concentrated than the original, the added solution is still responsible for a part of the concentration of the final mixture. Therefore, unless the correlation between benefits and DPIs is negative, benefits will always account for a non-negative share of total income inequality. To put it more technically, in order to find a unique decomposition rule for any inequality measure, Shorrocks (1982) imposes the assumption of the normalization of equal factor distributions. This restriction implies that according to Shorrocks decomposition method, equally distributed lump sum transfers do not contribute to overall inequality. However, most aggregate inequality measures satisfy the axiom that such equally distributed transfers (i.e. which are relatively higher for lower incomes) reduce aggregate inequality; whereas, proportional transfers do not change it. This axiom also holds for the GE(2) measure. According to the sequential approach, therefore, equally distributed transfers imply a reduction in inequality. In the decomposition approach, such transfers make no contribution to reducing inequality because their correlation with DPI is equal to zero.[27] In this framework, an income component has to be higher in absolute terms for lower incomes in order to achieve a negative contribution to total inequality. Therefore, the different normative foundations of the two approaches are to some extent responsible for the differing results.

[27] See also Burniaux et al. (1998) for a discussion of the effect of equally distributed income components in the Shorrocks decomposition.

	DPI	EFI				Personal income taxes				SIC (employee and employer)				Social benefits				Public pensions			
	I_2	I_2^f	μ_f	ρ_f	s_f	I_2^f	μ_f	ρ_f	s_f	I_2^f	μ_f	ρ_f	s_f	I_2^f	μ_f	ρ_f	s_f	I_2^f	μ_f	ρ_f	s_f
EU-24	0.312	0.645	1.186	0.857	1.462	1.755	-0.195	-0.722	-0.335	0.761	-0.289	-0.476	-0.214	1.833	0.092	-0.007	-0.002	2.105	0.206	0.159	0.089
EU-15																					
AT	0.164	0.470	1.118	0.764	1.446	1.315	-0.193	-0.639	-0.351	0.588	-0.293	-0.531	-0.294	1.038	0.112	-0.122	-0.034	2.094	0.256	0.248	0.234
BE	0.156	0.421	1.374	0.808	1.825	0.958	-0.183	-0.605	-0.276	0.487	-0.495	-0.593	-0.517	1.083	0.140	-0.075	-0.027	2.176	0.164	-0.010	-0.005
DE	0.262	0.534	1.186	0.805	1.364	1.817	-0.182	-0.461	-0.224	0.466	-0.322	-0.396	-0.169	1.334	0.103	-0.088	-0.021	2.014	0.214	0.080	0.050
DK	0.281	0.624	1.304	0.881	1.697	0.722	-0.413	-0.731	-0.489	1.546	-0.228	-0.325	-0.152	0.981	0.201	-0.082	-0.030	2.535	0.136	-0.058	-0.026
ES	0.196	0.364	1.167	0.865	1.374	1.045	-0.134	-0.677	-0.210	0.442	-0.254	-0.533	-0.202	3.409	0.050	0.047	0.010	1.948	0.171	0.053	0.029
FI	0.254	0.567	1.241	0.896	1.663	0.828	-0.281	-0.834	-0.423	0.474	-0.276	-0.521	-0.196	0.836	0.157	-0.130	-0.037	2.224	0.158	-0.012	-0.006
FR	0.181	0.576	1.148	0.781	1.599	1.422	-0.162	-0.745	-0.337	0.871	-0.345	-0.552	-0.418	1.381	0.119	0.013	0.004	1.977	0.239	0.194	0.152
GR	0.272	0.627	1.279	0.851	1.650	2.662	-0.191	-0.734	-0.440	0.940	-0.356	-0.505	-0.332	3.358	0.032	-0.061	-0.007	1.849	0.237	0.214	0.129
IE	0.303	0.667	1.024	0.932	1.416	2.024	-0.138	-0.813	-0.290	0.952	-0.134	-0.474	-0.113	0.783	0.152	-0.123	-0.030	2.572	0.095	0.055	0.017
IT	0.240	0.525	1.178	0.843	1.470	1.148	-0.246	-0.871	-0.468	0.649	-0.243	-0.422	-0.169	3.821	0.038	0.099	0.015	1.730	0.273	0.224	0.153
LU	0.183	0.477	1.094	0.858	1.514	2.048	-0.140	-0.726	-0.341	0.426	-0.246	-0.613	-0.230	1.222	0.102	-0.065	-0.017	2.109	0.190	0.110	0.074
NL	0.247	0.476	1.386	0.826	1.583	2.807	-0.149	-0.592	-0.303	0.444	-0.538	-0.436	-0.311	1.705	0.108	-0.120	-0.032	2.344	0.193	0.087	0.063
PT	0.344	0.753	1.183	0.847	1.482	1.662	-0.181	-0.911	-0.362	0.908	-0.281	-0.744	-0.339	2.173	0.061	-0.023	-0.003	2.452	0.218	0.346	0.223
SE	0.133	0.449	1.268	0.885	2.060	0.497	-0.355	-0.889	-0.609	0.436	-0.295	-0.733	-0.392	0.740	0.187	-0.115	-0.051	2.138	0.195	-0.010	-0.008
UK	0.360	0.727	1.164	0.924	1.530	1.866	-0.211	-0.910	-0.437	0.518	-0.195	-0.566	-0.133	1.448	0.087	-0.172	-0.030	2.247	0.154	0.171	0.070
NMS																					
CY	0.323	0.376	1.010	0.816	0.890	1.896	-0.071	-0.659	-0.114	0.367	-0.125	-0.405	-0.054	6.265	0.064	0.248	0.070	3.353	0.122	0.408	0.208
CZ	0.174	0.449	1.208	0.899	1.743	2.110	-0.108	-0.911	-0.344	0.495	-0.353	-0.524	-0.312	1.082	0.096	-0.142	-0.034	1.716	0.158	-0.117	-0.054
EE	0.465	0.701	1.299	0.968	1.543	1.342	-0.183	-0.965	-0.299	0.448	-0.313	-0.737	-0.226	1.316	0.070	0.103	0.012	1.656	0.126	-0.135	-0.029
HU	0.163	0.573	1.111	0.834	1.738	1.332	-0.196	-0.760	-0.427	0.619	-0.281	-0.672	-0.368	0.726	0.155	-0.055	-0.018	1.665	0.211	0.122	0.075
LT	0.247	0.497	1.309	0.919	1.708	1.115	-0.205	-0.675	-0.295	0.607	-0.308	-0.853	-0.412	1.677	0.077	0.100	0.020	1.748	0.127	-0.067	-0.021
LV	0.279	0.473	1.198	0.925	1.442	0.950	-0.149	-0.723	-0.199	0.674	-0.252	-0.670	-0.263	1.584	0.075	0.118	0.021	1.551	0.128	-0.009	-0.002
PL	0.265	0.629	1.076	0.873	1.448	0.597	-0.247	-0.757	-0.280	1.288	-0.169	-0.586	-0.219	1.602	0.085	-0.112	-0.024	1.666	0.255	0.129	0.075
SI	0.097	0.366	1.209	0.810	1.887	5.635	-0.057	-0.501	-0.219	0.449	-0.451	-0.736	-0.701	0.875	0.125	-0.095	-0.034	1.770	0.173	0.085	0.068
SK	0.123	0.311	1.156	0.839	1.540	2.418	-0.053	-0.775	-0.181	0.332	-0.369	-0.571	-0.346	1.468	0.075	-0.043	-0.011	1.554	0.191	-0.006	-0.002

Table 2.4.2: Factor shares and factor correlations

Source: Own calculations based on EU-SILC. I_2 stands for inequality in total income (=DPI), I_2^f represents the within factor income inequality of income component f, μ_f the income share, ρ_f its correlation with DPI and s_f the size of a factor´s relative inequality contribution.

These differing results have important policy implications. It would be wrong to conclude from their positive contribution to overall inequality in the Shorrocks approach that social benefits increase inequality and should therefore, perhaps, be abolished. This positive contribution has to be interpreted as the contribution of the components of the tax benefit system to overall inequality (like the different solutions to the mixture in the chemical example) but not as the effect of a change in this instrument. Abolishing the benefits would increase inequality, as shown by the sequential approach. Nonetheless, from the decomposition approach and due to the rather weak correlation between benefits and DPI it appears that benefits may have other objectives than simply income redistribution (e.g. support of families with children or elderly people).

From a policy perspective, it is important to take into account the results of both approaches. The sequential accounting approach (and the literature applying it) suggests that benefits are the most important source of income redistribution. However, the decomposition approach qualifies this view by accounting for the (weak) correlation between benefits and income and therefore highlights the different functions of taxes and benefits to redistribution.

2.5 Conclusion

The enhancement of economic and social cohesion is an important goal of EU policies. Nonetheless, the evidence suggests that there are sizeable differences across EU member states in the levels of within country income inequality - especially since the recent enlargement toward Eastern Europe. This holds true for the inequality in DPIs as well as the inequality in pre-tax incomes, hinting at substantial variation in the generosity of national income tax benefit systems. From a policy perspective, differences in the inequality of DPIs and, in particular, how these differences are driven by a different design of tax benefit instruments, are of particular interest in order to evaluate the different welfare state designs of European countries. In this study, we evaluate the impact of different tax benefit instruments (personal income taxes, SIC, public pensions, social benefits) on income inequality and specifically ask the question if the role of instruments differs across the EU member states in our sample.

Our results reveal that according to the sequential accounting approach, social benefits are the most important source of inequality reduction in most European tax and transfer systems; personal income taxes are less important. Also, public

pensions play an important role in lowering the inequality of DPI, when comparing the hypothetical situation without public pensions. The factor source decomposition approach suggested by Shorrocks, however, leads to very different conclusions: income taxes and SIC are by far the most important contributors to income inequality and the contribution of benefits is negligible. Public pensions even positively contribute to inequality of DPI in most countries.

An explanation for these somewhat contradictory results lies in the different normative focus of the two approaches as discussed in Section 2.4.3. Based on this evidence, it would seem that many social benefits may have purposes other than income redistribution. Whereas personal income taxes and SIC are clearly correlated with income, transfers have a much less clear effect on the income distribution, i.e. they are often relatively evenly distributed as they address other issues. This is clearly illustrated by the almost negligible correlation between social benefits and DPI. A clear negative correlation to DPI is evident only for some specific transfers, like means-tested benefits for the long term unemployed and benefits for social exclusion: however, these are only a small part of total transfers in most countries.

With regard to the question of how the redistributive importance of tax benefit instruments differs across countries, for Western Europe we basically observe the 'typical' welfare state clustering suggested by Esping-Andersen (1990) and later modified by Ferrera (1996). The Nordic countries in particular reveal very similar characteristics with regard to the redistributive effects of their tax benefit instruments according to both approaches. Also the Continental and Southern European countries form rather distinct groups. However, as opposed to the findings of the welfare state literature, we do not find evidence to support the conclusion that the Eastern European countries form a distinct group, at least according to the relative redistributive importance of tax benefit instruments. Instead, the majority of the Central Eastern European countries seem to naturally group together with the traditional Continental Western European welfare states. The Baltic flat tax countries, on the other hand, are rather distinct from the other countries in our sample. The Baltic countries are characterized by particularly small welfare states compared to the other European countries.

Note, however, that there are limitations to our analysis. First and most importantly, the analysis only assesses the direct effects of taxes and transfers on household incomes. But, the tax system has both a direct effect on the post-government income distribution and an indirect effect as it may also influence factor supplies and thus the pre-government income distribution. However, this analysis does not

account for any behavioral effects caused by redistributive policies. Second, the study is based on cross-sectional data which means that the distribution of lifetime incomes is not taken into account. Third, due to data limitations, we cannot account for in-kind transfers, indirect taxes, or corporate income taxes which may have different distributional impacts in different countries. These should be subjects of future research as comparative data on these elements become available.

2.6 Appendix

Data and definitions

	Concept	Definition / Imputation
Expanded Factor Income	**Wages and Salaries**	Gross employee cash or near cash income (including e.g. holiday payments, pay for overtime, bonuses etc.) plus non-cash employee income (e.g. company car, free or subsidized meals etc.).
	Self-employment Income	Net operating profit or loss accruing to working owners of, or partners in, an unincorporated enterprise less interest on business loans; royalities earned on writing and inventions as well as rentals from business buildings, vehicles, equipment etc.
	Capital Income	Imputed rent; income from rental of a property or land; interest, dividends, profits from capital investment in an unicorporated business; regular inter-household cash transfers received.
	Social Insurance Contributions Employer	Payments made by the employers for the benefits of their employees to insurers (social security funds and private funded schemes) covering statutory, convential or contractual contributions in respect of insurance against social risks Information on the amount of social insurance contributions paid by the employer is not reported for DE, LT and the UK. In these cases, we use country-specific legal rules to impute the SIC paid by the employer based on the corresponding employee income.
Public Pensions		Old-age benefits (any replacement income when the aged person retires from the labor market, care allowances etc.) and survivor's benefits (such as survivor's pension and death grants).
Cash Benefits		Unemployment benefits, sickness benefits, disability benefits, education-related allowances; family/children related allowances, housing allowances, benefits for social exclusion not elsewhere classified (periodic income support for people with insufficient resources and other related cash benefits).
Income taxes		Taxes on income, profits and capital gains, assessed on the actual or presumed income of individuals, households or tax-units EU-SILC only reports income taxes and employee SIC as an aggregated value. We subtract imputed SIC to isolate income tax payments as a single variable.
Total Social Insurance Contributions		Employer's SIC (see above) and employees' SIC (any contributions to either mandatory government or employer-based social insurance schemes) EU-SILC does not report SIC paid by the employee as a separate variable, therefore values are imputed (see above) applying the appropriate legal rules of each country.

Chapter 3

The development of fiscal redistribution

In this chapter, we take a dynamic perspective and analyze the development of the redistributive capacities of different tax benefit instruments over time. In particular, the analysis emphasizes the importance of considering indirect taxes in welfare state analyses.[28]

3.1 Introduction

The reduction of income inequalities has been one of the major socio-political achievements associated with the emergence of the modern welfare state. The political will for redistributing income is mainly implemented through the definition of fiscal policies. Progressive taxation and social benefits are regarded as appropriate political instruments for balancing income inequalities. The current chapter investigates the redistributive effects of the entire fiscal system with its revenue-raising and spending instruments in a dynamic perspective. The leading research questions are: Have the tax systems in Germany and the UK become less progressive? Is there a trend toward more redistribution of income through cash benefits? Is the structure of fiscal systems changing and is there a relation between changes in taxes and the transfer systems? It has been argued that the relation between the fiscal instruments of taxation and transfer payments are changing under the tightening influence of globalization. Increasing empirical evidence from the literature of political economy, known as the "paradox of redistribution",[29]

[28] This chapter is based on Kammer and Niehues (2011).

[29] This dynamic "paradox of redistribution" has to be distinguished from the "paradox of redistribution" that refers to smaller redistributive budgets in the case of more targeted benefits

suggests that the progressivity of taxation and transfer payments are developing a negative relation. However, we suggest a re-examination of this issue, due to various methodological and empirical shortcomings in the existing contributions. In particular, the mostly fuzzy definition of redistribution and the lack of micro-founded evidence form the starting point of the current research project.

The theoretical explanations for changes in the fiscal systems that we are going to draw on are political economic theories on the effects of globalization on taxation and the architecture of fiscal systems. These approaches suggest that increasing economic integration and the related capital mobility limit policy makers' ability for progressive taxation. At the same time, regressive tax systems are regarded as being notably successful in providing the preconditions of a welfare state that is able to achieve a high equality in the distribution of income. An extension of these approaches motivates our *hypothesis of substitution* that predicts that the redistributive capacities of tax and benefit policies are empirical substitutes.

For an empirical test of this hypothesis, some methodological effort is required. This is especially true as most of today's political science literature on the subject of fiscal redistribution suffers from weaknesses in empirical foundation. Due to incomplete evidence, their conclusions are often limited to hypothetical statements based on restrictive assumptions rather than comprehensive empirics. The present analysis intends to provide an interdisciplinary transfer of recent empirical methods, which have been developed in the economics literature for the measurement of fiscal progressivity, to questions raised by political science literature. More specifically, we introduce the methodological basics that are required for conducting an empirical investigation of fiscal progressivity and effective redistribution. In addition, we also apply the so-called *transplant-and-compare* procedure that has recently been developed by Dardanoni and Lambert (2002) to control for the impact of changing pre-government income distributions on the assessment of redistributive effects. Relying on this methodology from economic research, we then test the hypothesis of substitution, which is formulated in relation to political economy literature. To our knowledge, this project is going to be the first comprehensive dynamic analysis of fiscal progressivity and redistribution that is backed by micro evidence and includes the major fiscal elements: direct taxation, payroll taxes, indirect taxes, and benefits.[30]

(Korpi and Palme (1998)) and the "redistributive paradox" introduced by Sinn (1995) that predicts a positive effect of welfare state engagement on pre-government income inequality.

[30] Note, however, that we do not include in-kind benefits or public services in our analysis which may also be important for distributional outcomes (see Aaberge et al. (2008); Paulus et al. (2009)).

The setup of the chapter is organized as follows: Section 3.2 presents a brief summary of the relevant literature that motivates our research and provides the rationale for the guiding hypothesis of substitution. Section 3.3 introduces the analytical categories and methodological techniques that provide the conceptual toolkit for the empirical analysis of progressivity and redistribution. Thereafter, in Section 3.4, the used data and income concepts are briefly described. The actual analysis is carried out in Section 3.5. Finally, Section 3.6 closes with some concluding remarks.

3.2 Theory

In this section, we are going to deduce our leading dynamic hypothesis on the structure of national fiscal systems and the development of redistributive capacities of discrete welfare state policies. Political economy literature made a concerted effort to understand the effects of increased economic integration on political governance, in general, and on the fiscal policies, in particular. Increased economic integration is held responsible for causing structural changes of the welfare state and therewith affecting issues of the economic class conflict. The *efficiency thesis*, the *compensation theory*, and the *tax mix argument* build the theoretical background that give reasons for the formulation of our expectation that the redistributive capacities of fiscal policies are shifting from taxation to transfer policies over time.

The applied theories had been developed with the claim of validity for advanced industrialized societies in the period from the mid-1980s until today. These scope conditions also apply to the aspired contribution of our work. The selection of relevant theories is based on the assumption that the development of fiscal and welfare policies is fundamentally affected by economic events (Scharpf (1997); Hall and Soskice (2001); Iversen (2005)). However, there is a huge variety of theoretical contributions with endless narrow specifications that has not come to an agreement on the direction of the causal effects (Busemeyer (2009)). The majority of established studies apply a static comparative approach to investigate the link between economic integration and welfare policies. However, the tested models are highly sensitive with regard to the definition and selection of variables that lead to the vast amount of studies with significant and, at the same time, partly contradicting results. Since we are interested in the development of welfare states' redistributive effects and to test our hypothesis on structural changes in the fiscal welfare state, we suggest a dynamic perspective on the political economy of redistribution.

3.2.1 Efficiency thesis and tax competition

The central argument of the efficiency thesis states that the intensified economic integration increases the mobility of economic factors and finally displaces national welfare states into an intensified competitive environment that leads, among other things, to international tax competition (Basinger and Hallerberg, 1998: 27; Genschel (2005)). In this regard, the "race-to-the-bottom" thesis emerged in the early 1990s and suggested that national states would lose their ability to raise significant tax revenues. Economic integration enforces political adjustments that affect the integrity of national welfare state outcomes in two ways. Tightened competitive pressure not only punishes high-tax states by pulling down their tax ratios, but continuously cutting down the tax levels also increases the threat of cumulating public debts. Public deficits then increase prices of government bonds and result in high interest rates, which operate as a serious obstacle to growth and force national states to cut their spending. This implies that globalization also would have a significant effect on welfare states' spending and that national welfare states would inevitably converge to the level of the lowest common denominator (Bucovetsky and Wilson (1991); Genschel (2000)). However, empirical research that has been conducted since then concludes that the conventional "race-to-the-bottom" thesis does not pass the test. Policy makers still have the ability to raise significant amounts of tax revenues and the public expenditure quota and the tax ratios remain stable (Busemeyer (2009)). Subsequently, this objection led to a modification of political economic theories toward more differentiated statements on the effects of globalization on welfare states' fiscal policies.

Current political economy research still deals with the question whether globalization has perceptible effects on fiscal welfare policies, even though the vicious circle has not come true. Later research arrived at the conclusion that international tax competition, even though it did not lead to the bleeding of public households, causes significant changes in the structure of national tax systems (Ganghof (2006a)). Increased economic integration, mainly through the relaxation of capital controls, increases capital mobility and therewith exposes national states to an intensified competition for investments, location of production, and mobile tax bases. Competitive pressure triggers market-friendly tax reforms that lead to a decline of corporate tax rates (Devereux et al. (2008)). Thus, the specification of the efficiency thesis focuses on the development of tax rates and the structure of the fiscal systems.

As corporate taxation serves a safeguard function (Mintz (1995)), which pre-

vents an avoidance of income taxation, changes in corporate tax rates also affect personal income taxation. Situations in which top marginal tax rates for personal and corporate income differ extensively provide strong incentives for shifting incomes to the corporate sector in order to withdraw personal income tax payments (Fuest and Weichenrieder (2002)). For that reason, cutting top marginal tax rates on corporate business also causes a reduction of tax rates for the whole income tax system.[31] This phenomenon became known as "spill-over" and describes the "pull-down"-effects that have an impact on the marginal tax rates of income taxation (Ganghof (2006b); Ganghof (2006a)). However, under budget constraints of public households, this trend has been executed mostly without loss of tax revenue. Tax reforms in the style of tax-rate-cut-cum-base-broadening, in which marginal tax rates are cut and tax bases are broadened, have become the blueprint in fiscal legislation of the last two decades.[32] This process primarily affects income taxation, which has the reputation of implementing the ability-to-pay principle most adequately. In this regard, many authors have detected an extensive paradigm shift in tax policies from equity to efficiency (Swank and Steinmo (2002); Devereux and Sørensen (2006); Swank (2006)). Tax reforms corresponding to this paradigm shift were held responsible for causing a decline of tax progressivity and limit the redistribution of income through tax policies (Ganghof and Genschel (2008)).

3.2.2 Compensation theory

In the debate of the impact of international economic integration on domestic welfare policies the compensation thesis emerged as a competing thesis (Garrett and Mitchell (2001)). In contrast to the direction of causality of the efficiency argument, which predicts tax cuts and a welfare state retrenchment as a result of increased economic integration, the compensation thesis predicts an expansion of the welfare state. It puts forward a correlation between economic openness and economic integration on the one hand and public spending and welfare effort on the other (Rodrik (1998)). The common explanation for the interdependence

[31] This is of course not an automatism. Rather an independent lowering of corporate tax rates makes tax administration very costly and inefficient. The consequence then offers two options for policy makers: Either to deal with these losses of efficiency and the related administrative extra costs or to adjust all types of income taxation to the lower level. The maintenance of the trade-off can be managed through a Dual Income Taxation, but the general problem remains.

[32] Many competing explanations emphasize the efficiency gains that are linked to such reforms with potentially welfare increasing results. However, this does not call into question the empirical fact of declining tax rates and their implications to our research issue.

of welfare expansion and economic integration and trade openness is similar to the "double movement"-argument of Polanyi (1944), where social protectionism, likewise through welfare policies, are the response to expansion and liberalization of markets. Later contributions specify the underlying mechanisms that cause a growth of public insurances and also a growth of social expenditures. Globalization intensifies social and economic inequalities and increases people's exposure to economic risks, which subsequently increases demand for social policies to compensate for these developments (Cameron (1978); Katzenstein (1985); Rodrik (1998)).

Some authors are skeptical about the direct link between globalization and welfare policies. Iversen and Cusack (2000) suggest that economic insecurity, which is held responsible for increasing the demand for welfare states' programs, is rather the result of deindustrialization. They argue that deindustrialization comes along with structural changes in the working conditions. In this process, the threat of unemployment rises due to increased economic vulnerability. Rapid technological change devalues professional skills and intensifies the already increased threat of unemployment. Unemployment demolishes human capital, and workers have to accept loss of income in case of unfitting reemployment. Furthermore, the increased flexibility of labor markets leads to discontinuous employment records, which makes access to work-related benefits, likewise occupational pensions, increasingly difficult. All of these factors taken together intensify peoples' demand for public insurance against income loss and insecurity. These mechanisms illustrate the positive effect of deindustrialization on the size of the welfare state and the public budget.

Summing up, in the recent literature on the political economy of the welfare state, there are plenty of studies that argue in favor of a positive relation between globalization and the importance of the welfare state. However, in this strand of literature, theoretical reasoning as well as the empirical evidence focuses on the compensatory capacities of the welfare state. When it comes to compensation, implicitly or explicitly the redistributive capacities of welfare programs, such as public insurances and social expenditures, are addressed. The compensation thesis then suggests that in the context of increased market integration and rising inequalities, the redistributive capacities of the welfare state are increasing. Thus if the compensation thesis focus on the spending side of the welfare states and, as outlined above, the efficiency thesis merely describes effects on the revenue-raising side, these two approaches are not necessarily competing or even mutually exclusive.

3.2.3 Tax mix argument: Fiscal policies and redistribution

The fiscal structure and the relation between the taxing and spending in welfare policies is also subject to the tax mix argument that puts forward an empirical relation between the composition of fiscal revenue-raising instruments and policy makers' ability to maintain an extensive welfare state (Wilensky (2002); Kato (2003)). The tax mix is operationalized as the relative share of tax revenue, raised by a particular tax type on the public budget. Kato refers to the widespread assumption that consumption taxes are regarded as being the most efficient tax type with regard to their revenue-raising ability. In this rationale, a national state that has the ability to realize a regressive tax mix through a heavy reliance on consumption taxes is in the advantageous position to raise large tax revenues. Kato states that an early shift from progressive to regressive taxation leads to high tax revenues and therewith offers the key precondition to realize and maintain a large welfare state.[33] Essentially, Kato's tax mix argument provides a path-dependent explanation on the co-evolution of regressive taxation and generous welfare states.

Within the tax mix argument, it is the regressive tax structure that enables a generous welfare state. These fiscal strategies - regressive taxation and generous social spending - seem to implement contradicting policies with regard to the political goals of the redistribution of income. Even if the net effect is unclear, this challenges the overall redistributive ability of the welfare states. The hunch is that the welfare state does not redistribute at all, if it only taxes the poor and then donates benefits to the poor. Several authors even came up with a supposition that redistribution of income is limited to a "within-class redistribution" (Scharpf (1987)), that welfare policies only reach majorities if the payer and the payee are identical (Timmons (2005)), or proclaim a "socialism within one class" (Cusack and Beramendi, 2006: 43). Against this, Kato suggests that finally fiscal systems with a regressive tax system are most successful in equalizing differences in income distribution. Her conclusion claims that residual redistribution can be achieved most efficiently through generous welfare spending, which is financed by regressive revenue-raising techniques (Kato, 2003: 27). However, we want to emphasize the fact that the predicted relation, that regards a regressive taxing and large welfare spending strategy to be most efficient in providing the most equal after-tax

[33] There are controversies on the direction of this causal mechanism. Ganghof (2006c) provides strong arguments and counterexamples that suggest an inverse causality. However, the descriptive evidence of the present analysis will not allow for any causal conclusions. Thus, the aim of our study is the empirical investigation, whether we can identify a correlation between a regressive tax structure and a large, redistributive welfare state - based on micro data and all relevant fiscal instruments.

income distribution, is justified on the basis of composite empirical examples. In theoretical terms, Kato's findings lead toward a similar "paradox of redistribution" as the one formulated by Korpi and Palme (1998: 2), which likewise suggests that universal welfare states, in contrast to highly targeted welfare programs, are most effective in providing high after-tax income equality. In the full mapping of Kato's terminology, she claims a positive correlation between a regressive tax structure, at low political costs, and a large universal welfare spending that is held responsible a great equality of after-tax income. However, as the design of the taxing and spending policies have contrarily redistributive effects, and there are no theoretical models offered concerning the overall effect, the fiscal structure of the welfare state and the effective redistributive effects remain unexplained.

If the identified puzzle is correct and regressive taxation goes along with the most effective residual redistribution, then the corollary is that a highly redistributive transfer policy has to rule out the regressive effects of the tax structure in order to achieve a net redistribution of income from rich to poor. Surprisingly, Kato's argumentation is incomplete in this regard, as she only claims a relation between regressive revenue rising and the size of welfare state. However, as she identifies large welfare states with regressive tax mixes to possess the most extensive residual redistribution of income, the causal chain has to be extended from regressive taxation, over the maintenance of a large welfare state to, finally, an implementation of highly equalizing benefits. A coexistence of lower redistributive effects of taxation and higher redistributive effects of benefits has to follow from that.

3.2.4 Development of the fiscal structure

In principle, both fiscal instruments, taxing and spending, would equally be adequate for realizing an effective redistribution of income. For that reason, one would naturally expect to see these policies implemented in a complementary way. However, in the same manner as Kato's proposition, there are a couple of qualitative and quantitative studies that indicate an increasingly inverse relation between the redistributive impacts of tax and benefit policies (Steinmo (1993); Kenworthy (2009); Prasad and Deng (2009)). In this regard, the reviewed theoretical approaches, which offer hypotheses on the development of welfare states' policies and the redistribution of income under the conditions of increased economic integration, are no more mutually exclusive, if one distinguishes the fiscal instrument. Rather they offer the asymmetric dynamics that affect tax and transfer policies

with opposite signs in terms of redistributive capacities. Economic integration pushes toward an increasingly regressive tax structure, as proposed by the efficiency thesis, whereas it results in increased generosity of the welfare state, as the subject matter of the compensation thesis and the tax mix argument.

In terms of redistributive political goals, these trends are antipodes. However, in matters of their political economic claims, both statements appear as two complementary specifications of an asymmetric effect of economic integration on taxation and spending. This asymmetric effect is of central meaning for our research. For this reason, the contemporary research interest is not whether economic integration leads to welfare state expansion or retrenchment, but rather on how economic integration affects the structure of the fiscal welfare state, its effect on discrete fiscal instruments, and its effect on the overall distribution of income. It provides the basis from which we deduce our hypothesis on structural changes of the fiscal welfare state that predicts that the redistributive function of tax policies are incrementally transferred to transfer policies and both fiscal instruments are becoming *substitutes*.

The intended empirical analysis of the development of welfare states' fiscal structure will be instructed by the rational of measurements of progressivity that are introduced in the subsequent section. In the course of the analysis, we intend for the empirical analysis to take a dynamic perspective. The presented theories suggest that the substitutive relation initially developed with the occurrence of increased economic integration and tightened international competitive pressure. The impact of globalization was held responsible for a cutback of tax progressivity during the last two decades. In references to the literature related to the compensation thesis, we expect that, given a sustained political will for redistribution of income, a simultaneous increase of redistributive effects of benefits comes along with decreased tax progressivity. Such developments correspond with a *shift of redistributive capacities from the revenue side to the spending side of the welfare state*. Thus, as the assumed changes of the fiscal structure are resulting from gradual process of ongoing economic integration, we expect to find the formation of the substitutive pattern as sequential events in the data.

3.3 Methodology

The present research interest requires insight in the structure and the redistributive effects of the most important elements of the fiscal welfare system as well as evid-

ence on the aggregate affect of fiscal welfare policies on the redistribution of income. Until today, there is a serious shortage of evidence on progressivity and redistributive effects in political economy literature. Limited availability of adequate data, the increased technical standards of recent empirical methods, and a lack of interdisciplinary cooperation between economic research and comprehensive political issues in political economy research are the present barriers for reliable evidence on redistributive policies. Unfortunately, the few empirical studies that apply highly sophisticated methods on this issue are often limited in their generalizability since they only look at single time points and small country samples and are therefore unfeasible to test our hypothesis on the structural developments of fiscal systems (Immervoll (2004); Decoster et al. (2009)). Other contributions are too narrow in the research question or exclude significant parts of the fiscal system, which does not allow inference on the welfare state in the aggregate (Zandvakili (1994); Wagstaff et al. (1999); Corneo (2005); Piketty and Saez (2006); Duncan and Sabirianova Peter (2008); Sabirianova Peter et al. (2009)). Also the lack of micro-founded evidence is problematic, because it misses to conceptualize redistribution adequately and inevitably ties the conclusions to strong assumptions. In other examples, the presented empirical material is oftentimes incomprehensive and limited to income taxation, or at best it considers redistribution as differences between pre-tax and post-tax Gini-coefficients (Bradley et al. (2003); Alesina and Glaeser (2004)) or the relation of discrete income groups (Moene and Wallerstein (2001)). Since previous empirical studies on the dynamic *paradox of redistribution* suffer from various methodological shortcomings, we intend to develop an adequate and comprehensive research design for serving our empirical claim of validity.[34] The following section introduces concepts of empirical research that seem most convenient for testing our hypothesis of substitution.

3.3.1 Conceptualization of redistribution and progressivity

Until today, most of the literature on fiscal redistribution in political economy lacked clear-cut definitions of progressivity and redistribution. Commonly, they get along with ascribing progressive or regressive effects to certain fiscal instruments. Income taxes are responsible for redistributive tax policies and welfare states do

[34] E.g. Garfinkel et al. (2006) and Prasad and Deng (2009) use LIS (Luxembourg Income Study) data to analyze the distributional impact of indirect taxes. However, LIS data does only provide expenditure information for a small set of countries for very different time points. Furthermore, there is no information on disaggregated expenditure subcategories and therefore reduced consumption tax rates cannot be considered accurately.

redistribute more income if they use income taxes more extensively. However, with such assumptions, they more or less miss the target, when making claims on redistributive policies. So far, the assessment of redistribution in comparative political economy research is difficult, since there is no practical informative basis for redistribution of income lately because it is not a policy in itself. Rather, redistribution is an abstract phenomenon that results from the interaction between political conditions and institutions, on the one hand, and economic mechanisms on the other.

Obviously, an empirical approach to fiscal redistribution and progressivity is anything but trivial. Redistribution of income and progressivity are analytical categories that describe the economic consequences of fiscal policies on the distribution of income. It is neither directly linked to any indicators, nor do any qualitative political outcomes qualify for being especially progressive of redistributive. We are going to argue that it is not sufficient to capture the size of a welfare states' policy instrument in order to evaluate its redistributive effects. There is still a substantial difference between the level of social expenditures and effective redistribution of income. To give an example, we suggest that even if the spending on old-age pensions (unemployment benefits) in Europe is twice (six times) as high as in the United States (Alesina and Glaeser (2004)), this does not imply that the pension systems (unemployment insurances) in Europe are twice as redistributive as analogous policies in the United States. What is obviously missing is information on how many individuals benefit from such spending, and whether beneficiaries have high or low market income before transfers. Also structural differences between contribution-based and tax-financed social systems do not effectually imply a redistributive or progressive welfare state. What is rather supposed to be addressed, if one talks about redistributive effects of a progressive tax system, is the fact that the tax burden is relatively high for a rich person compared to the tax liability of a poor individual, and reciprocally, the relatively high share of social benefits that goes to the poor compared to the one that goes to the wealthy. The relevant aspect of redistribution and progressivity in political economy and welfare state research is the equalizing effect on the distribution of income. The following section describes the basic analytic concepts and empirical methods that allow an up-to-date examination of progressivity and redistribution.

Before we comment on the actual measurement concepts that are used for the empirical investigation, some terminology has to be defined in order to clarify the explored phenomenon. For the purpose of welfare state research, we are focusing on two related but analytically distinguishable effects of redistribution and progressiv-

ity. First, one expects particular fiscal instruments to reduce inequalities of market incomes; the residual equalizing effect is called *redistribution*. The second aspect is more related to the distribution of tax liability itself. Thus, in the strict sense, progressivity denotes the fact that the tax burden is unequally distributed along the income scale. *Progressivity* is then a form of deviation from proportionality. In common speech, the concepts of progressivity and redistribution of income are mostly used synonymously. However, for an adequate empirical research, we have to distinguish these phenomena, particularly as they are analytically linked by a principle of cause and effect. The gain of differentiating between progressivity and redistribution is the ability for a comprehensible tracing of the interdependency of a statutory tax system with the distribution of income and resulting redistributive effects. The causality is the following. The application of a progressive tax scale on any non-zero distribution of income leads to a disproportional distribution of tax burden and therewith brings about a redistributive effect. The intermediate step, the analysis of progressivity allows validation of partial effects of discrete fiscal instruments.

In the majority of works dealing with redistributive effects of tax policy, one finds statements on key characteristics of a taxation system. The relevant variation is mostly attached to variations in tax rates, allowances, or tax ratios. These indicators point toward the formal tax scales, which are very popular to analyze in social science due to their observability, unambiguousness, and comparability. A large share of welfare state research that deals with fiscal policy inconsiderately ascribes certain types of tax scales certain welfare implications. For example, it is mostly taken for granted that income taxation realizes redistributive effects. Against that, indirect taxation and social insurance contributions are considered as proportional taxes, or occasionally as regressive revenue-raising instruments. Thus, one finds operationalizations of fiscal redistribution, which deduce equalizing effects from tax ratios. Other popular objects of investigation are the details of tax schedules, especially allowances and top tax rates. A progressive tax schedule, with increasing average tax rates, introduces disproportionality into the distribution of tax burden along a distribution of income. Evidence of this type is classified as *local measure* of progressivity. Up to this point, an analysis is limited to the allocation of tax burden to unspecified tax bases, which does not take into account the actual empirical distribution of tax bases. However, local measures are ill-suited for the recent concern of evaluating real-world fiscal systems, as inference only holds for a hypothetical equi-proportional distribution of the tax base.

3.3.2 Definitions and measurement

Annotations on the issue of redistribution and progressivity can already be found in contributions to economic literature at the beginning of the 20th century. Dalton (1923) suggests that when arguing about the redistributive effects of taxation, one has to differentiate between the *"degree of progression of the tax scale itself, regardless of the distribution of incomes along the scale, taking account of the distribution of incomes along it ... [and the] effective redistribution"* that results from an interaction with the distribution of the tax base. Without considering the distribution of market incomes and the varying population on the tax scale, statements on the distributional effects of progressive tax schedules remain hypothetical assumptions. For example, a highly progressive income tax schedule does not result in any redistribution, as long as there is not at least a minimum of variation in the distribution of primary income. Indeed, what is relevant for this analysis, and not at least for policy making, are concepts that enable statements whether one empirical tax system or tax practice is more progressive than an alternative one. Therefore, technical concepts have been developed that measure *global* progressivity and redistribution as an interaction effect between an instrument of fiscal policy and income distribution that can be summarized in a one-dimensional, standardized scalar index number.[35]

In the end, residual redistribution of income, conceptualized as an interaction between income and tax instruments, is a purely empirical phenomenon. Therefore, the following concepts build on the terminology of distribution functions. In this regard, progressivity as a disproportional distribution of tax burden becomes apparent as a separation of the Lorenz curves of pre-tax income L_X and tax burden L_T (Lambert 2001: 201).[36] This simply formulizes the intuition of progressive taxation in picturing the distribution of tax burdens in comparison to the distribution of income. As, in practice, there is always a certain degree of inequality in the empirical distribution of income, a progressive tax has to allocate the tax burden marginally more unequal, in order to realize progressivity defined as the disproportional distribution of tax burden. In such cases, the concentration curves of income and tax burden deviate and the deviation indicates a progressive structure of the discrete tax instrument. In contrast, in cases with perfect pro-

[35] The following methodological explanations and definitions base on Pfähler and Lambert (1992); and Lambert (2001).

[36] Remember that Lorenz curves order income units by magnitude of their income, starting with the lowest. Then, the cumulative proportion of the population (running from zero to one along the x-axis) is plotted against the cumulative proportion of total income received by these units (Lambert, 2001: 24-25).

portionality, e.g., a flat income tax without any allowances, the Lorenz curves of pre-tax income and tax liability are congruent. The greater the separation of the two concentration curves, the higher the progressivity. Kakwani (1977) developed his index of progressivity from this relation and measures progressivity as twice the space between $L_X(p)$, the distribution of income, and $L_T(p)$, the distribution of tax liabilities, where $L_X(p) - L_T(p)$ measures the distance apart of L_X and L_T, at rank p of the pre-tax distribution x.

$$\Pi^K = 2 \int_0^1 [L_X(p) - L_T(p)]\, dp \tag{3.3.1}$$

Kakwani´s conception of progressivity can be interpreted as the deviation from equi-proportional taxation.[37] It takes values greater than zero in case of progressivity and values less than zero in case of regressivity. Again, if there is not at least a minimal difference between the two concentration curves, the Kakwani index takes a value of zero and we are concerned with a state of perfect proportionality.

At the same time and on the basis of the same idea, Suits formulated a similar index method (Suits (1977)). His approach calculates index values from the distribution of tax liabilities, which themselves are dependent on the distribution of pre-tax income; $q = L_x(p) \Rightarrow \ R_T(q) = L_T(p)$ (with p as ascending rank of income units with pre-tax income x). The Suits index is calculated as twice the space between the relative concentration curve $R_T(q)$ and the 45° line (in case of a flat tax $R_T(q) = 45°$ line).

$$\Pi^S = 2 \int_0^1 [q - R_T(q)]\, dp \tag{3.3.2}$$

The difference to the previous Kakwani index consists in the use of relative concentration curves, where the concentration of tax liability is a function of the concentration of primary income. This entails the great advantage of a fixed codomain, where the Suits index takes values between $\Pi^S = +1$ in case of maximum progressivity and $\Pi^S = -1$ in case of extreme regressivity. This characteristic makes the Suits index highly recommendable, not only for partial analysis, but also for purposes of international and sequential comparison.

In the beginning of this section, we stressed the analytical meaning of progressivity in contrast to redistribution. Indices of the rationale of Kakwani and

[37] Since the Gini coefficient for pre-tax income equals $G_x = 1 - 2\int_0^1 L_X(p)dp$ and the concentration coefficient for tax liabilites $C_T = 1 - 2\int_0^1 L_T(p)dp$, the Kakwani index can also be expressed as $\Pi^K = C_T - G_X$.

Suits respond to fiscal instruments' deviation from proportional distribution of tax liability. In contrast to progressivity measures, empirical measures of effective redistribution start from the difference between the distribution of pre-tax income and the distribution post-tax income, instead of capturing the relation between the distribution of tax liability and income. However, what they have in common is the algebraic rational of distribution functions of Lorenz curve type. In cases of progressive taxation, one observes a reduced inequality in the distribution of post-tax income compared to the distribution of primary income. This implies the separation of the concentration curves L_X, the distribution of pre-tax income, and L_{X-T}, the distribution of post-tax income. By transformation to the familiar mathematic syntax, one gets the index of redistribution accordant to Reynolds and Smolensky (1977).

$$\Pi^{RS} = 2 \int_0^1 [L_{X-T}(p) - L_X(p)]\, dp = G_X - C_{X-T} \tag{3.3.3}$$

The Reynolds-Smolensky index measures redistribution as the space between the distribution of pre-tax income, equivalent to the Gini-coefficient and the distribution of post-tax income.

Under the assumptions of horizontal equity and differentiable tax functions,[38] it is possible to derive a relationship between the Reynolds-Smolensky index of redistribution and the Kakwani-type measures of progressivity. The equation is then only dependent on the weight g that is interpreted as the average tax rate or public spending ratio (Lambert, 2001: 208):

$$\Pi^{RS} = \frac{g}{1-g}\, \Pi^K \tag{3.3.4}$$

The important conclusion that follows from this argues that redistribution results from (a) the level of the tax rate and (b) the disproportionality or rather the progressivity of a fiscal instrument. Micro-founded concepts of measuring progressivity are built on the assumption that there is a direct link between income and the size of a fiscal instrument such as the tax liability. The individual tax burden then is a function of income $t(x)$, with the assumption $0 \leq t'(x) < 1$, and serves the assumption of horizontal equity. However, in practice, tax liability is not only determined by primary income. In fact, qualitative attributes are often taken into account when it comes to the definition of the tax base. Tax

[38] Horizontal equity is valid in case of an income-dependent fiscal instrument, if the tax liability rises with increasing income and tax liability is equal for equal incomes. Additionally, the tax scale $t(x)$ is differentiable and for marginal tax rates it holds that $0 \leq t'(x) < x$.

systems with child allowances, marriage penalty, and all forms of tax deductions bring about that people with the same nominal pre-tax income may have to carry different tax burdens. The result is a discrimination of equivalent incomes that lead to a re-ranking of income units. In the empirical investigation of effective redistribution, we make use of these re-ranking effects to measure the redistributive effects that are not induced by the size of the tax base, but rather by its non-income characteristics. On the basis of their work on horizontal equity, Atkinson (1970) and Plotnick (1981) developed a measure of re-ranking that is calculated in the following form:

$$\Pi^R = G_Y - C_Y. \tag{3.3.5}$$

It measures the area between the Lorenz curve of pre-tax income and the concentration curve of post-tax income. Horizontal inequity is captured by a re-ranking effect that brings about a divergent sequence of ascending ranked incomes due to differential fiscal treatment. High values indicate a high impact of non-income characteristics in the calculation of tax liabilities and point toward high levels of horizontal inequity. Therefore, the Reynolds-Smolensky index only assesses the net effect of fiscal redistribution, since it does not take into account any re-ranking effects. Whereas the Reynolds-Smolensky index might be seen as a measure of vertical equity, the overall redistributive effect of fiscal instruments consists of both, *vertical equity* Π^{RS} and *horizontal equity* as measured by Π^R:

$$\Pi^{RE} = \Pi^{RS} - \Pi^R = G_X - G_Y. \tag{3.3.6}$$

Therefore, the overall redistributive impact of fiscal instruments is simply measured by the difference between the Gini coefficient of the pre-tax income distribution and the Gini coefficient of the post-tax income distribution.

Although the previous considerations mainly referred to taxes as fiscal instruments, the concepts are likewise applicable to assess the redistributive impact and the disproportionality of social benefits. However, as transfer payments are positive cash flows, here a regressive distribution of benefits leads to an equalization of the distribution of incomes. The described concepts also allow for the measurement of the *redistributive effects* of the net fiscal system, meaning the combination of all taxes and benefits. However, assessing the disproportionality (progressivity) of the net fiscal system is more problematic, since the disproportionality measures are not defined in the case of equal tax and transfer payments.[39]

[39] See Lambert (2001: 274-275) for a more detailed discussion.

3.4 Data

3.4.1 Data and indirect tax imputation

The empirical analysis is carried out on the cases of the UK and Germany, which can both be regarded as advanced industrial societies and that have both experienced processes of economic integration, especially to the European internal market. Comparing Germany and the UK is interesting in itself, as both countries have different welfare state regimes as well as varying political systems. The exemplary case study on fiscal progressivity and redistribution of the UK is based on the "Effects of Taxes and Benefits on Household Income" micro data set produced by the Office for National Statistics of the UK and distributed via the UK Data Archive.[40] In fact, this is a generic micro data file and the underlying data sets are the Family Expenditure Survey (until 2001/02) and the Expenditure and Food Survey (from 2001/02 onwards), which report representative information on incomes and expenditures of UK households. As opposed to the original data, the generic data sets also include estimated amounts of indirect taxes that are essential for this comprehensive analysis of the distributional impact of the fiscal system.[41] Currently these annual data sets cover a time period from 1994 until 2008 and contain around 6,000 and 7,500 households in each wave.

For the analysis of fiscal progressivity and redistribution in Germany, we generally rely on annual household data from the German Socio-Economic Panel (SOEP)"[42] In our study, we use data from 1988 until 2008, where data from 1991 onwards also includes respondents from East Germany. Unfortunately, SOEP's micro data does not report household expenditures and, therefore, it is not possible to infer information on indirect tax payments of households. For that reason, we additionally use information from the Einkommens-und Verbrauchsstrichprobe (EVS), which is an official micro data set on income and household expenditure and is provided by the German Statistical Office.[43] The EVS, however, is not sufficient for our analysis on its own, since it is only conducted in five-year intervals and may not reveal important changes in tax benefit policies in intermediate

[40] Office for National Statistics, Effects of Taxes and Benefits on Household Income, 1994-2008 [computer file]. Office for National Statistics, [original data producer(s)]. Colchester, Essex: UK Data Archive [distributor].

[41] For further information on this data and particularly on the estimation on indirect tax payments please see http://www.statistics.gov.uk/STATBASE/Product.asp?vlnk=10336.

[42] A detailed overview of the SOEP is provided by Haisken-DeNew and Frick (2003) and Wagner et al. (2007).

[43] For further information on EVS data and in particular on its comparability to SOEP data, see e.g. Becker et al. (2003).

Germany	Standard Rate	Reduced Rate	Application of reduced/ zero rates
01.07.1979	13	6.5	Reduced rates apply to food, water supplies, transport of
01.07.1983	14	7	passengers (<50km), books, newspapers/periodicals,
01.01.1993	15	7	admission to certain cultural and sporting events,
01.04.1998	16	7	agricultural inputs, social services, firewood, certain dental
01.01.2007	19	7	care services, cut flowers and plants, hotel (since 2010)
			Exempted: Building land, supply of building land, rents,
			mailing, bank turnover, insurances, waterway transport
United Kingdom	**Standard Rate**	**Reduced Rate**	**Application of reduced/ zero rates**
18.06.1979	15	-	Reduced rates apply to children's car seats, certain
01.04.1991	17.5	-	energy products such as natural gas, electricity and
01.01.1995	17.5	8	heating oil
01.09.1997	17.5	5	Zero rates apply to food, water supplies, pharmaceuticals,
01.12.2008	15	5	medical equipment, transport of passengers, books,
01.01.2010	17.5	5	newspapers/periodicals, children´s clothing
04.01.2011	20	5	Exempted: Social services, medical and dental care

Table 3.4.1: VAT rates in Germany and the UK

Source: European Commission (2011).

years. Therefore, in a first step, we apply legal information of value-added tax (VAT) rates for different consumer goods in combination with EVS expenditure data to approximate household indirect tax payments. Table 3.4.1 illustrates the evolution of VAT rates in Germany and the UK and provides a brief overview to which goods and services the reduced rates apply.[44] So far, we can rely on EVS data from 1988, 1993, 1998, and 2003, which at least nicely corresponds to the VAT rate reforms in 1993 and 1998.

We then estimate a simple OLS model in which we regress these indirect tax payments on a number of household characteristics based on the following relationship:

$$\ln(IndTax_{it}) = \alpha_t + \beta\ lnY_{it} + \gamma\ ln(Y_{it})^2 + \delta X_{it} + \varepsilon_{it} \tag{3.4.1}$$

with $IndTax$ as the approximated amount of indirect taxes for household i at time point t (with $t = 1988, 1993, 1998, 1999, 2003, 2007$). Y represents household disposable income and X a set of household characteristics such as household

[44]Note that particular goods in Germany are only virtually tax exempted. In these cases we generally follow Fritzsche et al. (2003) and Bach (2005) and assume that only 89% of rents are formally tax exempted and 11% underlie the standard VAT rate. In the case of medical services we assume a standard rate on 50% of total turnovers.

size and the number of children. X also includes the age and age squared of the household head as well as a dummy variable whether the head of the household is married or retired. Note that the choice of variables does not depend on a particular theory, but we try to reproduce all partial correlations between indirect taxes and household characteristics which are significantly different from zero (see O'Donoghue et al. (2004)).[45] The time index t indicates the underlying EVS wave and VAT rules of the particular estimation. In fact, we estimate six OLS models: One estimation per each EVS wave, one estimation for 1998 where we apply the new VAT rules from the second quarter onwards (see Table 3.4.1), and one additional estimation based on 2003 data and the new VAT rules of 2007. Then we use the estimated coefficients from the EVS wave 1988 to impute indirect tax payments into SOEP waves 1988 until 1992, then the estimated coefficients from EVS wave 1993 to impute indirect tax payments from 1993 until 1997, and so on. The underlying assumption of this approach is that apart from the impact of observed household characteristics, indirect tax payments only change in response to VAT rate changes. Although this procedure does not allow us to capture the exact distribution of consumption every year, we can at least pick up changes in consumption which are solely related to changes in those household characteristics, which we control for in our regression model. Since we also account for changes in VAT legislation, we think that, overall, we can quite adequately model the distribution of indirect taxes.[46]

3.4.2 Income concepts

The phenomena of interest, redistribution, and progressivity are conceptualized in relation to the distribution of household incomes. The unit of analysis is the household and to compensate for different household structures and possible economies of scales within households, we use equivalent household incomes throughout the analysis. In this chapter, equalized income is equal to unadjusted household income divided by the square root of the number of persons in the household. We use this

[45] Using indirect taxes instead of household expenditures as dependent variable has the advantage that we can also reproduce the structure of reduced VAT rates. An alternative procedure would be the use of disaggregated subcategories of expenditures as dependent variables - however, this would raise the problem of many observations with zero expenditures in certain categories.

[46] Table 3.7.1 in the Appendix provides information on the predictive power of the OLS models, Table 3.7.2 compares our simulated tax revenues with aggregate statistics. We find R^2 values above 0.50 for all indirect tax regressions and can reproduce about 60% of official VAT revenues. Furthermore, the redistributive effects of the imputed indirect taxes based on SOEP households are very similar to the results for EVS households in the corresponding year.

concept of equivalence scales because the UK data does not provide more detailed information on the household composition.[47] In the remainder of the chapter, we always refer to the equivalent measures of household income components unless explicitly noted otherwise.

With respect to the income concept, several decisions have to be taken in order to provide a standard benchmark that allows for cross-country and intertemporal comparison. The starting concept of the analysis is household market income, which is equal to the income before any government intervention. Market incomes therefore comprise all incomes that are received directly by the household (primarily from labor, self-employment, rents, and capital income). To assess the overall progressivity and redistribution of the fiscal system, we compare market incomes with households' post-tax incomes, which is equal to the common concept of household disposable income less indirect tax payments. The post-tax income concept represents the income that presumably matters for the general subjective decision making at the household level. The difference in the inequality of the distribution of market incomes and post-tax incomes therefore illustrates the overall redistributive impact of the fiscal system.

As outlined above, we are specifically interested in the progressivity and redistributive effects of the separate elements of the fiscal system, such as income taxes, social insurance contributions, social benefits, and indirect taxes.[48] Obviously, when measuring the redistributive effect of single tax benefit instruments, the order in which different components are accounted influences the measurement of their redistributive impacts (see, e.g., Ferrarini and Nelson (2003)). Therefore, to assess the progressivity and redistributive effect of a discrete fiscal element, we apply a similar approach as Immervoll et al. (2005) and start from a hypothetical situation without the actual instrument (=market income) and ask how the distribution of incomes is altered when introducing the component in question.[49]

Note that there are several limitations to our analysis. First and most importantly, the baseline analysis only assesses the direct effects of the fiscal system other things being equal. For the interpretation, we have to keep in mind that

[47] However, the square root of household size is also the standard equivalence scale applied in the Luxembourg Income Study (LIS).

[48] Note that in the baseline computations social benefits also include public pension payments, which must not necessarily be considered as part of the redistributive system. However, accounting public pensions as market incomes only lowers the overall redistributive effect of social benefits and does not qualitatively change the observed trends.

[49] We also applied the sequential accounting approach which we explained in Section 2.2.2. This does not change the trends of the single fiscal components, however, each component becomes slightly more progressive/less regressive.

beside these first-round effects of tax benefit systems on the post-government distribution of incomes, they may additionally induce indirect second-order effects by influencing the pre-government income distribution. However, we will try to deal with the impact of the pre-government income distribution on the assessment of redistribution by applying a transplant-and-compare procedure that we will explain later. Second, the analysis is static in so far that we are analyzing cumulative cross-sectional data, which does not consider lifetime incomes. Thus, we cannot disentangle redistribution over the lifecycle from redistribution from the rich to the poor. Also, using annual incomes instead of lifetime incomes might overestimate the regressivity of indirect taxes because often accumulated savings are consumed at a later point of the life.[50] Caspersen and Metcalf (1994) suggest to relate the VAT burden to current consumption expenditures instead of current incomes. Unfortunately, the UK data does not report the original household expenditures. Third, the analysis only allocates those taxes and benefits that can be numerically attributed to households. Benefits in kind, corporate taxes and the consumption of public goods are not captured. Finally, we only take into account VAT as indirect taxes since data on quantities are not readily available in the scientific-use-files for Germany. However, VAT taxes represent the most important element of overall indirect taxes in Germany.

3.5 Results

3.5.1 Baseline estimations

In this section, we want to describe some evidence of the substitution thesis outlined above. So far, the results are based on Germany and the UK for which we can include reasonably derived data on indirect taxes for a considerably long time period. As described in Section 3.3, for assessing the impact of the fiscal system, it is particularly important to look at the distribution of taxes and benefits along the income distribution. To motivate our analysis, we first show some macro evidence on the development of the tax mix, which has frequently been used to assess the development of the tax structure and fiscal redistribution of welfare states.

Figure 3.5.1 illustrates the development of direct and indirect taxes and social expenditures as a percentage of GDP from 1980 until 2008, for both Germany and the UK.[51] In line with the discussed theory, the figure reveals a decreasing trend

[50] See Metcalf (1994) and Bach (2005) for a detailed discussion of these issues.
[51] Note that here direct taxes combine taxes on income, profit and capital gains. Social insurance

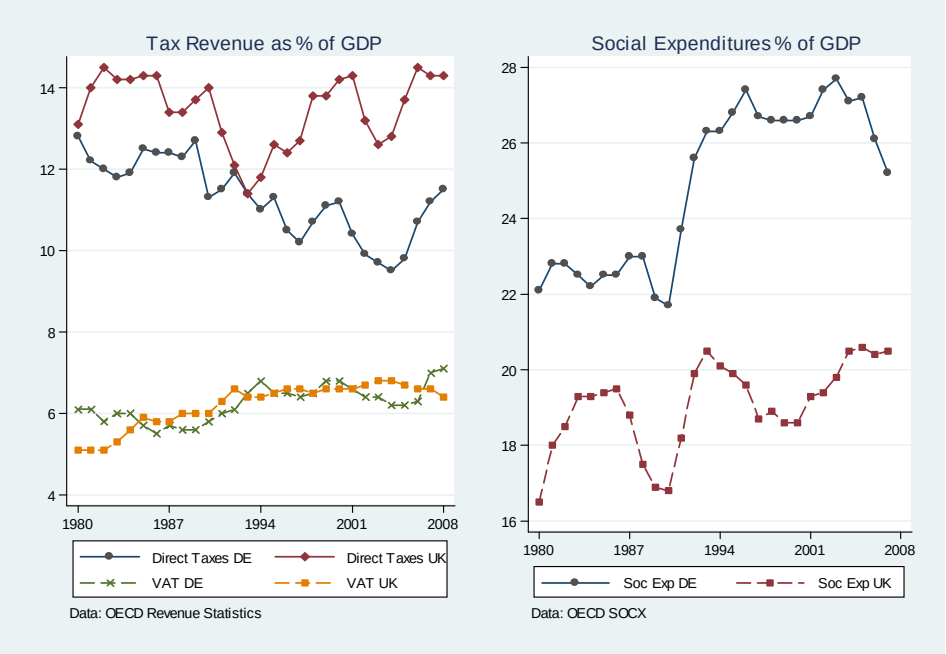

Figure 3.5.1: Development of taxes and social expenditures - some macro evidence

for the proportion of direct taxes for Germany, whereas there is no obvious trend for the UK. There is, however, even some indication for an upward trend in the UK since the end of the Thatcher government at the beginning of the 1990s. The indirect tax ratio is clearly increasing for both countries. This is also true for the proportion of social expenditures as percent of GDP, which increased from 16.5% of GDP to 20.5% in the UK, and from 22.1% to 25.2% in Germany.

The majority of previous studies then ascribe indirect taxes a rather regressive structure, while direct taxes, on the other hand, are presumed to have a progressive structure. Given the evidence of an increasing indirect-direct tax ratio, many studies conclude decreasing redistributive capacities of taxes. Therefore, when considering the whole time period of the last three decades, the macro evidence suggests for both countries that taxes have become less progressive, accompanied by higher social benefits. Indeed, the bivariate correlations between the indirect-direct tax ratios and social expenditures as proportion of GDP are negative (even if we control for the German reunification in 1990). The negative relationship is more pronounced in Germany and for the UK the picture becomes less clear from the beginning of the 1990s. However, pure macro evidence does not allow for conclusions about redistributive capacities since it does not provide any information of the distribution of tax burden across households. An increasing share of

contributions are not considered in this illustration.

indirect taxes need not necessarily lead to increasing income inequality. The effective redistributive impact of indirect taxes does not only depend on the average tax rate (the importance of indirect taxes) but also on its structural progressivity and, most importantly, on the consumption patterns of households. Admittedly, there are good reasons to assume that the liability of indirect taxes is unequally distributed and disproportionally levied on low income households. However, the micro evidence to justify this assumption is missing and, furthermore, the disproportional distribution of indirect tax liability might vary considerably across time and space. Therefore, as a next step, we use micro data of household´s incomes and tax payments to assess the effective distribution of taxes (and benefits) and to validate the regressivity (progressivity) of indirect (direct) taxes and attach this information with the distributive effects of other fiscal instruments to get a comprehensive picture of the redistributive effects of the fiscal welfare state.

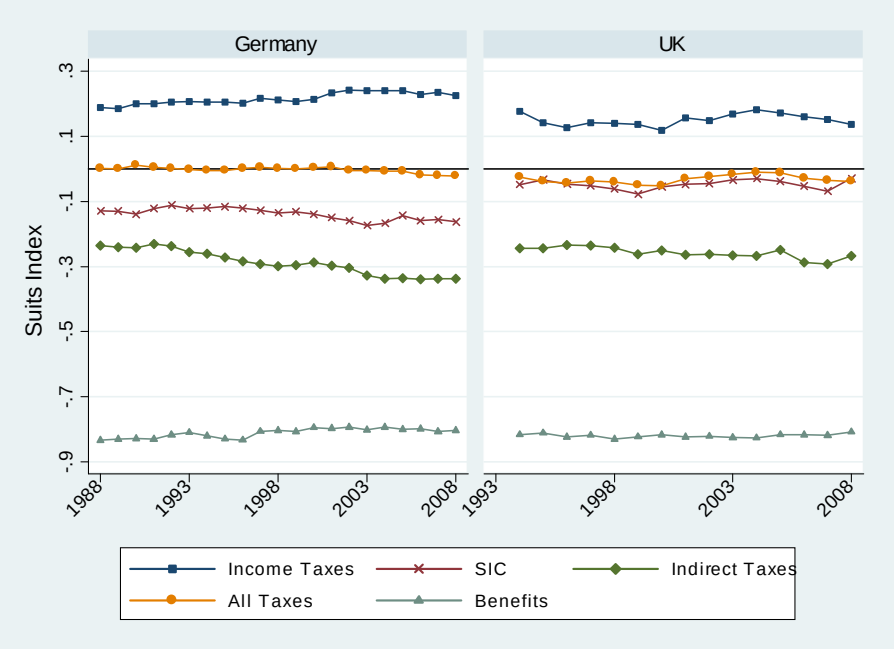

Figure 3.5.2: Development of progressivity of separate fiscal instruments

Figure 3.5.2 illustrates the different levels of progressivity of both, the spending and financing side of the welfare state for 1988 until 2008 for Germany and 1994 until 2008 for the UK. Progressivity levels are indicated by the Suits Index. Beside the progression level of the overall financing side ("all taxes"), the progression levels of income taxes, social insurance contributions, and indirect taxes are illustrated separately. It should again be noted that, in the case of benefits, negative progressivity (=regressive) levels indicate a pro-poor distribution of benefits.

Alternatively, one can also speak of target efficiency of transfer payments, where regressivity values of -1 indicate a maximum targeting toward the poorest. The unequal distribution of benefits over the income distribution then has similar effects on the inequality of market incomes as progressive income taxation. Therefore, the large negative values of the Suits index (on average, -.81 for Germany and -.82 for the UK) in the case of benefits show that benefits are directed toward low-income households. Figure 3.5.2 also confirms an expected progressive structure of income tax payments across households, meaning that households with higher incomes pay relatively more taxes. The figure also reveals that income tax progressivity is, on average, higher in Germany than in the UK (a Suits index of .22 as compared to .15 in the UK). However, Germany has another major source of revenue raising: social insurance contributions. In Germany, social insurance contributions display a slightly regressive structure and thus favor the wealthy. For the UK, the low levels of the Suits index for social insurance contributions indicate that contribution payments are almost proportionally distributed along the income scale and do not change income inequalities. In contrast, indirect taxes reveal a substantial regressive structure with Suits indices of less than -.25 in both countries. On average, indirect taxes are slightly less regressive in the UK. This might be attributed to the differing VAT legislation in the UK that generally applies zero rates to unelastic goods such as food, children's' clothing, and pharmaceuticals (see Table 3.4.1).

The empirical measurement so far confirms all common expectations about the established patterns of progressivity of separate fiscal instruments. The progressivity of income taxation is equally confirmed as the assumption that the indirect tax burden is disproportionally higher for low-income households, due to their higher marginal propensity to consume. With respect to time trends in the effective progressivity of taxes and benefits, we cannot identify any clear trends for the UK. Rather, short-term positive and short-term negative developments cancel each other out over the whole observation period. For Germany, we see that the progressivity of income taxes is increasing over time, whereas the indirect taxes seem to become more regressive. What is, however, a surprising result is the fact that the regressive structure of indirect taxes (and social insurance contributions) almost balances the progressive structure of incomes taxes in both countries. Thus, taken all revenue side sources together, their structure is almost proportional (see "all taxes" in Figure 3.5.2). This is true for the average value and for the development of "all taxes" over time.

The above-presented theories imply statements about changes of the fiscal ar-

chitecture of the welfare state over time. We expect the redistributive capacities of fiscal welfare state instruments to shift from the revenue-raising side to the spending side as a result of economic integration. In contrast to Figure 3.5.2, Figure 3.5.3 displays the level of redistributive effects of the taxes and benefits, as measured by the Reynolds-Smolensky index. Therefore, besides the structure and the distribution of tax benefit components, here we also take into account the average tax rates, meaning the importance of financing and spending sources.[52] If we first look at the overall levels of redistribution (average values of RS-index) of the different instruments, Figure 3.5.3 reveals that benefits achieve the highest amounts of effective redistribution. Benefits substantially decrease the inequality in the distribution of incomes along households. With an average RS-index of .16 in Germany and .13 in the UK, the redistributive effects of benefits are higher in Germany than in the UK, although above we revealed similar values of regressivity. This illustrates the higher benefit generosity in the German welfare state. Also, as suggested by the approximately proportional structure of the financing side, virtually no redistribution is achieved by the total tax system. In fact, with respect to the financing side, only income taxes reveal a significant redistributive effect, illustrated by a positive Reynolds-Smolensky index of on average .03 in Germany and .02 in the UK. On the other hand, the figure shows that indirect taxes lead to a considerable increase in the inequality of incomes, with increasingly larger disequalizing effects in Germany. In Germany, the contribution payments also have a considerable negative impact on income inequality, whereas in the UK they rarely reveal any effect. Overall, the redistribution by the overall system is substantially larger in Germany with an average RS-index of .23 compared to .16 in the UK.

If we then look at the development of the redistributive effects of the separate fiscal instruments over time, one might first become aware of the measurements' unfortunate high sensitivity to economic cycles, which might explain the waved shape of the lines. However, some discreet interpretation may be allowed in order to gain evidence for the validity of the suggested causal mechanisms. For Germany, we find a slight increase in the redistributive effect of income taxes. Therefore, we find no evidence for increasingly regressive income taxes as suggested by the efficiency theory. However, this trend is overbalanced by negative trends in social insurance contributions and even more in indirect taxation. Thus, the RS index of the revenue side displays a clear negative trend over the observation period. For social benefits, we find an apparent upward trend. Overall, this involves an

[52] The development of average tax rates, the residual component in this examination, is illustrated in Figure 3.7.2 in the Appendix.

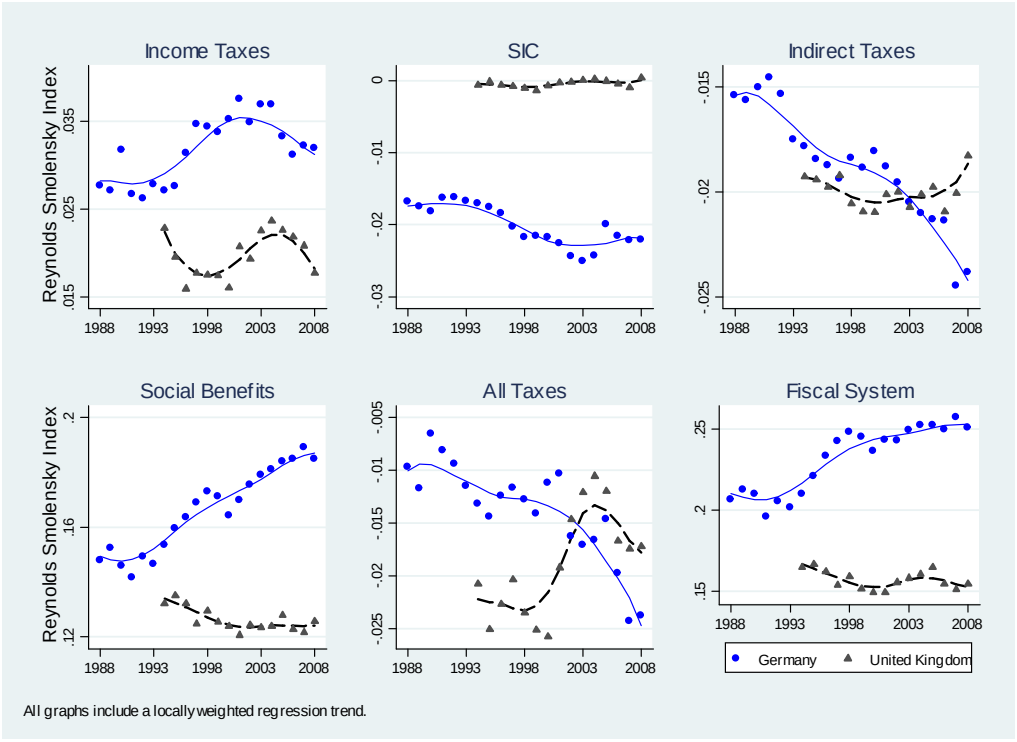

Figure 3.5.3: Development of redistribution of separate fiscal instruments

increasing redistributive effect of the total fiscal system. Therefore, we find some evidence that supports the hypothesis of substitution in Germany, indicating a shift of redistributive capacities from the revenue-raising side to the spending side. The decreasing progressivity of taxation due to upgraded meaning of regressive indirect taxes is on the horizon. As predicted in the theory section, benefits are increasingly important for equalizing incomes. For the UK, the different revenue sources do not reveal any clear trends. The redistributive effects of social benefits seem to be slightly decreasing over time. Thus, for the UK, the micro evidence suggests quite different trends than suggested by the macro developments in Figure 3.5.1. This effect is also recovered in the development of the effective redistribution achieved by the entire fiscal system. Thus, we do not find any evidence for a substitution of the redistributive capacities of taxes and benefits in the UK in the period under observation.

As outlined in the Section 3.3, the Reynolds-Smolensky measure captures the impact of fiscal instruments on vertical equity. However, as Figure 3.7.1 in the Appendix shows, the trends are very similar when we look at overall redistribution that takes into account effects on horizontal equity (re-ranking effects). A comparison of Figure 3.7.1 with Figure 3.5.3 also shows that re-ranking effects quite

substantially decrease the equalizing effects of income taxes and social benefits in both countries. The effects are particularly pronounced in Germany where the redistributive impact of the total fiscal system decreases from .23 to .19 (from .16 to .14 in the UK).

3.5.2 Robustness checks

In the analysis so far, we have neglected that the redistributive effect is determined by both tax benefit policies and the influence of the pre-government income distribution. As already noted, pre-government incomes are influenced by a number of factors other than policy changes, such as socio-economic and demographic changes, as well as the behavioral effects induced by tax benefit policies. Musgrave and Thin (1948: 510) stated decades ago, *"The less equal is the distribution of income before tax, the more potent will be a progressive tax structure in equalizing income"*. See Figure 3.5.4 for the development of pre- and post-government income inequality in Germany and the UK. Dardanoni and Lambert (2002) developed a so-called *transplant-and-compare* procedure (also referred to as *DL* procedure) that seeks to correct for such distributional differences in pre-government incomes in order to isolate the pure redistributive effect of tax benefit policies. The general idea of the approach is to find the post-government distribution of incomes that may have occurred if a certain tax benefit regime operated on some reference/baseline distribution of pre-government incomes rather than on the actual distribution.[53]

More formally, define N as an income schedule that maps pre-government incomes x into post-government incomes y. The pre-government distribution of incomes is symbolized by $F(x)$ and the pair $\langle N, F\rangle$ represents the overall tax benefit regime. The DL procedure then sets out to find a modified post-government income schedule N^g, which would occur if the income schedule N was applied to a deformed pre-government distribution $F \circ g^{-1}$, where $g(x)$ represents the deformation function and is the composition operator. By identifying an appropriate transformation function $g(x)$, any tax benefit regime can be transplanted into a reference distribution F_0. Thus, $\langle N, F\rangle^g$ is the tax benefit regime induced by the regime $\langle N, F\rangle$ on the distribution on deformed incomes $F \circ g^{-1}$, with $\langle N, F\rangle^g = \langle N, F_0\rangle^g$, when F_0 is the reference distribution in which regimes are transplanted by $g(x)$. After such transplantation, we will find redistributive effects that are invariant to the choice of the reference distribution if, and only if, candidate distributions

[53] The formal framework which is explained in the following is based on Dardanoni and Lambert (2002) and Lambert and Thoresen (2009).

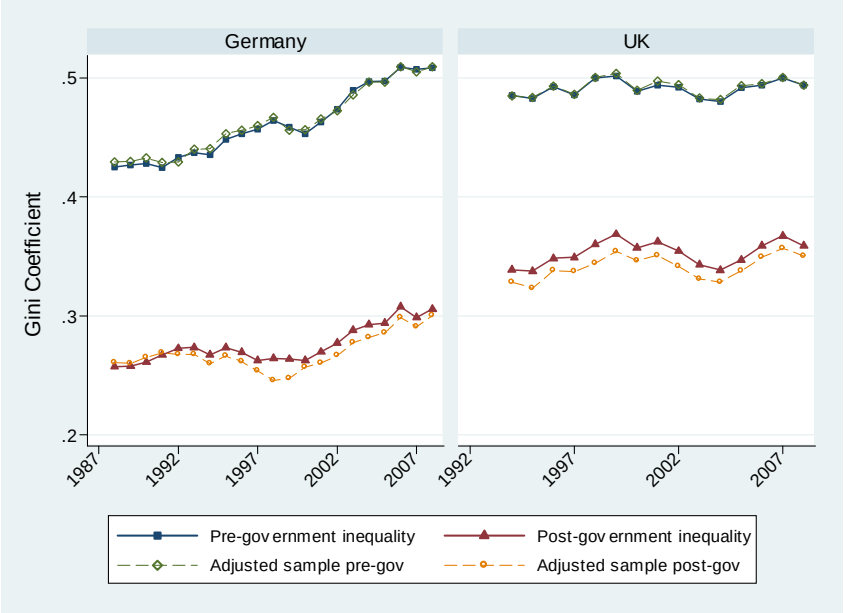

Figure 3.5.4: Development of pre- and post-government inequality

Note: Solid lines represent inequality levels based on the same sample as the baseline estimations in Section 3.5.1, dashed lines are based on the adjusted samples on which the transplant-and-compare procedure is applied.

are isoelastic transformations of one another, meaning that the pre-government distributions only differ by *location* and *scale*.

In practical terms, the transformation function $g(x)$ can be estimated by a simple bivariate OLS regression, where the logs of the reference pre-government incomes at each quantile are regressed on the logs of the quantiles of the actual pre-government incomes of year t:

$$\ln x_i^{F_0} = a_t + b_t \ln x_i^{F_t} + \varepsilon_i \tag{3.5.1}$$

with ε_i as an idiosyncratic error term and i as the rank of observations in the income distribution (in equal-sized samples). If there exist a_t and $b_t > 0$ such that the distribution of $a_t + b_t \ln x_i^{F_t}$ is sufficiently close to the reference distribution $F_0(x)$, then the post-government incomes y can be adjusted by the location and scale parameters as revealed from equation 3.5.1:

$$y_i^{\hat{g}} = e^{\hat{a}+\hat{b}\ln y_i + \delta^2/2} \tag{3.5.2}$$

where $y_i^{\hat{g}}$ indicates post-tax incomes that have been adjusted by a fitted deformation function $g(x)$.[54] Similarly, we derive the transplanted distribution of

[54] Lambert and Thoresen (2009) also add a random component to the fitted values because it

pre-government incomes.[55] The measure of goodness-of-fit is the R^2 of the OLS regression, which then becomes the key indicator of the isoelastic link between the reference and the actual distribution of pre-government incomes. Thus, the R^2 should be sufficiently close to 1 to ensure isoelasticity and baseline independence of the results. If relative pre-government income differentials are smaller in the baseline distribution than in the respective actual distribution, we will find $b < 1$, if the reference distribution displays higher inequality, then $b > 1$.

However, before we can apply the transplant-and-compare approach based on our data, some practical problems have to be solved. First, we can only identify deformation functions in the case of equal-sized samples across the different years. Thus, all sample sizes of the different years have to be adjusted to the smallest sample size over the observation period (see footnote 23 in Dardanoni and Lambert (2002)). In the UK, where sample sizes only differ slightly across years, we thus downsize all samples to 5,764 observations (sample size from 2008). In Germany, however, the sample size of the SOEP micro data almost doubled in 2000. Therefore, we decided to separately apply the transplant-and-compare method to 1988–1999 (4,636 observations) and 2000–2008 (11,067 observations). For the UK, we choose 1994 as the reference distribution and 1988 and 2000 for Germany. Second, in order to define identical ranks in the pre- and post-government distribution of incomes, we have to ensure that there is no re-ranking of observations (no horizontal inequality). The simplest approach to achieve this is to separately sort pre- and post-government incomes, such that in the end there is perfect association between households' pre- and post-government living standards.[56] The results of the OLS regressions for the different years are illustrated in Table 3.7.3 in the Appendix. For Germany, we find R^2 values above 0.97 in all estimations which provides strong support for an isoelastic relationship between the different pre-government income distributions. With R^2 estimates slightly above 0.75 in some years, the fit is somewhat poorer in the UK.

increases the fit between the baseline and the deformed distribution. However, in our case the fit becomes poorer if we add such a random component.

[55] Instead, we could also use the actual values of the baseline pre-government income distribution (see Appendix C in Lambert and Thoresen (2009) for a discussion of this issue). However, if we use actual values of the baseline distribution instead of fitted values of the deformed distribution, this does not change the general trends of the variables (only the shape of the trend becomes more similar across the different fiscal instruments).

[56] If we observe equals among pre- or post-government incomes, we add a small random number between zero and one to one of such observations, thereby ensuring that we have no ties in the ranking of incomes. Similarly, we revert zero and negative incomes into small random numbers since logarithms are not defined for zero or negative numbers. We shall refer to this again later.

Figures 3.5.5 and 3.5.6 represent the results for the transplant-and-compare procedure for Germany and the UK, respectively. Due to the various adjustments to the original samples in the different years, we contrast the resulting vertical redistribution from deformed incomes with redistributive effects from the standard approach based on identical samples. We first observe that the sample adjustments substantially change the resulting redistributive effects. In Germany, the redistributive effects of all revenue-raising instruments increase (income taxes become more redistributive, social insurance contributions, and indirect taxes less regressive) and the redistributive effect of social benefits and the overall fiscal system significantly decreases. We also find that the regressivity of all taxes is not robust to these sample adjustments. Basically, the same is true for the UK, except that here all taxes together still reveal an inequality increasing effect. With respect to the differences of the redistributive effects based on deformed incomes rather than those based on the standard, year-specific approach, we only find small changes and the overall trends remain the same across all fiscal instruments. In Germany, the only noteworthy difference is slightly smaller redistributive effects of income taxes until the early 2000s. Since we also observe an increase in pre-government inequality over this time period (see Figure 3.5.4), this would be in line with the claim by Musgrave and Thin (1948) that more unequal distributions mechanically lead to higher redistributive effects. However, we also find this decrease of the redistributive effects of income taxes for the UK where we do not observe an increase in the inequality of pre-government incomes. Furthermore, in the UK, we observe larger redistributive effects of social insurance contributions and social benefits when based on the 1994-transformed pre-and post-government distributions, resulting in a larger redistributive effect of the overall fiscal system. Overall, the trends and qualitative findings remain very robust across the two approaches which would suggest that behavioral and other factors do not play a large role in our analysis.

Note, however, that there are limitations to the transplant-and-compare approach as applied here (and similarly in Lambert and Thoresen (2009)). First, the approach does not allow for the inclusion of zero or negative incomes in the assessment of distributional outcomes. Second, decisions have to be taken how to treat equal incomes across households. Finally and most importantly, inequality orderings based on logarithms may be different from those based on levels. Thus, although inequality levels may suggest greater dispersion in pre-government incomes in the reference year ($b > 1$), the opposite may be true for the inequality in logarithmic incomes (thus we may find $b < 1$ in our logarithmic regressions). This

may be problematic since comparisons of the redistributive effects are based on levels again. Accordingly, we also applied the transplant-and-compare procedure based on a linear specification of the OLS regression. However, for some years the goodness-of-fit is rather poor, resulting in arbitrary deformation functions and ambiguous results.

An alternative to the transplant-and-compare procedure is the so-called fixed-income approach.[57] Here, counterfactual simulations are used to identify what redistributive effects would have been if either the pre-government distribution or the tax benefit policies remained unchanged.[58] For example, Bargain et al. (2011) provide a detailed analysis of the redistributive effects of income taxes for the United States. In contrast to our findings, they found that other factors, in particular, behavioral effects, played an important role in the assessment of distributional outcomes. However, we are not able to replicate their approach here, since comprehensive tax benefit simulation models for both countries and all years would be needed.

3.6 Conclusion

The main concern of this chapter is to offer a reliable examination of fiscal redistribution in modern welfare states. Starting from a methodological critique of studies using macro indicators as a proxy for redistribution, this leads to some conceptual and methodological modifications of major empirical relevance. As opposed to the majority of existing studies, we rely on annual micro data and sophisticated progressivity measures to analyze structural changes in the composition of national fiscal systems and to evaluate the development of effective redistributive outcomes over time. Thus, our project provides a comprehensive dynamic analysis of effective fiscal progressivity and redistribution by including the majority of relevant fiscal elements: direct taxation, payroll taxes, indirect taxes, and benefits. Another important achievement of this analysis is to test dynamic hypotheses about the development of welfare states in the context of economic integration and globalization. In the review of established political economic theories, we

[57] See Kasten et al. (1994), Clark and Leicester (2004), Alm et al. (2005), Bargain and Callan (2010) and Bargain et al. (2011) for applications of this simulation approach to identify distributional (tax) policy effects.

[58] Note that Lambert and Thoresen (2009) show that this approach may not be independent of the choice of the baseline income distribution. However, this problem may be solved by simulating counterfactuals for all possible combinations of pre-government income distributions and tax benefit schedules (see Bargain and Callan (2010) and Bargain et al. (2011)).

Figure 3.5.5: The transplant-and-compare Reynolds-Smolensky index for Germany

Note: Triangles represent redistributive effects based on the standard approach as applied in Section 3.5.1, dots illustrate redistributive effects based on the transplant-and-compare approach based on the reference year 1988 for the period until 1999 and the reference year 2000 from then onwards.

deduced our guiding hypothesis that predicts that redistributive capacities shift from the revenue-raising side to the spending side. That is because, on the one hand, increased competitive pressure is held responsible to trigger market-friendly tax reforms that cut top tax rates and increasingly rely on more efficient indirect taxes, which both reduce overall tax progressivity. On the other hand, under the assumption of strategic voting and utility maximizing individuals, increased social risk should lead to an increased demand for compensating social policies. This should translate into increased generosity of welfare spending and more target efficiency of transfer payments. Thus, the leading hypothesis is that the redistributive capacities shift from the taxation to the spending side, meaning that the redistributive effects of taxes and benefits are empirical substitutes.

In our empirical analysis, we then consider the distribution of a fiscal instrument along the income scale, which allows statements about the structure of fiscal instruments (progressivity) and its redistributive capacities. Our study contributes to the empirical evaluation of welfare state effort, by exploring the redistributive effects of the entire welfare state and discrete fiscal instruments. Additionally, the decomposition of redistributive effects into structure and size effects reveals

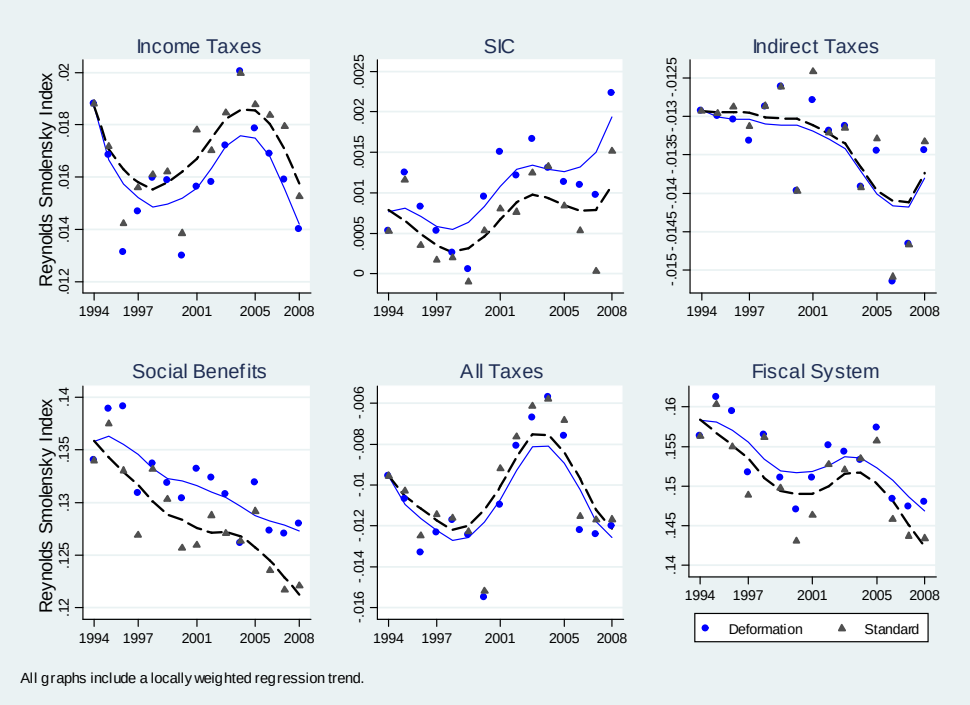

Figure 3.5.6: The transplant-and-compare Reynolds-Smolensky index for the UK

Note: Triangles represent redistributive effects based on the standard approach as applied in Section 3.5.1, dots illustrate redistributive effects based on the transplant-and-compare approach based on the reference year 1994.

the fiscal architecture of redistributive policies of the welfare state. What distinguishes our project from other studies is our attempt to consider indirect taxes in the mix of redistributive fiscal instruments. Our results, in fact, reveal that the regressive structure of indirect taxation absorbs the redistributive effects from other progressive revenue-raising instruments. However, in the case of Germany, this finding is not robust with respect to certain sample adjustments. With regard to the test of our substitution hypothesis, the shift of redistributive capacities only takes place in Germany in the expected manner, but not in the UK. Thus, even though both states are subject to the same external pressure, the politics and the economic outcomes obviously seem to depend on national specifications. We are not observing a universal reform trend in response to economic integration and globalization. These diverging trends in Germany and the UK remain qualitatively the same, even when we control for the impact of changes in the pre-government distribution.

There is an obvious restraint to this conclusion: so far, for the UK, we only observed data from 1994 onwards. Therefore, the shift might already have taken place before our observation period. Indeed, the former Prime Minister Margaret

Thatcher had implemented radical tax cuts and major welfare reforms. At least for the later period, we still identify clearly diverging trends - an important result. Future research should particularly draw attention to the political process that varies with different political institutions. Political institutions come into question as explanatory variables for different patterns in the development of redistributive policies as the political system in the UK - with its strictly pluralist and majoritarian tradition - differs considerably from the corporatist tradition in Germany and its multitude of veto points. Indeed, this analysis shows that redistribution is caused by the interaction between politics and economics or, more precisely, redistribution is an interaction effect that results from the distribution of a fiscal instrument over the distribution of economic resources. Finally, we would like to motivate further research to follow our micro approach of measuring redistribution and to add evidence for other countries. It would be of special interest to analyze cases from the family of Nordic welfare states and to test whether the tax mix of these countries, which is known for high income-tax ratios, is still realizing an effective redistribution of income when all revenue-raising instruments are considered.

Also, we only provide evidence on descriptive bivariate relationships between taxation and spending that does not allow for the identification of any causal effects between the two variables of interest. Nevertheless, we believe that our analysis is a necessary first step in analyzing the development of redistributive capacities of welfare states, founded on appropriate data and methodology of capturing the effective redistribution of different fiscal instruments. The analysis provides a good foundation for future research on this topic. In particular, it would be interesting to look at some exogenous variations in national tax codes that imply decreases in the structural tax progressivity and to evaluate their impacts on both the redistributive capacities of taxes and social benefits.

3.7 Appendix

Dependent variable: Log of indirect taxes

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	1988	1993	1998	1999	2003	2007
Log of dpi	2.075***	1.171***	1.712***	1.727***	0.789***	0.805***
	(0.085)	(0.076)	(0.084)	(0.085)	(0.075)	(0.076)
Log of dpi squared	-0.064***	-0.023***	-0.048***	-0.049***	-0.006*	-0.007*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Age	0.007***	0.008***	0.009***	0.009***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age squared	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of children	-0.043***	-0.049***	-0.055***	-0.055***	-0.063***	-0.063***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Household size	0.023***	0.041***	0.059***	0.058***	0.082***	0.081***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Married	0.053***	0.076***	0.085***	0.085***	0.083***	0.082***
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Retired	0.056***	0.070***	0.062***	0.062***	0.066***	0.065***
	(0.007)	(0.007)	(0.008)	(0.009)	(0.008)	(0.008)
Observations	44,185	40,227	49,710	49,710	42,730	42,730
R^2	0.621	0.599	0.517	0.516	0.538	0.535

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.7.1: OLS coefficients of indirect tax imputation

Source: Own computations based on EVS data.

	1988	1989	1990	1991	1992	1993	1994
Actual VAT revenue (in bn)	34.60	34.77	39.89	50.51	59.96	89.22	99.84
Simulated VAT revenue (in bn)	35.75	37.49	39.41	42.15	51.57	59.64	61.98
Simulated/ actual VAT revenue	103.3%	107.8%	98.8%	83.5%	86.0%	66.9%	62.1%
	1995	1996	1997	1998	1999	2000	2001
Actual VAT revenue (in bn)	101.49	102.45	102.23	104.14	111.60	107.14	104.46
Simulated VAT revenue (in bn)	62.38	63.96	65.30	61.41	66.08	68.73	69.41
Simulated/ actual VAT revenue	61.5%	62.4%	63.9%	59.0%	59.2%	64.2%	66.5%
	2002	2003	2004	2005	2006	2007	2008
Actual VAT revenue (in bn)	105.46	103.16	104.72	108.44	111.32	127.52	130.79
Simulated VAT revenue (in bn)	69.80	71.93	72.03	72.88	73.47	83.86	85.71
Simulated/ actual VAT revenue	66.2%	69.7%	68.8%	67.2%	66.0%	65.8%	65.5%

Table 3.7.2: Actual and simulated VAT revenues in billions of Euro

Source: Bundesministerium der Finanzen, Kassenmäßige Steuereinnahmen; own computations based on SOEP (and EVS) data.

Dependent variable: Log of reference pre-government incomes F_0

GERMANY						
Reference year 1988	a_t	(s.e.)	b_t	(s.e.)	Obs.	R^2
$\ln F_{1989}$	0.547	(0.020)	0.936	(0.002)	4,636	0.976
$\ln F_{1990}$	0.164	(0.019)	0.971	(0.002)	4,636	0.980
$\ln F_{1991}$	-0.322	(0.008)	1.016	(0.001)	4,636	0.997
$\ln F_{1992}$	0.067	(0.028)	0.984	(0.003)	4,636	0.959
$\ln F_{1993}$	-0.123	(0.021)	0.999	(0.002)	4,636	0.977
$\ln F_{1994}$	0.026	(0.005)	0.982	(0.001)	4,636	0.999
$\ln F_{1995}$	0.230	(0.006)	0.962	(0.001)	4,636	0.998
$\ln F_{1996}$	0.615	(0.019)	0.919	(0.002)	4,636	0.978
$\ln F_{1997}$	0.433	(0.010)	0.940	(0.001)	4,636	0.994
$\ln F_{1998}$	1.236	(0.021)	0.860	(0.002)	4,636	0.970
$\ln F_{1999}$	1.047	(0.019)	0.876	(0.002)	4,636	0.977
Reference year 2000						
$\ln F_{2001}$	0.215	(0.007)	0.976	(0.001)	11,067	0.993
$\ln F_{2002}$	-0.409	(0.011)	1.017	(0.001)	11,067	0.986
$\ln F_{2003}$	-0.174	(0.014)	0.999	(0.002)	11,067	0.976
$\ln F_{2004}$	-0.306	(0.013)	1.014	(0.001)	11,067	0.979
$\ln F_{2005}$	-0.123	(0.015)	0.998	(0.002)	11,067	0.972
$\ln F_{2006}$	0.604	(0.008)	0.932	(0.001)	11,067	0.991
$\ln F_{2007}$	0.517	(0.013)	0.937	(0.001)	11,067	0.977
$\ln F_{2008}$	0.286	(0.009)	0.958	(0.001)	11,067	0.990
UNITED KINGDOM						
Reference year 1994	a_t	(s.e.)	b_t	(s.e.)	Obs.	R^2
$\ln F_{1995}$	0.110	(0.005)	0.970	(0.001)	5,764	0.994
$\ln F_{1996}$	0.333	(0.036)	0.879	(0.007)	5,764	0.755
$\ln F_{1997}$	0.090	(0.037)	0.915	(0.007)	5,764	0.763
$\ln F_{1998}$	-0.362	(0.038)	1.005	(0.007)	5,764	0.778
$\ln F_{1999}$	-0.186	(0.037)	0.961	(0.007)	5,764	0.769
$\ln F_{2000}$	0.037	(0.036)	0.899	(0.006)	5,764	0.771
$\ln F_{2001}$	0.442	(0.019)	0.823	(0.003)	5,764	0.918
$\ln F_{2002}$	0.002	(0.020)	0.909	(0.003)	5,764	0.922
$\ln F_{2003}$	-0.002	(0.019)	0.905	(0.003)	5,764	0.931
$\ln F_{2004}$	-0.663	(0.032)	1.006	(0.006)	5,764	0.843
$\ln F_{2005}$	-0.273	(0.024)	0.940	(0.004)	5,764	0.899
$\ln F_{2006}$	-0.152	(0.019)	0.906	(0.003)	5,764	0.929
$\ln F_{2007}$	0.040	(0.017)	0.871	(0.003)	5,764	0.943
$\ln F_{2008}$	0.183	(0.018)	0.839	(0.003)	5,764	0.934

Table 3.7.3: Bivariate OLS estimations of location and scale parameters

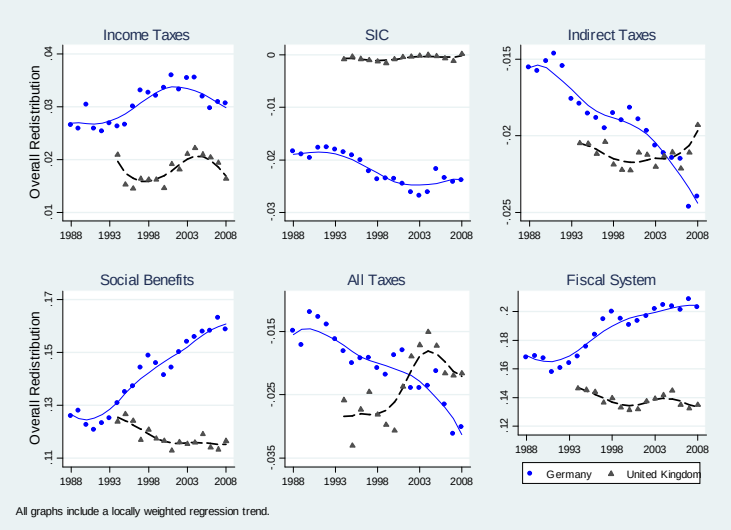

Figure 3.7.1: Development of overall redistribution

Note: This graph illustrates the absolute reduction in Gini coefficients achieved by the different fiscal instruments (inclusive re-ranking effect).

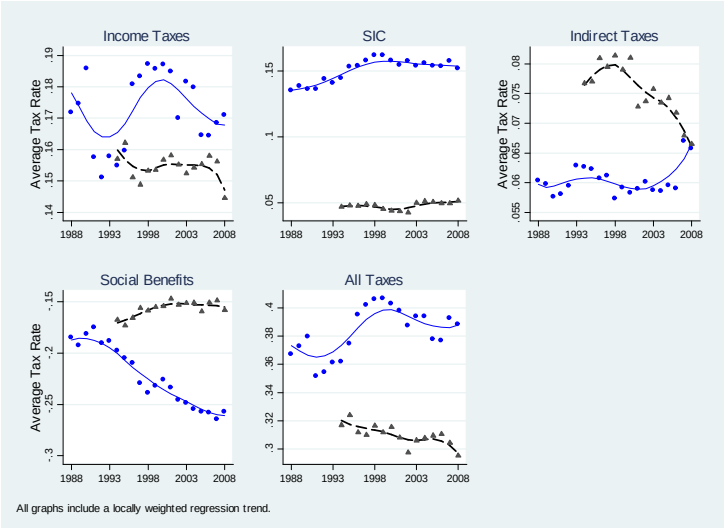

Figure 3.7.2: Development of average tax rates of separate fiscal instruments

Chapter 4

Social spending and income inequality

Using a dynamic panel approach, in this chapter we assess the causal relationship between social spending policies and income inequality. Whereas spending generosity significantly reduces income inequality, the positive effect of more low income targeting on the pre-government distribution of incomes hints at the importance of second-order effects when analysing the redistributive effects of social policies.[59]

4.1 Introduction

The relationship between redistributive policies and income inequality has generated much debate among social scientists and policy makers. In particular, the equity efficiency trade-off is fundamental in the public finance literature, and state interventions are often considered to decrease efficiency. Market forces alone, however, do not necessarily bring about a desirable distribution of income in terms of equity. This is seen as a justification for government intervention, and it is widely accepted that public policies can play a key role in redistributing income. However, while there is supposedly no doubt that all nations would ceteris paribus prefer less income inequality among their citizens, they differ dramatically in the extent to which they reach this goal. Therefore, understanding the differences in the design of fiscal and social policies and their corresponding distributive outcomes is crucial not only to public economics, but also to other social sciences.

Using a dynamic panel approach with European countries and a time period from 1993 until 2007, this chapter investigates whether a more generous welfare

[59] This chapter is based on Niehues (2010).

state is indeed causally related to more equality in the distribution of incomes. Besides the overall effect of social spending, this study also asks which kind of benefits are most effective in reducing income inequality by examining the specific structure and characteristics of benefits. In particular, the theoretical framework of the analysis elaborates on how far inequality reducing first-round effects might be offset by negative behavioral responses induced by redistributive social policies. As a consequence, the total effect on income inequality is ambigous. While the most extensive part of the empirical analysis looks at the determinants of post-government income inequality (i.e., the overall effect), behavioral second-order effects are identified by using next-period pre-government income inequality as a dependent variable.

Generally, the approach can be regarded as part of the large body of literature that tries to identify the determinants of income inequality in cross-national comparison (see Atkinson and Brandolini (2004) for a survey). One of the most tested theories of income inequality is the well-known Kuznets hypothesis (Kuznets (1955)), which predicts an inverted-U relationship between inequality and the level of economic development (see, among others, Galor and Tsiddon (1996); Barro (2000), Li et al. (2000)). Further studies focus on other macroeconomic factors such as globalization (Edwards (1997), Alderson and Nielsen (2002), Dreher and Gaston (2008)), inflation (Bulir and Gulde (1995), Galli and van der Hoeven (2001)) or financial development (Clarke et al. (2006)) to explain variations in income inequality across countries.

The effect of institutional factors on income inequality has been analyzed less. This is certainly due to the inherent endogeneity of policies with respect to inequality levels. Because social policies might be thought of as mechanisms for reducing income inequality, they might also be determined by inequality levels. This raises the problem of reverse causality. Recently, some studies have become available that focus on the impact of labor market institutions on income inequality, using instrumental variable approaches to handle endogeneity issues. For example, Checchi and García-Peñalosa (2008, 2010) develop a formal model of how labor share, union density, and unemployment benefits influence income inequality. Using three-stage least squares, they find that labor market institutions indeed reduce income inequality, but that this effect is associated with higher unemployment rates. Calderón and Chong (2009) apply the System GMM-IV approach and find that both de jure and de facto labor market regulations tend to improve the equality of incomes. They also evaluate the effect of separate regulations and reveal distinct effects. In the context of fiscal policies, Duncan and Sabirianova Peter

(2008) analyze the effect of the structural progressivity of income taxes on inequality in observed and true incomes. They use a two-stage least squares approach with weighted averages of tax/progressivity measures in neighboring countries as instruments for their fiscal policy variable.

Although most studies of inequality determinants also control for the impact of social spending, to the best of our knowledge, the effect of social policies as a key explanatory variable of income inequality has not yet been analyzed. Also, none of these studies has accounted for the endogeneity of social policies with respect to income inequality. Thus, in line with Dreher and Gaston (2008) and Calderón and Chong (2009), we apply the System GMM estimator, which is capable of dealing with the issue of reverse causality in a dynamic panel design, to evaluate the impact of social policies on income inequality. Instead of relying only on internal instruments, however, we also use the presumably random incidence of certain diseases to instrument for the possible endogeneity of redistributive policies.

The regression results suggest that a larger redistributive budget is strongly related to lower income inequality levels. The effect also remains robust when using differing numbers of instruments and data restrictions, supporting a causal effect of social spending levels on income inequality. Looking at the structure of benefits, the age-related and unemployment benefits in particular are responsible for the inequality reducing impact. More targeted benefits, however, do not significantly reduce income inequality. Rather, the positive effect on pre-government income inequality hints at the importance of possible disincentive effects associated with means-testing.

The chapter is organized thus: In Section 4.2, we introduce the theoretical considerations underlying the analysis. Section 4.3 describes the data and methodology. Section 4.4 presents the regression results, and Section 4.5 summarizes the main findings.

4.2 Theoretical framework

Some mechanisms correlate the welfare state to income inequality, wherein the term "welfare state" is used as shorthand for the total of social benefits provided by the state. The objective, however, is not to provide a complete theoretical picture of all possible effects of policies that influence inequality, but rather to highlight some major mechanisms to develop testable hypotheses. The focus of this study is certainly the empirical exploration of the impact of social spending

on income inequality.

At first glance, the impact of the welfare state on income inequality seems trivial, since as long as social benefits are somehow redistributive, the first-round effect on the inequality of post-government incomes is by definition negative. This effective redistributive effect is usually measured in micro studies by comparing pre-government income inequality with the inequality in post-transfer incomes. Indeed, Immervoll et al. (2005), Whiteford (2008) and Fuest et al. (2010) find substantial redistributive effects of social benefits. Consequently, one might expect a negative effect of social benefits on income inequality. However, this standard approach of measuring redistribution is problematic because it neglects the fact that the pre-government distribution of income is not independent of welfare state policies. Social benefits are generally associated with behavioral second-order effects that then influence the distribution of market incomes before government intervention. In fact, the provision of income transfers might influence behavior in manifold ways, with each having differing impacts on income inequality.[60] we will focus on the labor-supply–related responses induced by social policies and their possible impact on the distribution of incomes.

Generally, all forms of social protection create some disincentives to work. As standard consumer theory suggests, any additional transfer payments shift the recipients' budget constraints, which means that recipients have to work less to obtain a given standard of living. Assuming that leisure is a normal good, the positive income effect reduces the labor supply. If the design of the benefit involves a benefit reduction as income increases, this will impose an implicit marginal tax rate on additional earnings that also unambiguously decreases the labor supply. Supposing that low income earners reduce their labor supply more than high income earners, social benefits will lead to an increase of pre-government income inequality. In the empirical labor supply literature, it is a robust finding that average labor supply elasticities (taking into account participation elasticities as well as hours of labor supply) strongly decline with income (as pointed out in Røed and Strøm (2002) and also recently found in Aaberge and Colombino (2006)). If benefit levels discourage recipients from taking part in the labor market at all, this leads to an increase in the unemployment rate, which in turn also increases pre-government income inequality. Given these considerations, we expect a posit-

[60] Income transfers may have an impact on private savings and investments, on demographic choices, the unemployment rate, consumption decisions, and the formation of human capital (see Danziger et al. (1981) for further references). In addition, the financing sources of benefits such as taxes and contributions are also associated with their own behavorial responses, which are not discussed here.

ive effect of social benefits on pre-government income inequality.[61] Thus, taking into account second-order disincentive effects, the redistributive effects of social benefits might be smaller than the micro-studies would suggest. In fact, at the macro level, the distributional effect of social benefits on post-government income is a priori not clear. The hypothesized effects of the welfare state on pre- and post-government income inequality are also illustrated in Figure 4.2.1.

The "welfare state," however, is a complex construct that consists of several different social programs, each with different objectives and thus different effects on the distribution of pre- and post-government incomes. Most generally, social benefit programs can be divided into two groups: social insurance versus social assistance benefits (Danziger et al. (1981), Barr (2004)). Whereas social assistance benefits are generally provided on the basis of an income test to help people with low incomes, the main objective of social insurance benefits is to maintain income in the face of adverse risks (such as unemployment, disability, and sickness) or to redistribute income across the life-cycle (age-related benefits, family-related benefits).

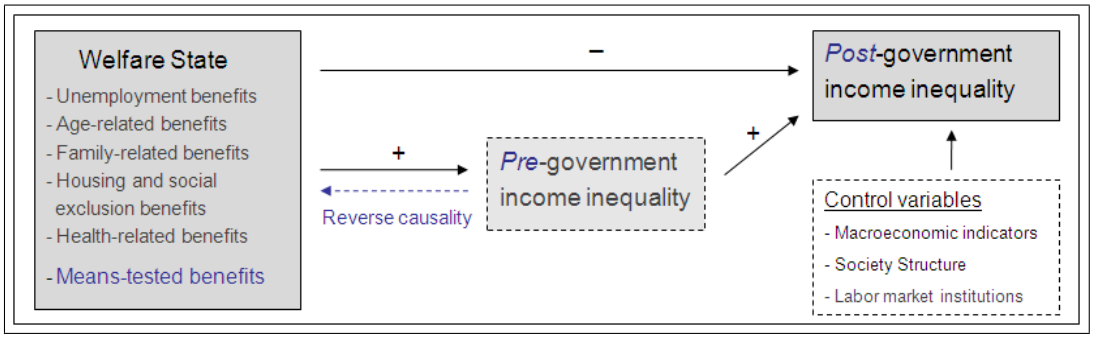

Figure 4.2.1: Social spending policies and income inequality

These different objectives of the benefit functions imply different expectations about their distributional outcomes.[62] For example, insurance-related benefits such as unemployment, sickness, and disability benefits need not necessarily be organized to redistribute from the rich to the poor. In the case of insurance-related benefits, one does not have to claim financial need, but eligibility and

[61] The "redistributive paradoxon" introduced by Sinn (1995) strengthens the expectation of a positive effect of the welfare state on pre-government income inequality. The underlying argument is that the social security system induces increasing investment in risky assets and moral hazard effects. Therefore, paradoxically, more redistribution may result in more post-tax inequality.

[62] The following explanations about expected distributional outcomes of different social benefits mainly draw upon Barr (1992) and Barr (2004).

benefit level depend on past contributions and the event of unemployment, illness, or invalidity. If the benefits are completely actuarial and designed exclusively to maintain status and income, they should have no equalizing effect. However, in most developed countries, the social insurance benefits of low income earners are disproportionally higher than their past contributions. Redistribution also occurs if benefit claims are more common in the low income part of the population, which is often the case. The argumentation in the context of public pensions is similar: Although redistribution is not an inherent part of pensions, most systems apply some redistributive formula that favors the poor. With respect to family-related programs, they usually imply redistribution (from rich to poor and across the life-cycle), since most families with children are typically among the younger segments of the populations that are characterized by low incomes. Housing benefits, on the other hand, are directly designed to help recipients meet the cost of housing, and eligibility is usually based on a kind of financial need test. Similar to the case of pure social assistance benefits (such as a minimum income guarantee), the main motive is vertical equity. Consequently, their expected first-round effect on income inequality is particularly high. Housing benefits and minimum income guarantees generally belong to the category of social assistance benefits.

With respect to the incentive effects of these different benefit functions, it is certainly possible to identify some expectations about typical behavioral effects. For example, it is generally assumed that extremely high unemployment benefits (replacement rates) provide little financial incentive to work, causing "unemployment traps" (Barr (2004); Meyer (2002)), which in turn increase pre-government income inequality. In the context of public pensions and labor-supply–related responses, it is discussed if they induce early retirement (Gruber and Wise (1998); Blundell et al. (2002)).[63] Family-related benefits are often expected to reduce the labor supply of second-income earners. In the case of unemployment benefits, however, empirical evidence suggests that the labor supply depends more on other characteristics such as the maximum duration of benefits than on the pure level of benefits (Atkinson and Micklewright (1991)). Furthermore, many programs involve some further eligibility conditions (e.g., working-tax credits, in-work benefits) that may partly offset behavioral disincentive effects (Blundell (2000)). Thus, to develop testable hypotheses of the behavioral effects of different benefit functions, further information on the specific design and financing of the program is

[63] Another debate relates to the question of whether public pensions reduce private savings (see for example Feldstein (1974)), with negative effects on economic growth and adverse effects on aggregate income inequality.

needed. Thus, the overall effect of different benefit functions on post-government income inequality remains an empirical matter.

From a theoretical viewpoint, the effect of means-tested benefits on pre-government income inequality is less controversial. Means-tested benefits generally involve a reduction in the level of benefits as earnings increase. This leads to implicit marginal tax rates above 100% and major labor-supply disincentives (Danziger et al. (1981); Pestieau (2006)). Since means-tested benefits are expected to reduce the labor supply more for low income earners than for high income earners, pre-government income inequality is expected to increase (Bergh (2005)). Therefore, the equalizing first-round effects of more targeting are likely to be counteracted by negative behavioral effects on pre-government income inequality.[64] As Atkinson (1995: 224) states, "*the case for greater targeting is typically based on the assumption of a fixed total budget for the social security ministry....Account has to be taken of changes in the behaviour of recipients, and the limits to targeting may arise from the adverse incentives created*'. Accordingly, we expect a clear positive effect of the proportion of means-tested benefits on pre-government income inequality. The overall effect on post-government income inequality, though, is a priori not clear.

Figure 4.2.1 also illustrates the endogeneity problem of social programs with respect to inequality in the pre-government distribution of incomes. Following the famous median voter theorem, higher inequality levels may also lead to higher redistribution (Meltzer and Richard (1981)). We will deal with this issue of reverse causality in the empirical part of the chapter. Figure 4.2.1 also hints at further control variables that are expected to influence income inequality. The choice of indicators is based on previous analyses of the income inequality determinants already described. Basically, we will use three sorts of indicators: macroeconomic factors, socio-economic society characteristics, and indicators for the influence of labor market institutions.

[64] Korpi and Palme's (1998) considerations of less political support and smaller redistributive budgets in the case of greater low-income targeting also provide arguments for the counteracting effects of redistributive effects of means-testing.

4.3 Data and methods

4.3.1 Data and conepts

The dependent variable of the main part of the empirical analysis is the Gini Coefficient of equivalized disposable income.[65] Disposable income means factor income originally earned at the market minus taxes plus social transfers; it therefore represents the income that finally matters for the individual. The unit of analysis is the individual. To compensate for different household structures and possible economies of scales within households, we use equivalized household incomes for computing Gini coefficients. For each person, the equivalized (per-capita) total net income is its household total net income divided by the equivalized household size, according to the modified OECD scale.[66] The data for the Gini coefficient is based on three different micro data sources. Data for the income reference period 1993 until 2000 is based on the ECHP (European Community Household Panel), a household survey with a common conceptual framework conducted in the member states of the EU, co-ordinated by the Statistical Office of the European Communites (Eurostat). The survey covers the old EU-15 member states, although data for Austria (1993), Finland (1993, 1994), and Sweden (1993-1995) is missing for the first periods. Gini coefficients for the year 2001 are based on the statistics of the baseline tax benefit systems of EUROMOD, a micro-simulation model for European countries.[67] Gini Coefficients from 2003 until 2006 are based on EU-SILC (Statistics on Income and Living Conditions) micro data, which is the successor of ECHP data. The EU-SILC provides harmonized cross-sectional and longitudinal multidimensional micro data on income and social exclusion in European countries. After its start in 2003 with seven European countries, in the 2004 wave, it covered all old EU-15 member states except Germany, the Netherlands, and the UK (Gini coefficients for these countries are also taken from the EUROMOD statistics). Since wave 2005, the dataset covers the 25 EU member states (except Malta), plus Norway and Iceland.

[65] In the case of maximum inequality, the standardized Gini coefficient equals one, and it corresponds to zero when all incomes are equal. Concerning the sensitivity on the distribution scale, the Gini coefficient attaches most weight to transfers among mid-level incomes.

[66] The modified OECD scale assigns a weight of 1.0 to the head of household, 0.5 to every household member aged 14 or more, and 0.3 to each child aged less than 14. Summing up the individual weights gives the household-specific equivalence factor.

[67] EUROMOD statistics on Distribution and Decomposition of Disposable Income, accessed at http://www.iser.essex.ac.uk/research/euromod/statistics/ using EUROMOD version no. D21 (June 2008). For further information on EUROMOD, see e.g., Sutherland (2001), Lietz and Mantovani (2006) and Sutherland (2007).

Overall, we have 223 observations for the Gini coefficient of post-government income, until 2003 covering the EU-15 countries and from 2004 onward also including the new European member states (except Malta, Slovenia, Romania, and Bulgaria) plus Norway, which is also included in the sample. Unfortunately, there are no comparable data sources for the EU-15 for 2002. Also, there is an unavoidable disruption in the time series of indicators produced when using different data surveys that has to be kept in mind when one interprets the results.[68] However, this is the best annual data available for EU member states. In fact, the cross-national comparability of the micro data and the time period covered are major contributions of this study.[69] In particular, the usage of micro data ensures that all Gini coefficients are based on the same income concept.

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-government Gini coefficient	223	29.02	4.43	20.48	39.24
Pre-government Gini coefficient	80	48.40	3.43	38.80	55.30
Social benefits/GDP	223	23.90	5.03	11.90	32.60
Means-tested/Soc Ben	223	9.08	6.55	0.82	33.12
Unemployment/Soc Ben	223	7.11	4.07	0.90	21.68
Family-related/Soc Ben	223	9.19	3.49	1.89	17.58
Invalidity/Soc Ben	223	9.39	3.31	3.75	19.06
Health and sickness/Soc Ben	223	27.72	4.61	17.53	42.66
Old-age and survivor/Soc Ben	223	43.26	7.92	24.68	64.09
Housing and exclusion/Soc Ben	223	3.33	2.06	0.11	7.78
GDP per capita (in 1000$)	223	31.36	14.30	6.19	78.89
Dependency ratio	223	49.14	3.33	39.36	59.05
Proportion higher education	223	63.28	18.47	17.80	90.30
Union density	223	37.87	21.26	8.00	85.10

Table 4.3.1: Descriptive statistics

In the second part of the analysis, we also use the Gini coefficient of original incomes as a dependent variable, meaning incomes before any redistributive gov-

[68] In various robustness checks, however, we check how far this structural break influences the results. Also, we restrict the sample to EU-15 countries and EU-SILC data only. The results are illustrated in the Appendix.

[69] See Atkinson and Brandolini (2001: 772), who comment on the pitfalls in the use of secondary inequality data: "*Gini coefficients of income inequality may be published for a range of countries, but there is no agreed basis of definition. [...] We cannot therefore be sure whether results of comparative or econometric analyses obtained using such data are genuine or a product of data differences.*"

ernment intervention. Unfortunately, data on pre-government incomes is only available from 2003 onward and then only for a limited country sample. Altogether, this totals at most 80 observations for the Gini coefficient of pre-government incomes. Still, comparability concerns decrease because the computation of the pre-government Gini coefficients is based on a single data source, which is EU-SILC micro data. Throughout the analysis, Gini coefficients are measured on a scale from 0 to 100. Descriptive statistics for the Gini coefficient of pre-government and post-government incomes are illustrated in Table 4.3.1.

Following this theoretical framework, the key explanatory variables of the analysis are indicators for the social spending structure of the welfare state. All data for these variables is taken from the Eurostat database. Thus, we use total social benefits to operationalize the overall spending generosity of the welfare state. Social benefits encompass all expenditures incurred by social protection systems apart from any operating expenditures. However, there are critical views of using such data.[70] In fact, it would be more accurate to use, for example, net social expenditures, which also take into account the impact of taxation and private benefits on social expenditures (see Adema and Ladaique (2009)). Unfortunately, this data is not available for the countries and time period we investigate. Throughout the analysis, total social benefits are expressed as proportion of GDP to account for different country sizes. To analyze the impact of different social spending categories on income inequality, we rely on the different benefit functions of the core system of the Social Protection Statistics provided by Eurostat.[71] Thus, we look at unemployment, family, health, and invalidity-related benefits separately. We add survivors' benefits to the category of old-age-related benefits and combine housing and social exclusion benefits, whereas social exclusion benefits only represent a small residual function in the Eurostat Social Protection Statistics. To measure the degree of low income targeting of welfare states, we apply the proportion of means-tested social benefits as a percentage of total social benefits. Means-tested benefits are social benefits that are explicitly or implicitly triggered by the beneficiary´s income falling below a specific level.

Besides social spending, there obviously are also a number of further variables that are expected to influence income inequality. The choice of the indicators that we will control for in our empirical anaylsis is based on previous studies

[70] See for example De Deken and Kittel (2007), who critically assess using data on social expenditures as they are available in Eurostat. For further information on methodological issues regarding variables of the spending dimension of social protection schemes, see Eurostat (1996).

[71] See Eurostat (1996) for further information on the definition of different spending categories in the Social Protection Statistics as published by Eurostat.

on income inequality determinants, which we briefly surveyed at the beginning of the chapter. Thus, we include three sorts of indicators: macroeconometric factors, socio-economic society characteristics, and indicators for the influence of labor market institutions. As macroeconomic indicators, we use GDP per capita (measured in constant international 1000 $) and GDP per capita squared to control for the aggregate income levels of countries. The data for the level of economic development is taken from the World Development Indicators (WDI) from the World Bank Group.

Variables that represent the socio-demographic and -economic structure of the society such as the dependency ratio (the proportion of population aged under 15 and over 64 as a percentage of total population) and the proportion of the population aged between 25 and 64 that has at least a higher secondary education are again from the Eurostat database.

Measures of the influence of labor market institutions are taken from the ICT-WSS Database on International Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts in 34 countries between 1960 and 2007. Union density presents the net union membership as a proportion of wage and salary earners in employment.[72] Finally, we also include a dummy for post-socialist new EU member states since their inequality levels may differ for reasons not captured by the control variables.

4.3.2 Estimation strategy

As has been indicated, this study is based on an unbalanced, pooled cross-sectional time series (CSTS) of at most 183 cases in 24 European countries. To empirically estimate the hypotheses derived in Section 4.2, we will use a reduced form equation such as

$$y_{it} = \alpha y_{i,t-1} + \beta S_{it} + \gamma X_{it} + \mu_i + \mu_t + \varepsilon_{it} \tag{4.3.1}$$

with y_{it} as the inequality measure of country i at time point t, which is either the Gini coefficient of post-government income or the Gini coefficient of pre-government income. S_{it} represents the variable of interest, the overall generosity of the welfare state, represented by total social benefits per GDP. X is a vector of control variables as described in the previous section. Finally, u_i presents

[72] Within robustness checks, we also included GDP growth, the inflation and unemployment rate, population growth, and different openness indicators as additional control variables. We dropped these variables in the final estimations because they either did not have a significant impact on inequality or due to multicollinearity concerns. However, the inclusion of these additional controls did not substantially change the results.

country-specific effects, u_t period-specific effects, and ε_{it} the idiosyncratic error term. The lagged dependent variable is included because income inequality is rather persistent over time. In the presence of country fixed effects, OLS will lead to biased and inconsistent estimates in this dynamic panel setting.[73] Thus, our preferred method of estimation is System GMM, which was introduced by Blundell and Bond (1998). More specifically, we use the System GMM estimator as implemented by Roodman (2009b) in Stata. In contrast to Difference GMM (Arellano and Bond (1991)), in which differences are instrumented with levels, the Blundell-Bond estimator instruments levels with differences. The underlying idea is that in the presence of persistent processes, past changes may be more predictive of current levels than past levels of current changes. Consequently, the instruments become more relevant. System GMM uses both the equation in differences and the equation in levels. Thus, System GMM also allows for including time-invariant variables in the level equation. In some additional specifications, we will also analyze the impact of specific social programs S^k (such as unemployment benefits, family-related benefits, old-age related benefits, and so on) on income inequality. To avoid omitted variable biases, we also include a measure of total social benefits less the specific benefits k in question (S_{it}^{1-k}) to simultaneously control for other social benefits:[74]

$$y_{it} = \alpha y_{i,t-1} + \beta_1 S_{it}^k + \beta_2 S_{it}^{1-k} + \gamma X_{it} + \mu_i + \mu_t + \varepsilon_{it} \tag{4.3.2}$$

The Difference and System GMM regression approaches are particularly useful because they can deal with endogenous regressors and reverse causality. Since we look at the impact of social policies on income inequality, there is no appropriate counterfactual without the social policy in place. In fact, in our particular setting, the long-established median voter theorem suggests that higher inequality could also lead to more redistribution (Meltzer and Richard (1981)). Accordingly, inequality levels might also influence the design of redistributive policies. This possible reverse causality implies that the results for the generosity of the welfare state are likely to be biased upward. Generally, System GMM is intended to build internal instruments for the predetermined dependent and additional endogenous regressor variables.

[73] In fact, OLS will tend to produce an upward bias in the coefficient of the dependent variable; for a fixed effects model, the opposite is true. Thus, a valid specification should produce coefficient estimates for the lagged dependent variable that lie within or near this range of estimates.

[74] See Calderón and Chong (2009) for a similar approach to analyzing the impact of specific labor market regulations on income inequality.

To deal specifically with the endogeneity of our social policy variable, we also include external instruments in our estimations. In the macro-context of developed countries in particular, appropriate instruments, and therefore an exogenous variation in social spending, are difficult to find. This analysis uses the presumably random incidence of certain diseases to instrument for the possible endogeneity of redistributive policies. Unfortunately, comparable data on the incidence of such diseases is rare. Finally, we include the number of hospital discharges of multiple sclerosis patients per 100,000 and the standardized death rates for malignant melanoma of skin and maligant neoplasms of the prostate as proxies for the incidence of these diseases.[75] We assume that they are not systematically related to behavioral effects, income, or income inequality, but that the incidence of these diseases is not clear and mainly arises from unsystematic genetic predisposition. On the other hand, an increasing incidence of such diseases is obviously associated with an increase in health-care expenditures and can therefore be regarded as an exogenous variation in social spending. Of course, the pure incidence of such diseases would be more appropriate because the indicators actually used might again be related with the social health-care system of a particular country. However, such data is not available for a sufficient number of countries. Beside the social spending variables and the lagged dependent variables, we treat all other regressors as strictly exogenous, meaning they instrument themselves.

System GMM involves many specification choices. Since our case involves a rather unbalanced panel, we use forward orthogonal deviations (Arellano and Bover (1995)) instead of differences to maximize the sample size. Also, we apply the one-step estimator with small sample correction and robust standard errors to account for heteroskedastic error structures. Recently Roodman (2009a)) discusses the problem of having too many instruments that might overfit endogenous variables. In fact, System GMM uses all available instruments, and the number of instruments increases quartic to the number of time points. In our specific setting of being only slightly larger than, this might especially be an issue. Thus, we test the robustness of the results to severely reducing the instrument count by collapsing instruments and restricting the number of lags used as instruments. In addition, we look at the Difference-in-Hansen test for the instruments of the level equation as recommended by Roodman (2009a). Obviously, another concern in

[75] Additionally, we used the incidence of female breast cancer and the number of hospital discharges of musculoskeletal system and connective tissue disease patients from the European Health for All Database (HFA-DB). However, data is only available for a very restricted sample of countries. The corresponding results are qualitatively the same and can be obtained from the authors upon request.

our setting is the structural break in the time series of the underlying micro data for the Gini coefficient. Thus, we conduct several robustness checks by testing for the existence of structural breaks in the full sample and restrict the sample to using EU-SILC data only.

4.4 Results

4.4.1 Post-government income inequality

Table 4.4.1 presents the results of the impact of total welfare spending on post-government income inequality, measured by the Gini coefficient of disposable income. The specification in column (1) uses all available instruments as suggested by the System GMM estimator. As the results reveal, the lagged dependent variable is significantly different from zero at a one percent significance level, emphasizing the persistence of inequality levels over time. Also, the findings in column (1) reveal a negative effect of the overall generosity of the welfare state in terms of social benefits per GDP. The effect is significant at a five percent significance level. With respect to the macroeconomic control variables, the results support a U-shaped relationship between GDP per capita and income inequality. Accordingly, in line with comparable studies on developed countries (e.g., Dreher and Gaston (2008)), the findings do not support the Kuznet hypothesis of an inverted U-shaped relationship between inequality and the level of economic development. The dependency rate and the proportion of higher education do not show significant effects on income inequality in this specification. Post-socialist EU member states reveal income inequality levels that are on average 3 Gini points lower than do countries without a socialist history. According to this specification, union density does not seem to have a significant effect on income inequality. As the identification statistics at the bottom of Table 4.4.1 suggest, the specification passes the Sargan overidentification test and the Arellano-Bond test of second-order serial correlation in error terms. However, the perfect Hansen statistic of 1.000 indicates that instrument proliferation might be an issue in this specification with all available instruments.

Thus, in the next estimations, we significantly reduce the instrument count by first collapsing the instruments and then using only the collapsed second-lag instruments, as suggested in Roodman (2009b) and Roodman (2009a). Even when severely reducing the number of instruments, the effect of social spending on income inequality remains significant, suggesting that redistributive first-round ef-

fects outweigh any negative second-order effects. With respect to the other covariates, the lagged dependent variable loses its significance in these specifications, whereas the intuitive positive effect of the dependency rate now turns significant. It should be noted that specification (3) also passes the Difference-in-Hansen test for both the full instrument set for the level equation as well as those based on the lagged dependent variable, supporting the finding of a *causal effect* from social spending on income inequality.

Dependent variable: Gini coefficient post-government income

VARIABLES	(1) Full instrument count	(2) Collapsed instruments	(3) Collapsed second-lag
Lagged Gini coefficient	0.650***	0.205	0.338
	(0.088)	(0.165)	(0.219)
Social benefits/GDP	-0.157**	-0.275**	-0.329**
	(0.062)	(0.102)	(0.124)
GDP pc (in 1000 int $)	-0.150**	-0.324***	-0.290***
	(0.058)	(0.089)	(0.083)
GDP pc squared (in 1000 int $)	0.001*	0.003***	0.002***
	(0.001)	(0.001)	(0.001)
Dependency rate	0.108	0.239*	0.224*
	(0.076)	(0.119)	(0.118)
Prop secondary education	-0.013	-0.048	-0.020
	(0.014)	(0.030)	(0.035)
Post-communist	-3.297**	-5.052**	-5.858***
	(1.213)	(1.901)	(1.977)
Union density	-0.009	-0.038*	-0.029
	(0.013)	(0.019)	(0.019)
Period Effects	✓	✓	✓
Observations	183	183	183
Number of countries	24	24	24
No of instruments	145	49	23
Sargan test	0.186	0.435	0.210
Hansen test	1.000	1.000	0.510
A-B test 2nd-order corr	0.327	0.407	0.358

System GMM estimations with robust standard errors, small sample correction, and forward orthogonal deviations. All equations also include external instruments.

*** p<0.01, ** p<0.05, * p<0.1

Table 4.4.1: Social spending generosity and post-government income inequality

As indicated, another concern might be the structural break in the time series of the underlying micro data for the Gini coeffcient. Therefore, Table 4.6.1 in the Appendix also reports the results of some data robustness checks. In the first specification, we restrict the sample to EU-15 member states to check the sensitivity of the results with respect to the inclusion of new EU member states. The result of social spending remains negative and significant. Yet, the p-value of the Sargan test does not pass the 10% level, indicating that the instruments may not be valid in this specification. The second specification in Table 4.6.1 only uses EU-SILC micro data. Thus, all observations before 2003 are dropped, and the number of observations decreases to 75. Again, the inequality-reducing effect of social spending is significant. Specification (3) indicates that, indeed, inequality levels after the data break in 2002 are on average one Gini point higher. Still, as the interaction effect in the last column shows, this does not significantly influence the effect of social spending on income inequality.[76]

The robustness of the results with respect to the instrument count and different data restrictions strongly supports a negative relationship between social spending and income inequality. Therefore, even if social benefits might be associated with negative disincentive effects that are positively correlated with pre-government income inequality, the overall effect on post-government income inequality is negative. Table 4.4.2 reports the effects of different social benefits on post-government income inequality. The estimations basically follow equation (2) and estimate the isolated effects of specific benefits, while simultaneously controlling for the other social benefits. The specification of each row is similar to that in Table 4.4.1 column (4), including the additional control variables and period effects. All models pass the Sargan and second-order serial correlation tests. As the results show, only the unemployment-related benefits and the old-age and survivor benefits reveal statistically significant effects on income inequality. Both effects are negative, indicating implicit redistribution formulas in both unemployment and pension benefits. The effect of family-related benefits is negative, but not statistically significant. On the other hand, the disability benefits and health-related benefits display positive signs, which might give some support to the idea that they have other objectives rather than redistribution. Nevertheless, both effects are statistically insignificant. Although the first-round effect of housing and social exclusion benefits is expected to be clearly inequality reducing, the overall effect on post-government income inequality is not significant and positive. Thus, there is some evidence that neg-

[76] Table 4.6.2 in the Appendix also illustrates the effects of social spending on income inequality when using the OLS and FE estimator. The effects are similar and remain significant.

ative behavioral effects induced by these social assistance benefits outweigh their inequality decreasing first-round effects. Overall, the results of Table 4.4.2 show that different social benefit functions display distinct effects on post-government income inequality. These findings indicate that the category of social assistance benefits is not responsible for the negative effect of social spending on income inequality, but insurance-related benefits such as unemployment and pension benefits are.[77]

Dependent variable: Gini coefficient post-government income

VARIABLES	Coefficient		Std.Dev.	Obs.	Sargan	AB AR(2)
Social Benefits	-0.275	**	(0.102)	183	0.435	0.407
Unemployment	-0.198	*	(0.098)	183	0.721	0.385
Family-related	-0.139		(0.169)	183	0.596	0.409
Invalidity	0.053		(0.145)	183	0.778	0.465
Health-related	0.032		(0.143)	183	0.470	0.418
Old-age and survivor	-0.119	**	(0.047)	183	0.809	0.469
Housing and exclusion	0.057		(0.188)	183	0.741	0.428

Full specification of each row includes the same control variables as the estimations in Table 4.4.1 column (4). System GMM estimations with robust standard errors, small sample correction, forward orthogonal deviations, and collapsed instruments. All equations also include external instruments. *** p<0.01, ** p<0.05, * p<0.1

Table 4.4.2: Income inequality and different benefit functions

4.4.2 Pre-government income inequality

Within the theoretical framework, we also derived expectations about the effects of social spending and the benefit targeting structure on pre-government income inequality. Therefore, in Table 4.4.3, we contrast the results of social spending and the proportion of means-tested benefits on post-government inequality with the corresponding effects on pre-government income inequality. Column (1) is identical to column (4) in Table 4.4.1. In the second specification, we include the proportion of means-tested benefits along with the proportion of non-means–tested benefits, to control for the rest of social benefits. Since in specifications (3) and (4) we specifically try to identify second-order behavioral effects that go along with social policies, we include lagged measures of social spending and means-tested

[77] Using OLS and FE as estimation methods, unemployment benefits and family-related benefits reveal a significant inequality reducing impact. Public pensions, though, lose significance in the FE model (see Table 4.6.2 in the Appendix).

benefits.[78] It should be noted that the number of observations is rather small in these specifications, with pre-government income inequality as a dependent variable, since data is only available for a restricted sample. In fact, estimations are only based on 56 observations in 20 countries.

The results in column (2) suggest that the proportion of means-tested benefits does not have a significant effect on post-government income inequality, although they are specifically targeted at low income groups. This finding is line with the previous finding of housing and social exclusion benefits, which make up a large part of means-tested benefits. When looking at the effects on pre-government inequality, the lagged value of social benefits reveals a positive correlation, though the effect is not significant at conventional significance levels. With respect to the lagged value of the proportion of means-tested benefits, we find a comparatively large positive effect on pre-government inequality, which is significant at a 5% level. This strongly corroborates with our hypothesis that a more targeted spending structure is associated with higher pre-government income inequality.[79]

Regarding the other covariates, model (3) gives weak support for the existence of an inverted U relationship of economic development and pre-government inequality. Yet, this finding vanishes when controlling for the targeting structure of benefits. Furthermore, there is some evidence that a higher dependency rate is associated with more inequality in pre-government incomes. Also, post-socialist countries display significantly larger levels of pre-government income inequality. As expected from theory, stronger labor market institutions are negatively related to pre-government inequality.

[78] We should emphasize that the results remain qualitatively the same when including current instead of lagged values for the social spending variables.

[79] This finding is also confirmed when using OLS as estimation method. However, the effect becomes insignificant and negative in the FE model (see Table 4.6.2 in the Appendix).

Dependent variable: Gini coefficient post- and pre-government income

	(1)	(2)	(3)	(4)
VARIABLES	Post-government inequality		Pre-government inequality	
Lagged Gini coefficient	0.205	0.401**	0.579***	0.194
	(0.165)	(0.159)	(0.200)	(0.155)
(Lagged) Social benefits	-0.275**		0.130	
	(0.102)		(0.085)	
(Lagged) Means-tested/Soc ben		-0.047		0.479**
		(0.147)		(0.175)
(Lagged) Non means-tested		-0.405*		0.364**
		(0.201)		(0.140)
GDP pc (in 1000 int $)	-0.324***	-0.331**	0.317*	-0.058
	(0.089)	(0.140)	(0.171)	(0.264)
GDP pc squared (in 1000 int $)	0.003***	0.003*	-0.003*	0.001
	(0.001)	(0.001)	(0.002)	(0.003)
Dependency rate	0.239*	-0.026	0.080	0.596***
	(0.119)	(0.184)	(0.160)	(0.180)
Prop secondary education	-0.048	-0.001	-0.038	-0.056
	(0.030)	(0.030)	(0.044)	(0.038)
Post-communist	-5.052**	-8.451**	5.087	8.771***
	(1.901)	(3.371)	(3.313)	(2.660)
Union density	-0.038*	-0.011	-0.055*	-0.054*
	(0.019)	(0.019)	(0.027)	(0.031)
Period effects	✓	✓	✓	✓
Observations	183	183	56	56
Number of countries	24	24	20	20
No of instruments	49	48	37	40
Sargan test	0.435	0.953	0.251	0.099
A-B test 2nd-order corr	0.407	0.350	0.187	0.502

System GMM estimations with robust standard errors, small sample correction, and forward orthogonal deviations. Models (1) and (3) also include external instruments.

*** p<0.01, ** p<0.05, * p<0.1

Table 4.4.3: Social spending and pre-government income inequality

4.5 Conclusion

The purpose of this chapter was to analyze whether more generous social spending policies are indeed associated with lower income inequality levels. Specifically, it examines to what extent negative behavioral effects might counteract the redistributive first-round effects of social benefits. According to the theoretical framework, the overall effect of social spending on post-government income inequality is a priori not clear, since social spending policies are expected to have a positive effect on pre-government income inequality. In addition, it is suggested that different benefit functions have different objectives and might, thus, be related to differing distributional outcomes

One major result of the regression analysis reveals that a larger social budget is strongly related with lower inequality levels in post-government incomes. This suggests that overall, redistributive first-round effects outweigh any inequality-increasing second-order effects. This negative effect of social spending on income inequality is robust to various specification choices. In particular, the effect remains statistically significant when severely reducing the instrument count and when using different data specifications, suggesting a causal effect of social spending levels on post-government income inequality. With respect to the inequality in pre-government incomes, we cannot identify any statistically significant effect of the overall spending generosity of welfare states. The empirical evidence suggests, however, that if there is an effect, it is positive. In terms of the different functions of social benefits, the results reveal that not all benefits are associated with lower inequality levels. More specifically, unemployment benefits and public pensions seem to be responsible for the inequality reducing impact.

Regarding the targeting structure of social policies, the empirical results reveal that social protection systems that specifically target low income groups are not associated with lower inequality levels in post-government incomes. This finding hints at the importance of possible disincentive effects created by low income targeting that counteract equalizing first-round effects. Additional regressions show that a higher proportion of means-tested benefits is indeed associated with more inequality in pre-government incomes. This strengthens the argument that more low income targeting comes at the cost of substantial negative second-order effects.

Note, however, that there are limitations to our analysis. First, the analysis only discusses behavioral effects related to labor-market–related decisions. However, social spending policies also affect pre-government incomes in ways other than through labor market outcomes. Redistributive policies might also affect the

behavior of market actors with regard to investment and saving decisions, geographical mobility, and so on. All these effects and their impact on inequality are not discussed. Second, the study only analyzes the effect of overall benefit levels on income inequality. However, specific additional characteristics such as the duration of benefits and other eligibility criteria might be responsible for the effects on income inequality. Thus, to make more specific statements about the distributional and behavioral effects of social programs, more information on the characteristics of these programs is needed. This information is also important for specific policy recommendations.

4.6 Appendix

Dependent variable: Gini coefficient post-government income

	(1)	(2)	(3)	(4)
VARIABLES	EU-15	EU-SILC	structural break	
Lagged Gini coefficient	0.411***	0.143	0.615***	0.408*
	(0.108)	(0.141)	(0.149)	(0.214)
Social benefits	-0.227**	-0.468**	-0.200*	-0.273**
	(0.084)	(0.180)	(0.103)	(0.103)
GDP pc (in 1000 int $)	-0.255***	-0.250*	-0.115	-0.126
	(0.061)	(0.128)	(0.075)	(0.098)
GDP pc squared (in 1000 int $)	0.002***	0.002	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Dependency rate	0.149	0.467*	0.406**	0.602***
	(0.089)	(0.240)	(0.161)	(0.206)
Prop secondary education	-0.032	-0.047*	-0.012	-0.028
	(0.027)	(0.027)	(0.026)	(0.035)
Post-communist		-4.906***	-2.041	-3.256
		(1.640)	(1.831)	(2.006)
Union density	-0.020	-0.049*	-0.024	-0.039
	(0.014)	(0.026)	(0.024)	(0.034)
Data			1.033***	5.828
			(0.260)	(3.693)
Data * Social Benefits				-0.173
				(0.130)
Period effects	✓	✓	✓	✓
Observations	161	75	183	183
Number of countries	15	24	24	24
No of instruments	48	43	38	39
Sargan test	0.097	0.753	0.466	0.611
A-B test 2nd-order corr	0.549	0.060	0.286	0.304

System GMM estimations with robust standard errors, small sample correction, forward orthogonal deviations, and collapsed instruments. All equations also include external instruments.

*** p<0.01, ** p<0.05, * p<0.1

Table 4.6.1: Data robustness checks

Dependent variable: Gini coefficient post-government income					
VARIABLES	Coefficient		Std.Dev.	R^2	Obs.
Pooled OLS					
Social Benefits	-0.159	***	(0.043)	0.908	183
Unemployment	-0.096	**	(0.037)	0.909	183
Family-related	-0.130	**	(0.057)	0.909	183
Invalidity	-0.062		(0.042)	0.908	183
Health-related	-0.067		(0.049)	0.908	183
Old-age and survivor	-0.039	**	(0.017)	0.909	183
Housing and exclusion	-0.050		(0.061)	0.908	183
Means-tested	-0.021		(0.033)	0.908	183
Dependent variable: Gini coefficient pre-government income					
Lagged Social Benefits	0.059		(0.048)	0.898	56
Lagged Means-tested	0.203	**	(0.090)	0.908	56
Fixed-Effects					
Social Benefits	-0.214	**	(0.108)	0.336	183
Unemployment	-0.309	***	(0.115)	0.358	183
Family-related	-0.251	*	(0.130)	0.346	183
Invalidity	-0.268	*	(0.147)	0.346	183
Health-related	0.075		(0.105)	0.360	183
Old-age and survivor	0.101		(0.088)	0.348	183
Housing and exclusion	-0.235		(0.220)	0.339	183
Means-tested	-0.039		(0.107)	0.337	183
Dependent Variable: Gini coefficient pre-government income					
Lagged Social Benefits	-0.052		(0.367)	0.536	56
Lagged Means-tested	-0.211		(0.367)	0.540	56

Full specifications include the same additional control variables as the previous estimations as well as period effects.

*** p<0.01, ** p<0.05, * p<0.1

Table 4.6.2: OLS and FE specifications

Chapter 5

Inequality of opportunity

In this chapter we introduce the concept of inequality of opportunity instead of the traditional inequality of outcome approach used in the previous analyses. While fiscal policies reveal a substantial impact on outcomes, we find no differential impact of tax benefit systems on unequal opportunities.[80]

5.1 Introduction

Preferences for redistribution are systematically correlated with beliefs about the relative importance of effort and luck in the determination of outcomes (see Konow (2003), Alesina and Giuliano (2011) and Gaertner and Schokkaert (2011) for overviews). Individuals are more willing to accept income differences which are due to individual effort (or laziness) rather than exogenous circumstances (Fong (2001)). Theories of distributive justice distinguish ethically acceptable inequalities (e.g. due to differences in effort) from unfair inequalities (e.g. due to endowed characteristics).[81] In empirical applications, the main problem is the identification of the latter, i.e. the amount of inequality which is due to circumstances beyond the sphere of individual responsibility. It has been recognized that previous estimates of such inequality of opportunity (IOp henceforth) yield only lower bounds because of the unobservability of the full set of circumstances (e.g. Bourguignon et al. (2007) and Ferreira and Gignoux (2011)). In this chapter, we suggest a new estimator of IOp based on a fixed effects model which additionally allows identifying an upper bound for unfair inequalities in order to provide the full range of IOp estimates. We illustrate our approach by comparing estimates for Ger-

[80] This chapter is based on Niehues and Peichl (2011).

[81] See Sen (1980, 1985, 1992), Dworkin (1981a,b), Arneson (1989), Cohen (1989), Roemer (1993, 1998, 2002) and Fleurbaey (2008).

many and the US – two countries with different welfare state regimes, attitudes toward inequality and redistribution (see Figure 5.7.1 in the Appendix) and social mobility.[82]

The concept of equality of opportunity (EOp) in contrast to equality of outcomes (EO) has received considerable attention since the seminal contributions of Roemer (1993, 1998), Van de gaer (1993) and Fleurbaey (1995).[83] The traditional notion of EO refers to an equal distribution of economic outcomes (e.g. well-being, consumption or income) across the population.[84] The EOp theory, in contrast, is interested in the sources of inequality and separates the influences on the outcomes of an individual into circumstances and effort. Circumstances are defined as all factors beyond the sphere of individual control, for which society deems individuals should not be held responsible, such as parental education, gender or ethnic origin. Effort, on the other hand, comprises all actions and choices within individual responsibility for which society holds the individual (partially) accountable, e.g. schooling or labor supply decisions. Inequalities (in income) due to differences in effort are deemed equitable, whereas inequalities due to endowed circumstances are not.[85]

In empirical estimations of EOp it is impossible to observe all characteristics that constitute individual's circumstances (e.g. innate talent or ability). Hence, in practice, all existing estimates of IOp are only lower bound estimates of the true share of unfair inequalities due to circumstances.[86] Estimating lower bounds of IOp has important implications for the design of redistributive policies. As

[82] According to Alesina and Glaeser (2004), Americans believe that social mobility is important and high in the US, whereas Europeans perceive lower chances to climb the social ladder. Hence, Germans are more in favor of redistribution than Americans (Alesina and Angeletos (2005)).

[83] See e.g. Roemer et al. (2003), Dardanoni et al. (2005), Betts and Roemer (2006), Lefranc et al. (2008, 2009), Devooght (2008), Checchi et al. (2010), Checchi and Peragine (2011), Dunnzlaff et al. (2011), Aaberge et al. (2011), Almås et al. (2011) as well as Björklund et al. (2011).

[84] See, e.g., Katz and Autor (1999) for an overview as well as Autor et al. (2008) and Dustmann et al. (2009) for recent applications to the US and Germany.

[85] This is related to the literature on wage discrimination (see, e.g., Altonji and Blank (1999) for an overview). However, a fundamental differences exists between the two fields. Labor economists studying discrimination are usually interested in estimating the direct effect of endowed characteristics (e.g. race, gender) on income and try to separate it from confounding effects due to between-group differences in effort. In contrast, the EOp literature believes that the confounding indirect effect is also a source of unfair inequalities, i.e. a circumstance, itself that should not be separated from the direct effect of circumstances on income (see, e.g., the discussion in Roemer (1998)). We discuss this issue in more detail in Section 5.2.

[86] This is due to the fact that adding another circumstance variable to the analysis increases the explained variation and hence the share of inequality due to circumstances – just like an R^2-measure increases when adding another variable to the analysis. See Ferreira and Gignoux (2011) for an extensive discussion.

most theories of distributive justice are based on ethical principles which only defend compensation for inequalities due to circumstances, underestimating the true amount of this IOp might lead to too little redistribution when designing a fair tax benefit system (Luongo (2010)) – or to too much if the implicit assumption is that the upper bound is 100%. In addition, especially when comparing countries, the observed and unobserved circumstances might behave differently which can lead to different conclusions when looking only at a(n observed) subset of all (potential) circumstances.

In order to tackle the lower-bound problem, we suggest a new estimator for IOp which takes into account the maximum value of (observed and unobserved) circumstances. Our method is based on a two-step approach. First, we estimate a fixed effects model using panel data. We argue that the time-constant unobserved heterogeneity is the maximum amount of circumstance variables which an individual should not be held responsible for – as, by definition it comprises all exogenous circumstances as well as some unchanging effort variables. Second, we use this estimated individual effect to estimate the maximum extent of inequality which can be attributed to IOp, i.e. inequality due to circumstances. This two-stage estimator allows us to quantify an upper bound of IOp. Together with the well-known lower bound we thus provide a range for the extent of IOp which allows to better compare income distributions and to give guidelines for the design of redistribution policies.

To empirically illustrate our new estimator, we rely on the Cross-National Equivalent Files (CNEF) for Germany and the United States (US) which contain harmonized micro-level panel data from national surveys which cover long time periods and include a comprehensive set of income, circumstance and effort variables. The German Socio-Economic Panel (SOEP) data has been widely used for income inequality analyses (see, e.g. Fuchs-Schündeln et al. (2010), Peichl et al. (2011)). However, it has not yet been used to analyze IOp. We compare our estimates to US data taken from the Panel Study of Income Dynamics (PSID) which has been used by Pistolesi (2009) to analyze 'IOp in the land of opportunities'. Comparing the US with a Continental European country like Germany is interesting in itself (see, e.g. Piketty and Saez (2007)), as both countries have different welfare state regimes and people have different beliefs about redistribution and social mobility.[87] Almås (2008) uses data from the Luxembourg Income Study to

[87] There are a number of studies investigating social and economic mobility (see, e.g., Corak and Heisz (1999), Björklund and Jaentti (1997, 2009), or Björklund et al. (2010). While these studies only implicitly measure IOp, we can directly estimate it in our approach.

compare estimates of unfair inequalities for Germany and the US and shows that the results depend on the fairness ideal and the measure used.[88]

Our lower bound estimates yield IOp shares of up about 16% for annual earnings in the US, which is comparable to previous findings. The upper bound of IOp, in contrast, accounts for around 35% of the observed inequality. Results for Germany are significantly higher with shares of 30% and 50% respectively – which is in line with the findings of Almås (2008). The significant differences between lower and upper bounds suggest that previous (lower bound) estimates of IOp might demand for too little redistribution in order to equalize unfair inequalities. Furthermore, our results based on annual incomes seem to indicate that EOp is higher in the "land of opportunities". However, as it has been shown in the literature, IOp is usually higher in permanent than in annual incomes (Aaberge et al. (2011)). We are able to confirm this result for the lower and upper bound shares for the US, which increase to 30% and 70% respectively. However we do not find a large increase for Germany. Hence, when looking at permanent income, IOp is even slightly higher in the US. We relate this interesting country difference to different degrees of mobility and persistence in different parts of the distribution (Björklund and Jäntti (2009)).

Results are similar for gross and net earnings. This implies that there is no differential effect of redistribution on IOp, i.e. there is no implicit tagging on circumstances in the tax systems of Germany and the US. Our results further indicate that unobserved circumstances, such as ability and talent, are important determinants of inequality (in line with findings for Sweden, see Björklund et al. (2011)). Furthermore, we identify gender as an important source of IOp which is mainly driven by the indirect effect of gender on earning outcomes through the selection into part-time employment. A policy simulation reveals that the switch from joint taxation to individual taxation significantly reduces IOp in Germany.

[88] Two different approaches have been used in literature to estimate IOp (see, e.g., Fleurbaey and Peragine (2009)): ex-ante vs. ex-post. The former partitions the population into types, i.e. groups of individuals endowed with the same set of circumstances, and IOp is measured as inequality between types. In the latter case, individuals are classified into responsibility groups (tranches) of individuals at the same effort level and inequality within tranches is investigated. Note that Almås (2008) argues that the ex-ante approach gives a lower bound because it treats the unexplained variation as an responsibility variable (see also the discussion in Ferreira and Gignoux (2011)), whereas the ex-post approach would give an upper bound because it treats the residual as a circumstance. This, however, is only true for a given set of (observed) circumstances. Defining the upper bound as in our case, gives lower and upper bounds both for the ex-ante and ex-post approaches. In our empirical application, we focus on the ex-ante approach due to practical reasons and data limitations. We discuss the two approaches in more detail in Section 5.2.

The setup of the chapter is as follows: In Section 5.2, we introduce the conceptual framework of EOp and the methodology to estimate the upper bounds of IOp. Section 5.3 describes the data and income concepts used. Section 5.4 presents the results of our empirical analysis which are discussed in Section 5.5. Section 5.6 concludes.

5.2 Conceptual framework and methodology

5.2.1 Measuring IOp: a simple model

In order to compare our new estimator to previous IOp estimates, we follow standard practice in the literature to define our theoretical and empirical approaches. In accordance with Roemer (1998), we distinguish between two generic determinants of individual outcome y_{is} of individual i at time point s. First, circumstances C_i are characteristics outside individual control (think of race, gender, family background) – and hence a source of inequitable inequalities in outcomes. Second, effort E_{is} is representing all factors affecting earnings that are assumed to be the result of personal responsibility.

Following Roemer (1998), we explicitly recognize the fact that effort is shaped by circumstances, i.e. that the distribution of effort within each type is itself a characteristic of the type. This approach, which is common in the literature on EOp, differs from the literature on wage discrimination (see Altonji and Blank (1999) for an overview) where economists are usually interested in a 'clean' measure of the direct effect of circumstances. Suppose there in an unobservable aspect of effort that is correlated with an endowed characteristic. Then a regression of earnings on circumstances only (e.g. a gender dummy) overestimates the direct effect of gender on earnings because it confounds the effects of the endowed characteristic with a dimension of effort that it is correlated with. Hence, economists studying discrimination control for between-group differences in effort in order to arrive at a 'clean' measure of the direct effects of circumstances. In the literature on EOp, in contrast, the confounding indirect effect (of circumstances on income via effort) is also seen as a source of unfair inequalities itself which should be compensated and hence not be separated from the direct effect of circumstances on income[89]. Therefore, IOp is related to wage discrimination, but it is not the same. Unfair income differences in the IOp framework can be indeed caused by discrim-

[89] Note, however, that there is disagreement about the degree of compensation (see, e.g., the discussion in Roemer (1998) and Fleurbaey (2008)).

ination, but they could also be due to between-group differences in productivity or preferences. Therefore, the two approaches imply different normative choices about the compensation of the indirect (confounding) effect. While we focus on the traditional notion of EOp in this analysis, the different normative choices of the underlying fairness principles can be made explicit (see Fleurbaey (2008) or Almås et al. (2011)) and, in principle, it is possible to extend our approach of estimating an upper bound to other normative frameworks as well.

We assume that the outcome variable of interest depends both on exogenous, i.e. time-invariant, circumstances C_i belonging to a finite set $\Gamma = \{C_1, C_2, ..., C_N\}$, as well as personal effort E_{is}, which can be shaped by C_i, belonging to a set $\Omega = \{E_1, E_2, ..., E_N\}$. In our analysis, we focus on (annual or permanent) labor earnings w_{is} of individual i at time point s which is generated by a function $f : \Gamma \times \Omega \rightarrow \mathbb{R}_+$:

$$w_{is} = f(C_i, E(C_i)_{is}) \tag{5.2.1}$$

As it is common in most parts of the literature, we do not explicitly take into account the role of luck. Hence, we (implicitly) assume that luck belongs to the sphere of individual responsibility and in our deterministic model, the individual is held responsible for any random component that may affect the income and that cannot be attributed to the observed circumstances.[90] The same is true for potential measurement errors in the earnings data.

We follow the ex ante approach of equality of opportunity and partition the population of discrete agents $i \in \{1, ...N\}$ into a set of types $\Pi = \{T_1, T_2, ...T_k\}$, i.e. subgroups of the population that are homogeneous in terms of their circumstances.[91] The income distribution within a type is a representation of the opportunity set which can be achieved for individuals with the same circumstances C_i by exerting different degrees of effort. EOp is achieved if the mean advantage levels μ are identical across types:

$$\mu^k(w) = \mu^l(w), \forall l, k | T_k \in \Pi, T_l \in \Pi \tag{5.2.2}$$

[90] We further discuss – and relax – this assumption in Section 5.3. See also Lefranc et al. (2009) for the extension of the EOp framework to explicitly take into account luck.

[91] See Fleurbaey and Peragine (2009) or Checchi et al. (2010) for a extensive discussion of ex-ante vs. ex-post approaches. We choose the ex-ante approach in our context because it is easier to estimate it empirically when accounting for numerous circumstance variables and a large number of types in the presence of small samples or cell sizes. Our method is, in general, also applicable to the ex-post approach which will be discussed in more detail later on.

Measuring IOp thus means capturing the extent to which $\mu^k(w) \neq \mu^l(w)$, for $k \neq l$. To compute a measure of IOp, a hypothetical smoothed distribution (Foster and Shneyerov (2000)) is constructed: $\mu^k(w) = f(C_i, \overline{E})$, which is obtained when each individual outcome w_i^k is replaced by the group-specific mean for each type $\mu^k(w)$ (for a given reference value of effort $\overline{E}$).

Based on this smoothed distribution, we compute two scalar measures of IOp for any (scale invariant) inequality index I:

$$\theta_a = I(\{\mu_i^k\}) \tag{5.2.3}$$

$$\theta_r = \frac{I(\{\mu_i^k\})}{I(w)} \tag{5.2.4}$$

where θ_a is a measure of the absolute inequality of opportunity level (IOL), and θ_r is the inequality of opportunity ratio (IOR) measuring the share of total inequality that can be attributed to circumstances. This allows to decompose the total income inequality into inequality within types (i.e. effort inequality) and inequality between types (i.e. opportunity inequality).

In order to respect the axioms of anonymity, Pigou-Dalton transfer principle, normalization, population replication, scale invariance and subgroup decomposability, we choose a member of the Generalized Entropy class (Shorrocks (1980)) as inequality measure. By introducing the further requirement of *path-independent decomposability* (see Foster and Shneyerov (2000)), the set of eligible indices reduces to the *mean logarithmic deviation* (MLD) $I_0 = \frac{1}{N} \sum \ln \frac{\mu_w}{w_i}$.

5.2.2 Empirical strategy to estimate IOp

Lower bound of IOp In our empirical estimation approach we follow Bourguignon et al. (2007) and Ferreira and Gignoux (2011) who use a parametric specification to estimate *lower bounds* of IOp. Relying on a parametric approach allows us to estimate the impact of numerous circumstance variables even in the presence of small sample and cell sizes – which, unfortunately, is the case in the data that we use for our empirical illustration.[92] Log-linearization of equation

[92] In contrast, non-parametric methods avoid the arbitrary choice of a functional form on the relationship between outcome, circumstances and effort (e.g. Lefranc et al. (2009), Ferreira and Gignoux (2011) or Aaberge et al. (2011)). The drawback of the non-parametric approach, however, is that a consideration of more than one circumstance variable is difficult due to practical reasons in the presence of small cell sizes which is usually the case in survey data. Access to large-scale administrative panel data with information on circumstances (family background), which is not available in Germany and rather restrictive in the US, would allow to estimate lower and upper bounds of IOp also non-parametrically.

(5.2.1) and adding an error term yields the following empirical specifications

$$\ln(w_{is}) = \alpha C_i + \beta E_{is} + u_{is} \tag{5.2.5}$$

$$E_{is} = HC_i + v_{is} \tag{5.2.6}$$

Equation (5.2.5) represents the direct effect of circumstances, equation (5.2.6) the indirect effect of circumstances on effort. Since it is unlikely that we will observe all relevant circumstance and effort variables that constitute individuals outcomes, estimating this model will likely yield biased estimates. However, in order to compute IOp shares, it is not necessary to estimate the structural model and to derive causal relationships. By substituting the effort equation (5.2.6) into the earnings equation (5.2.5), we obtain the following reduced-form relationship:

$$\ln(w_{is}) = \underbrace{(\alpha + \beta H)}_{\psi} C_i + \underbrace{\beta v_{is} + u_{is}}_{\eta_{is}} \tag{5.2.7}$$

This reduced-form equation can then be simply estimated by OLS to derive the fraction of variance which is explained by circumstances. Including all available k observed circumstances C^K in equation (5.2.7), the estimates $\widehat{\psi}$ measure the overall effect of circumstances on labor earnings, combining both, the direct and indirect effects. Based on this, we can construct a parametric estimate of the smoothed distribution:

$$\widetilde{\mu}^{LB} = \exp[\widehat{\psi} C_i^K + \sigma^2/2] \tag{5.2.8}$$

As we replace earnings outcomes by their predictions (with σ^2 being the estimated residual variance in the earnings equation, see Blackburn (2007)), all individuals with the same circumstances necessarily have the same advantage levels. Thus, in the case of absolute EOp, i.e. no income differences due to (observed) circumstances C_i^K, all predicted earning levels would be identical. Consequently, IOp can then be measured as the inequality of these counterfactual earnings levels, where differences are only due to differences in circumstances. By inserting (5.2.8) into (5.2.3), we derive a measure of the absolute IOp level (IOL), whereas inserting (5.2.8) into (5.2.4) gives a measure of the relative IOp share (IOR).

The approach has so far been in line with the existing literature such as Bourguignon et al. (2007), Checchi et al. (2010) and Ferreira and Gignoux (2011). It has been recognized that this procedure leads to lower bound estimates of the true

share of unfair inequalities due to circumstances. The intuition to this is just like that of an R^2-measure which increases when adding another variable to the analysis: adding another circumstance variable to the analysis increases the explained variation (or at least does not decrease it in the case it is orthogonal), and hence the share of inequality due to circumstances cannot decrease. In the next step, we suggest a new estimator for IOp to tackle the lower-bound problem.

Upper bound of IOp Our method to derive an upper bound of IOp is based on a two-step approach. First, we estimate a fixed effects model using panel data to derive a measure of time-constant unobserved heterogeneity. Second, we use this estimated unit effect to estimate the maximum extent of inequality which can be attributed to inequality due to circumstances. The intuition for the difference between lower and upper bounds of IOp is comparing the explained variance of an earnings equation with all observed circumstance variables (lower bound) to (one minus) the explained (within) variance of an fixed effects regression (upper bound). However, instead of comparing the (explained) variances of the log earnings equations, we compute an inequality measure with well-defined properties based on the smoothed distributions.[93]

To estimate the fixed-effects model, we apply our setting to a longitudinal data structure. This implies that individual earnings at time point t (with $t \neq s$) might be influenced by time-constant observable circumstances C_i (economically exogenous by definition), by time-varying observable effort variables E_{it} as well as time-constant unobserved factors u_i, time-specific unobserved factors u_t and an independent error term ε_{it}:

$$w_{it} = f(C_{i,}E_{it}, u_{i,}u_t, \varepsilon_{it}) \tag{5.2.9}$$

Log-linearization yields the empirical specification

$$\ln(w_{it}) = \alpha C_i + \beta E_{it} + u_i + u_t + \varepsilon_{it} \tag{5.2.10}$$

which corresponds to the data generating process of a fixed effects model with time-specific effects. Thus u_t takes up serial effects such as inflation and other time-specific earnings shocks which are common for all individuals and ε_{it} comprise unsystematic factors which influence wages. Using this longitudinal design enables

[93] We do this, because the variance of logarithms – in contrast to the MLD and other GE-measures – is not a good measure of inequality because it violates the Pigou-Dalton transfer principle as well as the Lorenz criterion (Foster and Ok (1999)).

us to derive consistent estimates for the effort variables despite their endogeneity with respect to the unobserved circumstances. As opposed to other studies which assess the impact of effort variables in EOp settings, we can also estimate the effect independently of unobserved circumstances.

If one argues that all effort variables are not exogenous in the sense that they vary over time (at least to some extent), then – given the time period is long enough – all time-constant unobserved heterogeneity is attributable to exogenous circumstances. Furthermore, assuming that no circumstance variables were observable, all circumstances were accounted for by the individual specific unit-effect $c_{i.}$:

$$\ln(w_{it}) = \beta E_{it} + c_i + u_t + \varepsilon_{it} \tag{5.2.11}$$

As data limitations do not allow us to look at the whole earnings history of individuals, of course, we cannot be sure that there are no unobserved effects in c_i, which might rather be attributed to effort, such as long-term motivation and work effort. As this cannot be ruled out, we argue that the time-constant unobserved heterogeneity c_i is the maximum amount of circumstance variables which an individual might not be held responsible for.[94] Estimating equation (5.2.11) by a simple FE model with period dummies then yields estimates for $\hat{c}_i$:

$$\hat{c}_i = \bar{w}_i - \sum \hat{\beta}_k^{FE} \bar{x}_{ik} - \bar{\varepsilon}_i \tag{5.2.12}$$

We use this estimate of the person effect as an indicator for the maximum value of time-constant circumstances which an individual should not be held responsible – as by definition, it comprises all exogenous circumstances as well as some not changing effort variables. Thus, this regression can be regarded as a pre-stage for estimating our final model of interest, where we use $\hat{c}_i$ as a circumstance variable which includes all unobservable and observable (which we treat as unobserved) time-constant circumstances of an individual.

When estimating our model of interest we go back to a cross-sectional setting and use the annual earnings $\ln(w_{is})$ of time point s (with $s \neq t$) as dependent variable (identical with the lower bound estimation) and simply estimate the

[94] Note that the estimation of the unit-effect relies on the consistent estimation of coefficients in the FE model. Omitting any effort variables that interact with circumstances biases our results upwards, emphasizing that we should interpret our results as upper bounds of IOp.

reduced-form (bivariate) model:

$$\ln(w_{is}) = \psi \hat{c}_i + \upsilon_{is} \tag{5.2.13}$$

Again, as in the lower bound case, we construct a parametric estimate of the smoothed distribution by replacing individual earnings by their predictions:

$$\widetilde{\mu}^{UB} = \exp[\widehat{\psi}\hat{c}_i + \sigma^2/2] \tag{5.2.14}$$

Based on these predicted counterfactual levels, we derive upper bound measures of IOp, by inserting (5.2.14) into (5.2.3) for the upper bound IOp level and into (5.2.4) for the upper bound IOp share in total inequality. Again, as our estimated circumstance variable includes all observed and unobserved time-constant characteristics of an individual which might have an influence on earnings, these measures can be interpreted as *upper bound* estimates of IOp. Thus, by accounting for unobserved circumstances and observed circumstances, we are able to estimate lower and upper bounds of IOL and can identify a reasonable range for the true values of IOp.

Ex-ante vs. ex-post – upper and lower bounds for effort inequality In the (empirical) EOp literature, two different approaches have been used to estimate IOp (see, e.g., Fleurbaey and Peragine (2009)): ex-ante vs. ex-post. The (lower-bound) IOp shares from the ex-ante approach are smaller than the IOp shares from the ex-post approach (Checchi et al. (2010)). The difference between the two approaches can be explained with how unobserved factors are treated. Almås (2008) argues that the ex-ante approach treats the unexplained variation as an responsibility variable and hence gives a lower bound, whereas the ex-post approach, in contrast, treats it as a circumstance which would give an upper bound. This, however, is only true for a given set of (observed) circumstances. Defining the upper bound as in our case (observed vs. unobserved circumstances), gives lower and upper bounds both for the ex-ante and ex-post approaches.[95]

[95] The fact that the ex-post approach gives lower bounds only is also discussed by Aaberge and Colombino (2011) who estimate optimal income tax rules using different social welfare functions (SWF). They recognize that for the (ex-post) EOp approach "*[...] there might be other exogenous factors that affect individuals' achievements*" which are not captured by the observed circumstances. Hence, the within-type distribution of income might still depend on unobserved circumstances. Their solution is using an inequality measure based on an 'extended EOp-SWF' which (partially) accounts for the within-type inequality. Applying this approach in our setting yields an intermediate case with an IOp measure between the lower and the upper bound.

The ex-ante (lower bound) approach differentiates between inequality due to observed circumstances vs. residual inequality which is assigned to effort. This gives a lower bound for IOp – as described above – and hence an upper bound for effort inequality. Our (ex-ante) upper bound for circumstance inequality is also a lower bound for effort inequality, as the unobserved (not changing) residual effort is picked up by the circumstance IOp in this case.

While the ex-ante approach focuses on measuring inequality between types (individuals with the same circumstances), the ex-post approach looks at inequality within tranches of individuals, i.e. people at the same quantile of the effort/outcome distribution with different circumstances. Due to practical reasons, however, the number of circumstances which are incorporated in the analysis is limited to a small number of types (e.g. three types according to father's education). By doing this, the residual is implicitly assigned to IOp. This is, however, not an upper bound as adding another circumstances variable in this setting can still increase the contribution of explained variance due to circumstances. It is straightforward to apply our method for an upper bound of IOp to the ex-post setting as well by defining types based on the unit effect. In the extreme case that everybody is his/her own type, the upper bound of IOp equals outcome inequality, i.e. the share is 100%. In our empirical application, we focus on the ex-ante approach due to practical reasons and data limitations.[96]

5.3 Data

We use the Cross-National Equivalent Files (CNEF) of the SOEP for Germany and the PSID for the US for our estimations. The CNEF contains harmonized data from the respective national panel surveys. The SOEP is a representative panel study of households and individuals in Germany that has been conducted annually since 1984.[97] We use information from all available waves from the SOEP from 1984 until 2009 (since 1991 also including East Germany). The PSID began in 1968 (since 1997 only biennially) and the most current wave is from 2007. In our analysis we use information from 1981 onwards, since specific information on

[96] In our application, we have more than 500 types for the lower bound approach. In order to apply the ex-post approach based on percentiles of the earnings distribution, we would need at least 100 observations per cell, i.e. in total more than 50,000 observations per year. Unfortunately, we do not have access to such a large panel data set.

[97] A detailed overview of the SOEP is provided by Haisken-DeNew and Frick (2003) and Wagner et al. (2007). Issues concerning sampling and weighting methods or the imputation of information in case of item or unit non-response is well documented by the SOEP Service Group.

the occupation and industry of the individual is not available in previous PSID waves.[98]

In line with the previous literature, the units of our analysis are individuals aged 25-55 who are in (part- or full-time) employment. The dependent variables are logarithmic real (annual or permanent) labor earnings, adjusted by consumer prices indices. Inequality measures are based on the corresponding absolute levels of earnings. To derive satisfying estimates of the unit-effect, a long time period is needed. Consequently, we base our analysis only on those individuals who report positive earnings for at least five subsequent points in time.[99] We further restrict our sample to individuals with data on parental background.

We first estimate lower bounds of IOp by using either log annual earnings of the most current wave (2009 for Germany, 2007 for the US) or log permanent incomes – proxied by average real earnings over the whole period.[100] In a second set of estimations, we rely on permanent log earnings which are computed as the individual's mean income over the observation period.

As *circumstance variables,* we include gender, a dummy whether the individual was born in a foreign country, categorical variables of the occupation and education of the father, the degree of urbanization of the place where the individual was born as well as the height and year of birth of the individual. In the case of Germany, we include a dummy if the individual was born in East Germany, and for the US we include a corresponding dummy whether the individual was born in the South. Additionally, we include a variable for the US which indicates the race of the individual. Summary statistics on the mean annual earnings and all employed circumstance variables are illustrated in Table 5.7.1 in the Appendix.

In our longitudinal fixed effects earnings regressions, we include as *effort variables* weekly working hours, age-standardized experience, individual's education in years, as well as industry dummies. We term these variables effort variables since they can be affected by responsible individual choices. In the case that these variables do not vary over time, they are included in the fixed effect and hence counted as a circumstances. This is why the FE model gives an upper bound for IOp. Summary statistics of these variables are illustrated in Table 5.7.2 in the Appendix.

[98] Note that the income reference period in both surveys is the year before the interview. Hence, we actually cover the period 1983 until 2008 for Germany and 1981 until 2006 for the US.

[99] This is a rather arbitrary restriction. However, as our robustness checks show the number of time points does not qualitatively change the results.

[100] In principle, it would be possible to compute more sophisticated measures of permanent income as, e.g., recently proposed by Aaberge et al. (2011).

5.4 Empirical results

5.4.1 Estimation of earnings equations

Derivation of lower bound of IOp The first step of our analysis is the estimation of the log earnings equation (5.2.7) for the most current survey wave (Germany: SOEP 2009; US: PSID 2007) on all observable circumstances which are expected to have an impact on individual labor earnings. The results of these reduced-form OLS regressions are illustrated in Table 5.7.4 in the Appendix. The specifications in the first column are based on the whole sample, in the second and third columns the sample is restricted to male and female individuals, respectively. The first set of regressions for each country is based on periodical incomes, the second set on permanent incomes.

The first column for each set shows that women have significantly lower labor earnings than men in all specifications – the well-known gender wage gap, with values around 50%. A large fraction of the earnings difference is due to the fact that women are more likely to be employed in part-time employment. However, the effect is still negative and significant when only looking at full-time employed (result available upon request), implying that there are further negative opportunities for women.

The effect of being born in a foreign country is negative and significant in Germany. In the US, being 'non-white' reveals an earnings decreasing effect for permanent incomes but not for annual incomes.[101] Being born in a disadvantaged region is related to significantly lower earnings in both countries. In Germany, the effect is more pronounced in the male subsample, whereas in the US, this is the case in the female subsample. Individuals who were born in a larger city have on average larger earnings than individuals who grew up in the countryside.

The regressions also reveal that the education of the father matters for the acquisition of individual earnings. If the father has an upper secondary (college) education, the children's wages are significantly higher in both countries. Accordingly, the occupational status of the father also matters in both countries. If the father was occupied as a white-collar worker or as a professional rather than in blue-collar professions, this is associated with significantly higher earnings in Germany. In the US, a self-employed father seems to be particularly favorable for the earnings acquisition of their children.

[101] The 'non-effect' of race for periodical incomes might be explained with the fact that blacks are more likely to be out of the labor force or even in prison, which leads to underestimated racial wage gaps in cross-sectional data (Chandra (2000)).

As expected, later born (i.e. younger) individuals have smaller earnings. Here the effect is more robust in Germany. The same is true for body height, which has a substantial positive impact in all specifications in Germany. Interestingly, in the US this effect is only evident in the male subsample. Overall, the observed circumstances can explain up to 26.3% of the overall variation in log earnings in Germany, and up to 29.5% in the US. In a world of equal opportunities, these exogenous circumstances should actually have no effect on earnings – hinting that at least some degree of IOp exists in both countries.

Derivation of upper bound of IOp To derive upper bounds of IOp, the first step is the FE estimation of the earnings equation (5.2.11) on the observable time-varying effort variables. Table 5.7.5 in the Appendix presents the results. Again, we run separate regressions for periodical and permanent income as well as men and women. Overall, the models explain up to 42% of the within-variation of real earnings in Germany and up to 36% in the US. The unexplained part is a first hint for the existence (and size) of the upper bound IOp.

In Germany, we find a clear non-linear relationship between age-standardized experience and earnings in almost all specifications – with the exception of the male subsample in the US. Not surprisingly, working hours have a significant positive impact on earnings in both countries and the effect is robust across all specifications. The same is true for education. With regard to the industry dummies, in both countries, an occupation in the energy and mining, manufacturing, construction, transportation, financial (only in the US) and health sector is associated with higher earnings than if you are employed in the public sector (reference).

5.4.2 Lower and upper bounds of IOp

In the next step, the coefficients of the reduced-form OLS regression (5.2.7) are used to predict counterfactual advantage levels $\widetilde{\mu}^{LB}$ in annual earnings which are only due to differences in circumstances. Thus, if there were an absolute EOp, all predicted advantage levels $\widetilde{\mu}^{LB}$ would be exactly the same. This smoothed distribution $\widetilde{\mu}^{LB}$ is then used to compute the lower bound IOp measures.

The upper bound measures are derived from the FE model. Based on the first-stage FE wage regressions, we predict the unit-effects for all individuals, as suggested by equation (5.2.12). In the next step, we use these indicators of the maximum amount of circumstances $\hat{c}_i$ as independent variables to estimate equation (5.2.13). Now, the dependent variable are the individual's logarithmic labor

earnings in 2009 (2007) for Germany (the US). The coefficients of this OLS regression are then used to predict counterfactual advantage levels $\widetilde{\mu}^{UB}$ in annual earnings which are only due to differences in the unobserved heterogeneity.

The MLD for inequality in outcomes (total bar) as well as the counterfactual smoothed distributions for the lower (dark grey) and upper (medium grey) bounds are presented in Figure 5.4.1. Inequality in periodical (permanent) incomes is reported in the upper (lower) panel both for the US and Germany for the full sample as well as separated by gender. Furthermore, for each subgroup, the left bar is based on gross earnings whereas the right bar is based on net earnings.

Inequality levels We start by examining annual labor earnings (upper panel). Our results reveal a MLD of 0.26 (0.21) for Germany and 0.35 (0.29) in the US for gross (net) earnings. Not surprisingly, redistribution reduces outcome inequality in both countries and in all samples. Inequality of outcomes is substantially larger in the US than in Germany in all samples, which is in line with previous findings. In Germany, the inequality in earnings is substantially smaller (higher) if we look at the male (female) sample separately. This indicates that men are more likely employed in full-time jobs and thus earnings are distributed more homogenously than across women – which have a much higher variation in hours worked. In the US, the outcome inequality levels are similar in the male and female subsamples. Inequality in permanent incomes is substantially lower in the US than inequality in annual incomes. In Germany, this is only the case for the female subsample whereas the decrease is rather small for the full sample which could hint at lower income mobility in Germany (van Kerm (2004)). Therefore, inequality in permanent incomes is surprisingly similar between Germany and the US.

The lower bound IOp estimations control for a full range of observed circumstance variables such as gender, country and region of origin, height as well as father's education and occupation. Based on annual incomes, the MLD levels are rather similar between Germany (0.07) and the US (0.06) for the full samples. However, the difference is statistically significant as suggested by the bootstrapped confidence intervals in Table 5.7.3 in the Appendix. Redistribution has only a small effect on the lower bounds in both countries. When looking at the male and female subsamples separately, the IOp levels decrease. This is a first indication that gender is an important (observed) circumstance and in line with the large male-female wage gap found in Table 5.7.4. The results for permanent incomes are almost identical suggesting no great difference between the two income concepts in terms of (lower bound) IOp levels.

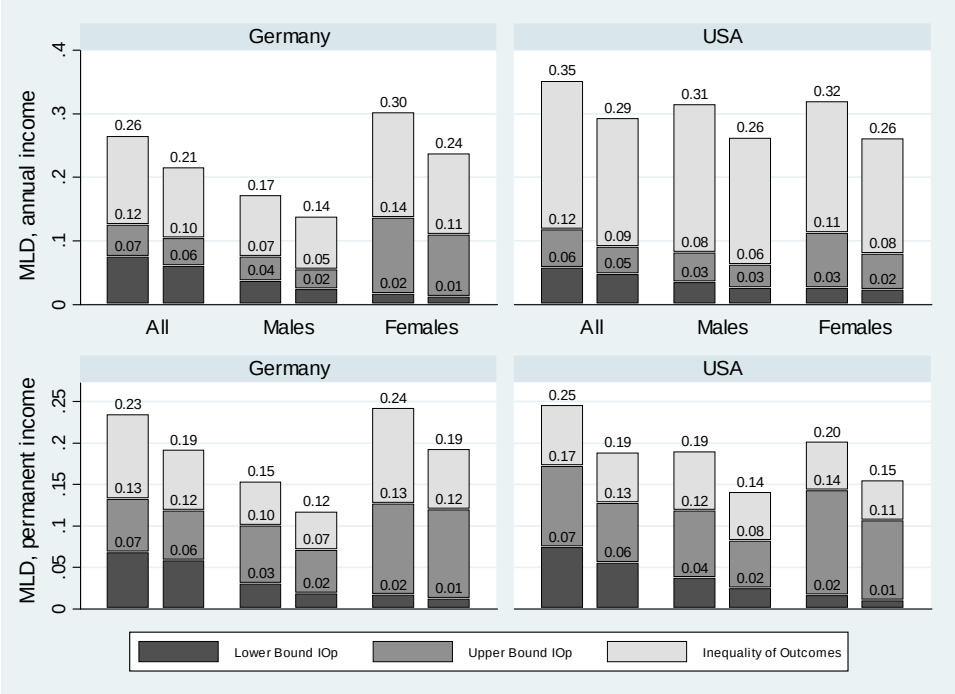

Figure 5.4.1: Upper and lower bound indices of IOp

Source: Own calculations based on SOEP and PSID. The two graphs on the top illustrate IOp levels in annual incomes (2009 for Germany, 2007 for the US); the graphs at the bottom IOp levels in permanent incomes.

The upper bound IOp levels are also rather similar for annual income in all samples in both countries. With MLD values of 0.12 for both countries in the full sample, the IOp levels are significantly (and about two times) larger than the lower bound estimates that control for a comprehensive set of observed circumstances. Again, we interpret these numbers as upper bounds of IOp, since they represent all constant characteristics of an individual which may have an impact on labor earnings.[102] When looking at permanent incomes, the pictures changes. The IOp level is similar to annual incomes only for Germany in the full sample and the male subsample. When looking at the female subsample separately as well as in all US samples, the IOp levels increase significantly.

IOp shares In order to get a feeling for the relative importance of IOp, Figure 5.4.2 presents the range for IOp shares, i.e. the IOp levels divided by the MLD for outcome inequality (between group inequality as fraction of total inequality). The

[102] It should be noted that the upper bounds of IOp decrease if we, e.g., add the marital status or the number of children in the FE wage regressions, which can be expected to have an indirect impact on annual earnings. This provides additional evidence that our results can indeed be interpreted as upper bounds of IOp.

upper (lower) line corresponds to the upper (lower) bound share. Again, results are presented for periodical (permanent) incomes in the upper (lower) panel both for the US and Germany for the full sample as well as separated by gender for gross (left, darker bar) and net (right, lighter bar) earnings.

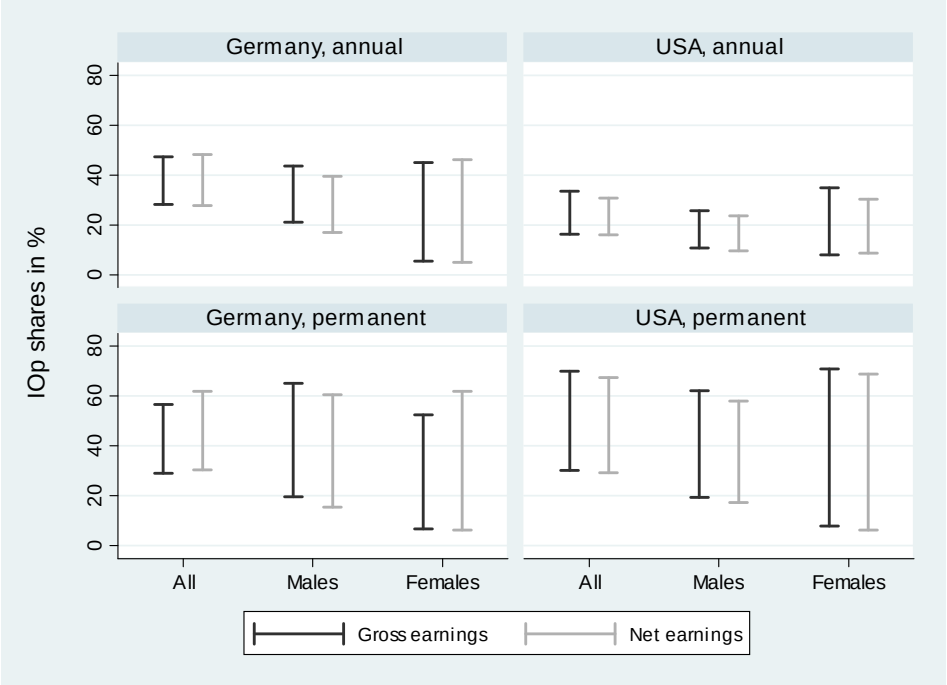

Figure 5.4.2: IOp shares in outcome inequality

Source: Own calculations based on SOEP and PSID. The two graphs on the top illustrate IOp shares in annual incomes (2009 for Germany, 2007 for the US); the graphs at the bottom IOp shares in permanent incomes.

The IOp shares are significantly higher for Germany than for the US for annual incomes, which is due to lower absolute levels of outcome inequality while having similar values of IOp – which is in line with the findings of Almås (2008). The lower bound shares equal 30% in Germany and 16% in the US – the latter is comparable to previous findings (Pistolesi (2009)). Based on these results, it would be possible to deduce that individual earnings are mainly driven by individual's effort choices and only to a lesser extent by circumstances. Our upper bound estimates, however, suggest that earnings are to a larger extent pre-determined by exogenous circumstances. We find upper bounds of IOp of around 50% in Germany and 35% in the US. The differences are statistically significant.

Thus, it seems that there is substantially less IOp in the US compared to Germany, i.e. one could conclude that equality of opportunity is higher in the "land of opportunities". However, using permanent instead of annual incomes

matters for inequality levels, especially in the US, where IOp levels are much higher for permanent incomes (comparable to the findings of Pistolesi (2009)). In Germany, the difference between inequality levels for the two income concepts is much smaller. Therefore, inequality levels (and hence the IOp shares) are similar for both income concepts. Hence, the IOp shares for permanent incomes are higher in the US than in Germany.

Again, the lower bound IOp shares are substantially smaller when we look at the female and male sample separately. This again hints at gender as an important source of IOp. However, the effect is not as strong for the upper bounds based on the unit-effect as circumstance variable. This indicates that a large share of the inequality in outcomes can be explained by unobserved heterogeneity of individuals.

Gross vs. net incomes We find that the differences between gross and net income inequality, i.e. the redistributive effects of the tax benefit systems, are rather similar between Germany and the US. This might be surprising at a first glance, since European welfare states are usually said to be more redistributive. But in our exercise, as we focus on the working age population, this is not the case. The main difference in redistribution between Germany and the US is due to benefits (especially for the unemployed) and not due to the progressivity of the income tax which is rather similar in both countries. In our sample, we focus on individuals who are working. They pay taxes and receive almost no benefits – except for child credits which are comparable between both countries. Hence, the redistributive effects for this subgroup of the population is rather similar between Germany and the US.

5.5 Discussion of results

5.5.1 'Explaining' the results

Annual vs. permanent incomes The result that IOp in permanent incomes in the US is much higher than for annual incomes – which is not the case for Germany, might be explained by different mobility patterns between both countries. In general, mobility is higher in the US (van Kerm (2004)). However, in the US much higher persistence and hence lower mobility – compared to European countries – is observed at the tails of the distribution (Björklund and Jäntti (2009)). Whereas in countries like Germany, mobility is on average lower, it

is more equally spread across the distribution. In the US, in contrast, there is much higher mobility in the middle, but, compared to other countries, the probability for the poor (rich) to make it to the top (bottom) is much lower. This persistence of inequality at the tails of the distribution might help to explain IOp levels in permanent incomes are much higher in the US, i.e. the rags-to-riches story is less common than usually thought, as it has been shown that IOp is generally higher at the tails (Aaberge et al. (2011)).

Gross vs. net incomes We have seen that there is basically no difference between the IOp shares between gross and net earnings in both countries. This does not imply that policy does not matter – in contrast, the IOp levels are considerably lower in both countries. However, the results indicate that there is no differential effect of the tax benefit system in our sample. This is not surprising for two reasons. First, tagging, i.e. the use of exogenous circumstance information to determine tax liabilities and benefit eligibility, is usually not explicitly used in existing tax benefit systems due to anti-discrimination laws. Second, we focus on the working population between 25-55. These individually usually pay taxes but receive little benefits in both countries. Implicit tagging, i.e. designing rules and conditions such that individual with certain circumstances are more likely to be eligible for it, is much less common in the tax system than for benefits. Hence, one would expect that existing tax benefit systems do not account for the source of inequalities – whether equitable (due to effort) or not (due to circumstances) – when redistributing income. Therefore, in order to improve the fairness (and efficiency) of the redistributive system, tagging on circumstances has to be increased (Ooghe and Peichl (2010)).

Policy simulation As we have seen, gender differences play an important role for the EOp gap. Most of it was due to the indirect effect that women tend to work fewer hours. Part of this is due to the tax benefit rules – especially the system of joint taxation which yields high marginal tax rates for the second earner – usually the wife. Based on IZA's behavioral microsimulation model for the German tax and transfer system (IZAΨMOD, see Peichl et al. (2010) for an overview), we simulate the abolishment of the joint taxation system in Germany by introducing pure individual taxation to illustrate the importance of policy for the extent of EOp.

The abolishment of joint taxation increases (decreases) married women's (men's)

labor supply.[103] When looking at the resulting IOp levels, we find that this policy change indeed leads to lower IOp (the upper and lower bound indices decrease by more than 10% each). Given the fact that this policy affects only married couples and that we focus on the intensive margin, this reduction is quite substantial. Furthermore, this policy is also associated with higher tax revenue which could be used to promote child care policies to further increase female labor force participation and reduce IOp.

5.5.2 Robustness checks

Different inequality measures Although the other measures from the GE family violate the path-independent decomposability axiom, it is still insightful to see that the results are not driven by the choice of MLD which can be seen in Figure 5.5.1. For both, Germany and the US, the resulting lower and upper bound IOp shares of the MLD compared to the Theil (1) index (GE(1)) are very similar. With respect to the half squared coefficient of variation (GE(2)), which is particularly sensitive to changes at the top of the income distribution, we do observe some differences. Using this inequality measure generally leads to lower IOp shares in all samples. The differences are more pronounced in the US than in Germany, and the range of IOp shares particularly decreases in the case of annual incomes.

Different samples In order to further check the sensitivity of our results, we examine different samples. The results are illustrated in Table 5.5.1. First, we restrict our sample to full-time employed individuals. For Germany, this leads to a decrease of the lower bound share of IOp of almost ten percentage points. This substantial decrease may be explained by the less explanatory power of the gender dummy when only looking at full-time employed individuals. The upper bound increases, on the other hand. For the US, the results remain fairly similar to those in the baseline sample. Thus, the qualitative differences between Germany and the US remain. Note, however, that the sample size are substantially smaller than in the baseline estimations. When we restrict our sample to prime-aged 30-45 aged individuals, the results are very similar as those in the baseline estimations, except for the US where we find a substantial increase in the upper bound IOp share.

[103] The largest effect of the policy change can be observed at the extensive margin, which is not relevant in our case since we only look at individuals who are already working. However, we can also observe labor supply effects at the intensive margin which then lead to different individual earning outcomes for married couples.

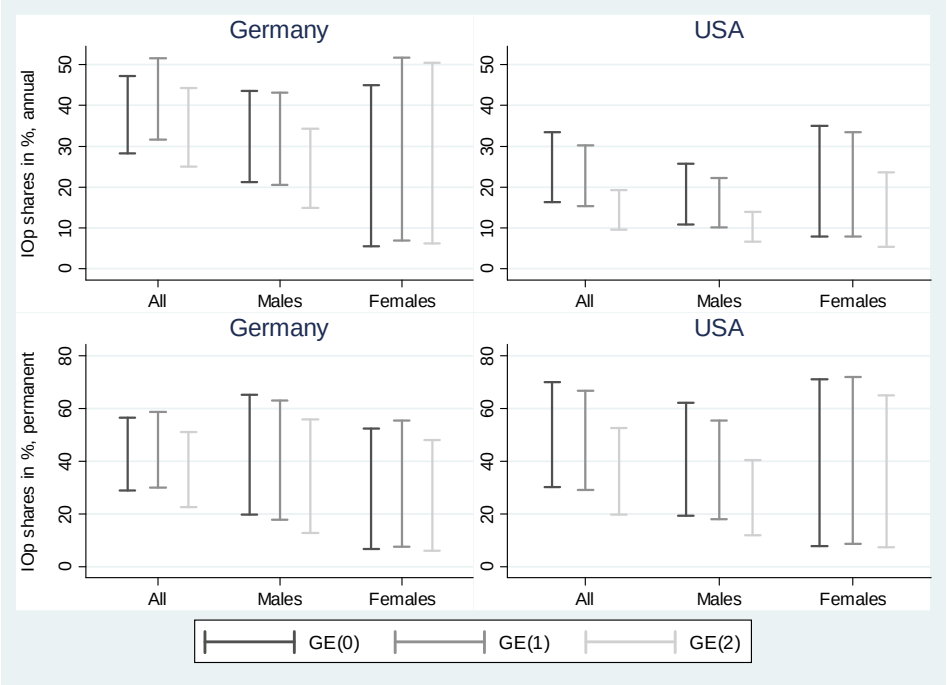

Figure 5.5.1: IOp shares in outcome inequality for different inequality measures

Source: Own calculations based on SOEP and PSID. The two graphs on the top illustrate IOp shares in annual incomes (2009 for Germany, 2007 for the US); the graphs at the bottom IOp shares in permanent incomes.

In our baseline estimations we derive the unit-effect based on observations from unbalanced panels. Thus, we also run estimations which we base on balanced panels over a time period of ten years. The results for the most current balanced panel are very similar as our baseline results. For Germany, however, we find a considerable decrease of the upper bound for the previous time period, whereas in the US the upper bound share is larger when looking at the earlier time period.

Finally, we also test the responsiveness of our results with respect to sample selection due to missing values in circumstances variables. As expected, the lower bound decreases when reducing the circumstance set. In line with our model the results for the upper bound IOp shares remain very stable and are therefore independent of the circumstances set.

5.5.3 The role of luck

So far, we have assumed that luck belongs to the sphere of individual responsibility. In the (philosophical) debate about whether luck should be compensated or not, a distinction is made between 'brute luck' on the one hand and 'option luck' on the other. The former is a random shock not associated with any (effort-related)

	Germany						US					
	Annual			Permanent			Annual			Permanent		
	N	LB	UB	N	LB	UB	N	LB	UB	N	LB	UB
Baseline	3,410	28.2	47.3	7,632	29.0	56.6	1,293	16.3	33.5	7,081	30.2	70.0
Full-time employed only	1,894	19.1	67.9	5034	21.8	72.7	590	15.4	32.9	4,539	26.7	55.5
Age range 30-45 only	1,364	29.5	56.7	4,767	35.0	71.5	375	22.3	46.3	5,199	30.1	79.7
Balanced-panel 10 years												
2008-1999 (2005-1992)	1,327	27.3	63.6	1,503	31.1	78.6	859	19.1	44.6	1,498	40.2	76.0
1998-1989 (1991-1982)	841	33.1	43.8	889	38.9	60.0	1,704	20.1	52.9	2,427	33.5	86.7
Missing values circumstance variables												
Without father's occ.	3,856	26.0	48.5	9,296	28.9	55.1	1,475	14.8	31.3	8,026	28.1	69.2
Without father's occ., region, ethnicity, urbanity	4,091	23.9	45.8	9,801	26.0	52.3	1,634	14.2	32.1	8,938	24.8	68.4
Only gender, birth, height	4,633	20.6	45.2	11,273	22.8	52.1	1,741	9.7	32.2	9,850	18.4	67.1

Source: Own calculations based on SOEP and PSID. N illustrates the underlying number of observations, LB (UB) the lower (upper) bound IOp share. Year intervals without (with) brackets indicate time periods for Germany (the US). All robustness checks rely on log gross earnings as dependent variables.

Table 5.5.1: Sensitivity analysis

choices (e.g. being struck by a lightning), whereas the latter is a consequence of a choice (e.g. winning or losing money while gambling) and should not be compensated. Hence, by neglecting (brute) luck, we (implicitly) assumed that all individual shocks are option luck, which was reasonable since our empirical analysis was mainly meant to illustrate the difference between lower and upper bound estimates.

Additionally accounting for brute luck gives the 'true' upper bound. However, the empirical identification of the two forms of luck is not straightforward. Nonetheless, our approach of estimating an upper bound can be extended following Lefranc et al. (2009). In order to illustrate this, and as a further robustness check, we now assume that all unobserved factors are non-responsibility characteristics, i.e. brute luck. Hence, we modify equation (5.2.13) in the following way in order to separate the effect of observed effort variables and unobserved factors:

$$\ln(w_{is}) = \psi \hat{c}_i + \beta E_{is} + \upsilon_{is} \tag{5.5.1}$$

We then construct a parametric estimate of the smoothed distribution explicitly taking into account the error term υ_{is} :

$$\widetilde{\mu}^{UB,L} = \exp[\widehat{\psi}\hat{c}_i + \widehat{\upsilon}_{is} + \sigma^2/2] \tag{5.5.2}$$

Based on these predicted counterfactual levels, we then derive new upper bound

measures of IOp taking into account luck. This gives an *upper* upper bound estimate of IOp as we do not only capture time-constant effort (in the unit effect) but also unobserved effort as well as option luck in the error term. The results are illustrated in Figure 5.5.2. The darker grey bar line shows the range between the lower and upper bound as previously defined, whereas the upper, lighter grey line shows the difference to the upper bound when additionally accounting for luck.

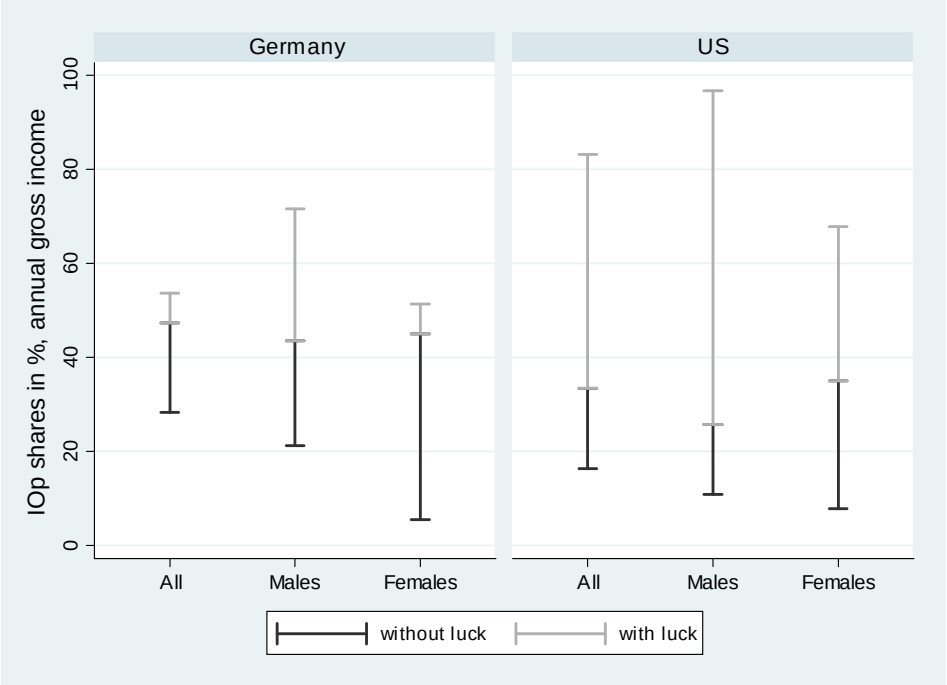

Figure 5.5.2: Upper and lower bounds of IOp when accounting for luck

Source: Own calculations based on SOEP and PSID.

When accounting for luck, the upper bound does not change much in the German data for the full sample and the female subsample. The change is higher for the male subsample as well as in the US data for all samples. These results point toward a higher importance of unobserved effort or indeed luck in the cases where the luck-adjusted upper bound is much higher. The results for the US are also much more in line with the findings for permanent incomes, where we found higher upper bound IOp shares for the US than for Germany.

To sum up, our approach of estimating an upper bound does not depend on the assumption about the responsibility cut for luck. With the appropriate data and identification strategy that would allow for separating brute luck from option luck, it would be possible to estimate the 'true' upper bound.

5.6 Conclusion

The existing literature on EOp provides only lower bound estimates of IOp. We suggest a two-stage estimator based on a fixed effects model to tackle this issue. The maximum amount of circumstances which an individual should not be held responsible is the person's fixed effect, as by definition, it comprises all exogenous circumstances as well as some not changing effort variables. Using this unit effect as a circumstance measure enables us to quantify the maximum amount of inequality which can be attributed to IOp. We apply the method to a rich set of harmonized micro-level panel data for Germany and the US in order to empirically illustrate our new estimator and to compare it to the well-known lower bound.

The IOp levels are rather similar between Germany and the US in terms of the lower and upper bounds for annual incomes and the lower bound for permanent incomes. For the latter, the upper bound levels are higher in the US than in Germany. The IOp shares are higher for Germany (30-50%) than for the US (16-35%) for annual incomes which is due to lower absolute levels of outcome inequality while having similar values of IOp. This result might help to explain why attitudes toward inequality and redistribution differ substantially between both countries (Figure 5.7.1 in the Appendix). Contrary to Germany, the majority of respondents in the US thinks that larger income differences are necessary as incentives, while 40% of the respondents think that the most important reason why people live in need is laziness – the numbers are only half as high in Germany. However, when moving to a measure of permanent income, we find larger (lower and upper bound) IOp shares for the US, which increase to 30% and 70% respectively. However, we do not find a substantial increase for Germany. We explain this difference with different degrees of mobility and persistence in different parts of the distribution (Björklund and Jäntti (2009)). The persistence of inequality at the tails of the distribution suggests that the rags-to-riches (or vice versa) story is less common than usually thought.

To sum up, we find significant and robust differences between lower and upper bound estimates for both countries for all specifications. At a first sight, the high IOp shares for the upper bound might seem surprising. However, it should be noted that our estimate of unobserved heterogeneity also includes all unobserved abilities and innate talent. This is in line with Björklund et al. (2011), who indicate that the intelligence quotient (IQ) is the most important circumstance among the variables that they consider to explain differences in earnings. In addition, results from the literature on sibling correlations also emphasize the importance

of family background and genetic material (Solon (1999), Björklund et al. (2009)). Furthermore, recent results from the literature on the effect of human capital on wage dispersion show that individual characteristics (e.g. Bagger et al. (2010)) as well as initial conditions (e.g. Hugget et al. (2011)) account for most of the variation in annual as well as lifetime earnings. Although we do not claim that our upper bound estimates present the true amount of IOp, they provide evidence that the existing lower bound estimates substantially underestimate IOp and thus might demand for too little redistribution to equalize inequalities due to circumstances.

Our results also reveal the importance of gender as one driving force of IOp. The effect of gender is considerably smaller when only looking at full-time employed individuals. Thus, the *gender opportunity gap* is mainly due to the indirect effect of gender on earnings: women are more likely employed in part-time jobs. Introducing a policy change which is likely to increase female labor supply – such as the move from joint to individual taxation – indeed reduces the IOp bounds by about two percentage points. This suggests that policies can be a useful tool to change IOp – and also that existing policies might actually increase IOp. It would be interesting to analyze the effect of tax systems that are based on exogenous characteristics (Ooghe and Peichl (2010)) on IOp in future research.

5.7 Appendix

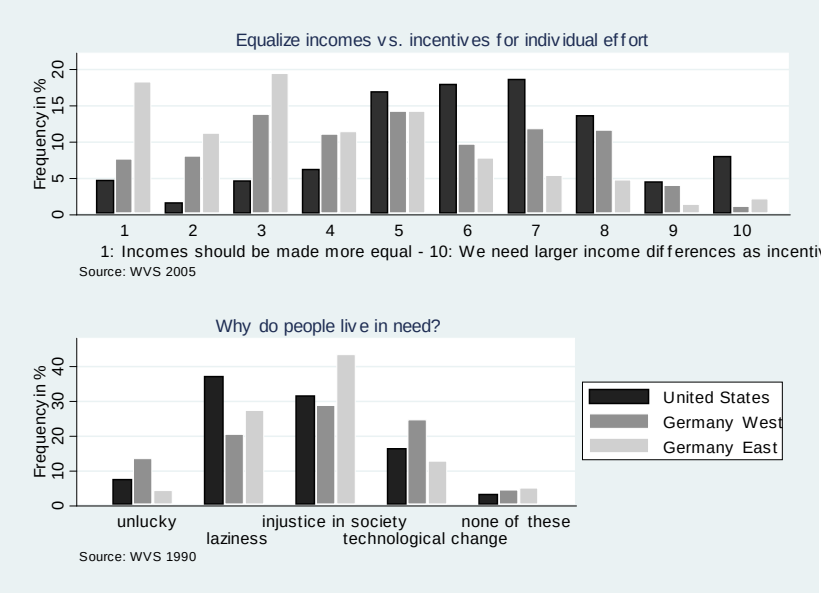

Figure 5.7.1: Attitudes towards inequality and redistribution

Source: Own calculations based on WVS.

	Germany						USA					
	Annual Incomes			Permanent Incomes			Annual Incomes			Permanent Incomes		
	All	Male	Female	All	Male	Female	All	Male	Female	All	Male	Female
Mean gross earnings in $	52042.93	65433.91	37162.22	35792.16	44976.36	25629.46	61070.60	75872.79	40181.17	40381.58	51668.01	27009.21
Mean net earnings in $	37488.91	46986.76	26934.43	26274.02	33028.10	18800.35	46919.01	57203.8	32404.71	30904.41	38767.91	21587.59
Female	47.37	0.00	100.00	47.47	0.00	100.00	41.47	0.00	100.00	45.77	0.00	100.00
Ethnicity (Foreigner/ non-white)	4.95	5.56	4.26	5.63	5.99	5.24	28.39	22.26	37.04	30.69	27.14	34.90
Region (East/ South)	28.78	26.81	30.96	27.65	26.89	28.48	35.01	31.67	39.72	40.62	38.85	42.70
Lower-secondary	2.37	2.61	2.10	2.44	2.79	2.04	2.75	2.17	3.58	6.48	5.42	7.74
Secondary	66.74	66.30	67.24	69.77	69.62	69.94	67.00	64.71	70.24	71.01	70.83	71.21
Intermediate	17.45	17.74	17.12	15.87	15.76	15.98	12.13	12.22	12.01	9.74	10.23	9.16
Upper-secondary	13.44	13.35	13.54	11.92	11.82	12.03	18.11	20.90	14.18	12.77	13.52	11.88
Worker	51.52	49.17	54.14	52.35	51.36	53.44	49.15	42.44	58.62	54.33	49.92	59.55
Farmer	2.99	3.62	2.29	3.49	3.99	2.93	7.20	7.51	6.77	12.15	12.79	11.39
White-collar	16.01	15.91	16.13	15.47	15.37	15.59	8.00	7.33	8.94	7.54	7.11	8.05
Professional	14.14	14.52	13.72	12.60	12.47	12.75	24.58	33.21	12.39	16.23	20.91	10.68
Self employed	6.67	7.23	6.06	7.40	7.58	7.20	11.07	9.50	13.28	9.76	9.27	10.34
Civil servant	8.67	9.57	7.66	8.69	9.23	8.09						
Countryside	38.26	38.32	38.20	38.05	38.21	37.87	13.67	14.57	12.39	19.64	20.39	18.76
Small city	40.49	40.93	39.99	40.38	40.21	40.57	51.54	54.03	48.02	44.30	44.90	43.60
Large city	21.25	20.75	21.82	21.57	21.58	21.56	34.80	31.40	39.59	36.05	34.71	37.64
Birth	1964.05	1964.11	1963.99	1959.96	1959.74	1960.20	1960.84	1961.44	1960.00	1953.29	1953.80	1952.70
Height	174.35	180.59	167.41	173.55	179.64	166.80	174.71	180.72	166.24	173.20	179.78	165.40
N	3410	1795	1615	7632	4009	3623	1293	712	581	7081	3840	3241

Table 5.7.1: Descriptive statistics – circumstance variables (cross-sectional data)

Source: Own calculations based on SOEP and PSID.

	Germany						USA					
	Annual incomes			Permanent incomes			Annual incomes			Permanent incomes		
	All	Male	Female	All	Male	Female	All	Male	Female	All	Male	Female
Mean gross earnings in $	36387.13	44783.87	26019.72	36325.09	44717.64	26017.85	42946.78	54501.67	28782.89	42927.45	54426.67	28778.46
Mean net earnings in $	26733.54	32978.3	19023.17	26694.91	32943.8	19020.38	32585.49	40659.38	22688.59	32591.35	40623.01	22708.94
Weekly work hours	34.49	39.25	28.62	34.45	39.21	28.60	38.58	42.65	33.59	38.60	42.65	33.62
Education in years	12.69	12.72	12.66	12.69	12.72	12.67	13.45	13.50	13.40	13.45	13.49	13.40
Age	40.95	40.71	41.24	40.85	40.64	41.12	38.73	38.50	39.02	38.67	38.41	38.98
Experience	16.52	18.07	14.61	16.42	17.99	14.50	10.61	10.22	11.08	10.69	10.32	11.15
Public	9.78	9.44	10.20	9.76	9.45	10.14	5.58	5.85	5.26	5.61	5.87	5.28
Energy Mining	14.19	19.65	7.45	14.15	19.61	7.44	9.32	14.04	3.53	9.27	13.96	3.51
Engineering	7.16	9.93	3.74	7.15	9.91	3.76	7.95	10.27	5.12	7.92	10.22	5.08
Manufacturing	5.64	5.63	5.67	5.62	5.59	5.65	8.37	9.45	7.04	8.32	9.37	7.03
Construction	8.06	12.79	2.22	8.02	12.75	2.20	6.32	10.58	1.11	6.34	10.59	1.10
Sales	13.09	10.07	16.81	13.09	10.09	16.77	14.95	15.08	14.78	14.94	15.05	14.82
Transport	5.55	7.01	3.74	5.55	7.02	3.75	7.24	9.35	4.65	7.26	9.38	4.65
Financial	3.60	3.42	3.83	3.59	3.41	3.80	4.74	3.08	6.78	4.75	3.10	6.77
Service	13.63	12.43	15.10	13.66	12.47	15.13	15.12	13.52	17.08	15.23	13.65	17.18
Education	8.57	5.42	12.47	8.64	5.49	12.50	10.53	5.32	16.91	10.48	5.31	16.83
Health	10.73	4.22	18.77	10.79	4.20	18.87	9.87	3.47	17.72	9.89	3.51	17.75
N	78137	43261	34876	82673	45569	37104	82859	45567	37292	85827	47347	38480

Table 5.7.2: Descriptive statistics – effort variables (longitudinal data)

Source: Own calculations based on SOEP and PSID.

	Germany									USA								
	All			Male			Female			All			Male			Female		
	P	CI		P	CI		P	CI		P	CI		P	CI		P	CI	
Annual incomes																		
Lower bound gross	0.075	(0.071	0.079)	0.036	(0.032	0.040)	0.017	(0.015	0.020)	0.057	(0.054	0.061)	0.034	(0.031	0.037)	0.025	(0.022	0.029)
Lower bound net	0.059	(0.057	0.062)	0.023	(0.021	0.026)	0.012	(0.011	0.014)	0.047	(0.044	0.050)	0.025	(0.023	0.027)	0.023	(0.019	0.026)
Upper bound gross	0.125	(0.116	0.135)	0.074	(0.066	0.085)	0.136	(0.121	0.152)	0.117	(0.106	0.129)	0.081	(0.070	0.091)	0.111	(0.096	0.129)
Upper bound net	0.104	(0.096	0.112)	0.054	(0.047	0.061)	0.109	(0.097	0.122)	0.090	(0.081	0.099)	0.062	(0.053	0.070)	0.079	(0.067	0.093)
LB share gross	28.2	(25.5	31.5)	21.2	(18.3	24.8)	5.5	(4.7	6.7)	16.3	(14.3	18.5)	10.9	(9.2	13.2)	7.9	(6.3	10.0)
LB share net	27.7	(25.0	31.1)	17.0	(14.5	20.0)	5.1	(4.3	6.2)	16.1	(14.0	18.3)	9.6	(8.1	11.7)	8.7	(7.1	11.0)
UB share gross	47.3	(42.9	52.3)	43.6	(36.7	52.3)	45.0	(39.8	51.8)	33.5	(29.6	38.5)	25.7	(21.5	30.9)	35.0	(29.6	41.6)
UB share net	48.2	(43.4	53.6)	39.5	(32.7	48.0)	46.1	(40.3	53.6)	30.8	(27.0	35.6)	23.7	(19.7	28.9)	30.4	(25.4	36.9)
Permanent incomes																		
Lower bound gross	0.068	(0.066	0.069)	0.030	(0.029	0.031)	0.016	(0.016	0.017)	0.074	(0.072	0.076)	0.037	(0.035	0.038)	0.016	(0.015	0.017)
Lower bound net	0.058	(0.057	0.059)	0.018	(0.017	0.019)	0.012	(0.011	0.013)	0.055	(0.054	0.056)	0.024	(0.023	0.025)	0.010	(0.009	0.010)
Upper bound gross	0.132	(0.127	0.138)	0.100	(0.093	0.107)	0.127	(0.120	0.134)	0.172	(0.166	0.178)	0.118	(0.112	0.125)	0.142	(0.137	0.149)
Upper bound net	0.118	(0.113	0.123)	0.071	(0.066	0.076)	0.119	(0.113	0.126)	0.127	(0.123	0.132)	0.081	(0.077	0.086)	0.106	(0.101	0.111)
LB share gross	29.0	(27.7	30.4)	19.7	(18.3	21.2)	6.8	(6.3	7.3)	30.2	(28.9	31.6)	19.3	(17.8	21.0)	7.9	(7.4	8.5)
LB share net	30.4	(29.1	31.8)	15.4	(14.3	16.6)	6.3	(5.8	6.7)	29.3	(28.0	30.6)	17.2	(15.8	18.7)	6.2	(5.7	6.6)
UB share gross	56.6	(54.4	59.2)	65.2	(61.6	69.8)	52.4	(49.6	55.2)	70.0	(68.0	72.4)	62.2	(59.3	66.2)	71.0	(67.9	74.3)
UB share net	61.8	(59.6	64.2)	60.6	(57.0	65.1)	62.0	(58.9	65.0)	67.6	(65.3	70.0)	57.9	(54.9	61.8)	68.8	(65.5	72.3)

Table 5.7.3: Bootstrapped confidence intervals

Source: Own calculations based on SOEP and PSID. P indicates point estimates, CI the boostrapped confidence intervals (500 replications).

Dependent variable: Log gross real earnings

VARIABLES	Germany						USA					
	Annual incomes			Permanent incomes			Annual incomes			Permanent incomes		
	All	Males	Females	All	Males	Females	All	Males	Females	All	Males	Females
Female	-0.483***			-0.542***			-0.546***			-0.561***		
	(0.034)			(0.021)			(0.065)			(0.020)		
Non-white	-0.208***	-0.159***	-0.253***	-0.131***	-0.144***	-0.117**	-0.023	-0.152	0.125	-0.171***	-0.285***	-0.061**
	(0.051)	(0.052)	(0.094)	(0.033)	(0.036)	(0.056)	(0.070)	(0.096)	(0.102)	(0.018)	(0.023)	(0.028)
Region (East/ South)	-0.242***	-0.448***	-0.032	-0.198***	-0.447***	0.064**	-0.148***	-0.129*	-0.171**	-0.055***	-0.092***	-0.017
	(0.031)	(0.034)	(0.054)	(0.017)	(0.019)	(0.028)	(0.053)	(0.070)	(0.081)	(0.017)	(0.021)	(0.026)
Secondary	0.143**	0.496***	-0.180	-0.039	-0.038	-0.024	0.190	0.372	0.071	0.188***	0.182***	0.192***
	(0.072)	(0.080)	(0.120)	(0.050)	(0.052)	(0.088)	(0.196)	(0.292)	(0.259)	(0.030)	(0.041)	(0.044)
Intermediate	0.263***	0.663***	-0.087	0.064	0.077	0.063	0.170	0.547*	-0.165	0.277***	0.304***	0.242***
	(0.078)	(0.086)	(0.131)	(0.053)	(0.056)	(0.094)	(0.206)	(0.304)	(0.275)	(0.039)	(0.051)	(0.059)
College	0.318***	0.799***	-0.143	0.128**	0.181***	0.075	0.494**	0.875***	0.098	0.424***	0.434***	0.385***
	(0.083)	(0.091)	(0.141)	(0.056)	(0.059)	(0.098)	(0.206)	(0.303)	(0.280)	(0.040)	(0.051)	(0.062)
Farmer	0.034	-0.144*	0.284**	0.073*	0.012	0.097	0.059	0.235	-0.191	0.080***	0.087***	0.077*
	(0.074)	(0.075)	(0.138)	(0.040)	(0.041)	(0.073)	(0.113)	(0.146)	(0.180)	(0.027)	(0.033)	(0.043)
White-collar	0.122***	0.084**	0.145**	0.140***	0.112***	0.173***	0.107	0.081	0.156	0.159***	0.154***	0.168***
	(0.035)	(0.037)	(0.062)	(0.021)	(0.023)	(0.036)	(0.079)	(0.110)	(0.113)	(0.029)	(0.037)	(0.044)
Professional	0.268***	0.230***	0.272***	0.204***	0.152***	0.280***	0.144**	-0.003	0.394***	0.125***	0.164***	0.155***
	(0.045)	(0.047)	(0.082)	(0.026)	(0.029)	(0.044)	(0.068)	(0.086)	(0.116)	(0.025)	(0.028)	(0.047)
Self-employed	-0.020	-0.011	-0.022	0.085***	0.033	0.143***	0.111	-0.038	0.269***	0.215***	0.253***	0.181***
	(0.052)	(0.056)	(0.090)	(0.029)	(0.031)	(0.049)	(0.072)	(0.102)	(0.099)	(0.026)	(0.033)	(0.040)
Civil servant	0.062	0.024	0.112	0.148***	0.057*	0.266***						
	(0.051)	(0.054)	(0.091)	(0.029)	(0.031)	(0.051)						
City	0.029	-0.018	0.059	0.077***	0.054***	0.090***	0.134*	0.130	0.072	0.099***	0.096***	0.106***
	(0.028)	(0.030)	(0.049)	(0.017)	(0.018)	(0.028)	(0.081)	(0.098)	(0.142)	(0.023)	(0.028)	(0.037)
Large city	0.044	-0.028	0.100	0.114***	0.050**	0.159***	0.143	0.208*	-0.033	0.150***	0.120***	0.168***
	(0.034)	(0.036)	(0.061)	(0.020)	(0.022)	(0.034)	(0.087)	(0.108)	(0.150)	(0.024)	(0.030)	(0.039)
Year of birth	-0.009***	-0.009***	-0.008**	-0.003***	-0.007***	0.002	-0.003	-0.005	0.003	-0.005***	-0.012***	0.003**
	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.004)	(0.005)	(0.006)	(0.001)	(0.001)	(0.001)
Height	1.282***	1.026***	1.490***	0.811***	0.994***	0.586***	-0.130	0.577	-1.036**	0.504***	0.638***	0.316**
	(0.190)	(0.193)	(0.348)	(0.114)	(0.120)	(0.198)	(0.321)	(0.421)	(0.487)	(0.099)	(0.123)	(0.155)
Constant	25.687***	25.790***	22.873***	14.750***	22.419***	5.238**	16.215**	18.718*	5.244	19.258***	32.556***	3.097
	(3.603)	(3.954)	(6.162)	(1.463)	(1.573)	(2.489)	(7.290)	(9.534)	(11.546)	(1.470)	(1.824)	(2.358)
N	3410	1795	1615	7632	4009	3623	1293	712	581	7081	3840	3241
R^2	0.234	0.204	0.044	0.263	0.207	0.058	0.162	0.107	0.075	0.295	0.195	0.071

Standard errors in parentheses; annual income estimations for Germany rely on SOEP wave 2009; estimations for the USA on PSID wave 2007;
*** p<0.01, ** p<0.05, * p<0.1

Table 5.7.4: OLS reduced-form regressions – lower bound of IOp

Dependent variable: Log gross real earnings

VARIABLES	Germany						USA					
	Annual incomes			Permanent incomes			Annual incomes			Permanent incomes		
	All	Males	Females	All	Males	Females	All	Males	Females	All	Males	Females
Experience	0.257***	0.360***	0.207***	0.256***	0.358***	0.207***	0.174***	0.202***	0.108***	0.180***	0.209***	0.117***
	(0.008)	(0.011)	(0.014)	(0.008)	(0.010)	(0.013)	(0.011)	(0.016)	(0.015)	(0.010)	(0.016)	(0.015)
Experience squared	-0.063***	-0.087***	-0.029***	-0.063***	-0.087***	-0.032***	-0.010**	0.000	-0.014**	-0.010**	0.001	-0.015**
	(0.004)	(0.005)	(0.008)	(0.004)	(0.005)	(0.007)	(0.004)	(0.006)	(0.007)	(0.004)	(0.005)	(0.006)
Working hours	0.024***	0.016***	0.032***	0.024***	0.016***	0.032***	0.026***	0.020***	0.034***	0.026***	0.020***	0.033***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.058***	0.082***	0.028***	0.063***	0.088***	0.032***	0.040***	0.044***	0.035***	0.039***	0.043***	0.034***
	(0.004)	(0.004)	(0.007)	(0.004)	(0.004)	(0.007)	(0.005)	(0.007)	(0.007)	(0.005)	(0.007)	(0.007)
Energy and Mining	0.041***	0.046***	0.041*	0.044***	0.048***	0.040*	0.049***	0.085***	0.002	0.043**	0.078***	0.003
	(0.014)	(0.016)	(0.025)	(0.014)	(0.016)	(0.024)	(0.017)	(0.021)	(0.031)	(0.017)	(0.021)	(0.031)
Engineering	0.046***	0.046***	0.065**	0.049***	0.046***	0.076***	0.044**	0.068***	0.016	0.041**	0.067***	0.013
	(0.015)	(0.017)	(0.029)	(0.015)	(0.017)	(0.028)	(0.018)	(0.022)	(0.030)	(0.017)	(0.021)	(0.029)
Manufacturing	-0.013	0.050**	-0.063**	-0.008	0.050***	-0.053**	0.005	0.019	-0.002	0.006	0.021	-0.002
	(0.016)	(0.020)	(0.026)	(0.016)	(0.019)	(0.025)	(0.018)	(0.022)	(0.029)	(0.017)	(0.022)	(0.028)
Construction	0.036**	0.064***	-0.067**	0.036**	0.058***	-0.053*	-0.014	0.011	-0.033	-0.021	0.006	-0.042
	(0.015)	(0.017)	(0.033)	(0.015)	(0.016)	(0.032)	(0.019)	(0.022)	(0.042)	(0.018)	(0.021)	(0.041)
Sales	-0.074***	-0.051***	-0.089***	-0.067***	-0.049***	-0.077***	-0.091***	-0.043**	-0.140***	-0.093***	-0.047**	-0.139***
	(0.014)	(0.017)	(0.022)	(0.014)	(0.017)	(0.022)	(0.016)	(0.020)	(0.025)	(0.016)	(0.020)	(0.024)
Transport	-0.025	-0.036*	0.040	-0.023	-0.031*	0.033	0.022	0.045**	0.056*	0.021	0.043*	0.056*
	(0.017)	(0.019)	(0.032)	(0.017)	(0.018)	(0.031)	(0.019)	(0.023)	(0.033)	(0.018)	(0.022)	(0.032)
Financial	0.069***	0.137***	0.011	0.050*	0.094***	0.027	0.034*	-0.007	0.042	0.038*	-0.003	0.046*
	(0.026)	(0.031)	(0.044)	(0.026)	(0.030)	(0.043)	(0.020)	(0.030)	(0.029)	(0.020)	(0.029)	(0.028)
Service	-0.056***	-0.004	-0.101***	-0.056***	-0.004	-0.102***	-0.103***	-0.025	-0.182***	-0.106***	-0.028	-0.184***
	(0.013)	(0.016)	(0.020)	(0.013)	(0.015)	(0.020)	(0.015)	(0.020)	(0.024)	(0.015)	(0.019)	(0.023)
Education	-0.023	-0.079***	-0.010	-0.022	-0.087***	-0.005	-0.074***	-0.092***	-0.079***	-0.077***	-0.096***	-0.082***
	(0.015)	(0.020)	(0.022)	(0.014)	(0.020)	(0.021)	(0.018)	(0.027)	(0.026)	(0.018)	(0.027)	(0.026)
Health	-0.006	-0.013	-0.020	-0.012	-0.022	-0.024	0.025	-0.013	-0.003	0.021	-0.008	-0.009
	(0.015)	(0.024)	(0.022)	(0.015)	(0.023)	(0.021)	(0.018)	(0.030)	(0.026)	(0.018)	(0.029)	(0.025)
Constant	8.050***	8.194***	7.936***	7.971***	8.117***	7.875***	8.626***	9.036***	8.195***	8.633***	9.032***	8.211***
	(0.050)	(0.055)	(0.090)	(0.049)	(0.054)	(0.088)	(0.071)	(0.100)	(0.100)	(0.068)	(0.096)	(0.096)
N	78137	43261	34876	82673	45569	37104	82859	45567	37292	85827	47347	38480
R^2	0.390	0.421	0.403	0.399	0.428	0.413	0.262	0.186	0.358	0.264	0.190	0.360
No of individuals	7408	3907	3501	7632	4009	3623	6865	3705	3160	7081	3840	3241

Standard errors in parentheses; all estimations include period effects; annual (permanent) income estimations for Germany rely on SOEP waves 1984 - 2008 (2009), estimations for the USA on PSID waves 1981 - 2006 (2007); *** p<0.01, ** p<0.05, * p<0.1

Table 5.7.5: FE earnings regressions – deriving the unit-effect

Chapter 6

Concluding remarks

We started the book with the empirical observation that over the last three decades, income inequality has increased considerably in most developed welfare states. Therefore, redistributive policies are high on the political agenda. From a policy perspective, the correct assessment of the redistributive effects of taxes and benefits is important for developing an effective redistributive policy mix. The aim of the book was to contribute to the understanding and measurement of the redistributive effects of national tax benefit systems.

Chapter 2 analyzed the redistributive effects of different tax benefit instruments in the enlarged EU based on two different approaches. It showed that different measurement approaches might lead to very different results. However, cross-country groupings with respect to the redistributive capacities of tax benefit instruments remain fairly robust regardless of which approach is used. The analysis revealed the relative positions of the new EU member states among the well-established welfare states from Western Europe, thereby identifying the current state of social cohesion in the enlarged EU.

Based on different political economy theories, in Chapter 3, we deduced our hypothesis of substitution, meaning that the redistributive capacities of taxes and benefits become empirical substitutes. We found clearly divergent trends for Germany and the United Kingdom. While for Germany there is some evidence that increasingly regressive taxes are accompanied by larger redistributive benefits, we do not observe this structural change in the United Kingdom. The findings hint at the importance of political institutions and indicate that the political will for redistributive policies might differ substantially between the two countries.

Chapter 4 provided a multivariate analysis of the effect of social spending policies and different benefit functions on income inequality. By using some pre-

sumably exogenous variation in social spending levels as an instrument, we sought to identify causal effects. While the analysis revealed a robust inequality-reducing effect of social spending generosity, more means testing does not result in reductions of income inequality. In fact, more low-income targeting reveals a positive effect on pre-government income inequality, indicating the importance of second-order disincentive effects.

Chapter 5 distinguished between inequality of outcomes and inequality of opportunity. We find that the unobservability of some relevant circumstances might lead to an underestimation of inequality of opportunity and might thus demand for too little redistribution. Also, opportunities are more equal in the United States than in Germany. Therefore, distinguishing between fair and unfair inequalities might help to explain different attitudes toward inequality and redistribution in different countries.

The following statements summarize the main findings of the four analyses and discuss their policy implications. Finally, we also outline directions for further research.

The choice of the measurement approach matters. The first analysis showed that it is absolutely necessary to understand the normative assumptions of the measurement methods applied; otherwise citizens or policy makers might draw the wrong conclusions about the redistributive capacities of the tax benefit system. While the factor source decomposition method is suitable for learning more about the objectives of different tax benefit instruments, the sequential accounting approach is more appropriate for assessing the effective impact on income inequality. In fact, the factor source decomposition approach might underestimate the *effective* equalizing impact of benefits that are not dependent on recipients' income.

Indirect taxes have to be taken into account. Due to data limitations, most studies on income redistribution do not consider the distributional impact of indirect taxes. However, we found that the inclusion of indirect taxes might even absorb the progressive effects of income taxation. Studies that do not consider indirect taxes might severely overestimate the redistributive effects of fiscal policies and might thus fail to represent the true structure of the welfare state. Unfortunately, so far, comparable micro data on indirect taxes or expenditures is rare. We hope that our analysis serves as motivation for collecting and publishing such data in the future.

Second-order effects can be important. Due to second-order effects, identified redistributive effects at the micro level do not necessarily result in equalizing effects at the macro level. Indeed, we found that means-tested benefits, which reveal highly equalizing effects at the micro level, do not reduce income inequality at the macro level. In contrast, means testing is associated with higher pre-government income inequality, hinting at substantial second-order effects. These findings have important implications for the design of public policies. While the size of the social budget effectively reduces income inequality, more low-income targeting might be associated with undesirable effects on the pre-government distribution of incomes. Therefore, possible behavioral effects should be taken into account when designing redistributive policies.

Tax benefit systems equalize outcomes, but not opportunities. People have different attitudes toward inequality and redistribution, depending on whether differences in incomes are due to effort or exogenous circumstances. Therefore, distinguishing between unequal outcomes and unequal opportunities is important, particularly when assessing the impact of public policies. Our analysis showed that in the cases of Germany and the United States, the tax benefit system has no differential effect on unequal opportunity among the working population. In fact, we found that existing policies might even increase inequality of opportunity. Abolishing the joint taxation system in Germany increases equal opportunity in terms of gender by increasing the female labor supply. Thus, we identify policies as a useful tool to decrease unequal opportunities. However, so far, existing policies do not differentiate between fair and unfair inequalities. Therefore, in the future, policymakers might consider more tagging on circumstances to support the fairness of redistributive policies.

Overall, we addressed several open research questions around the measurement of the redistributive capacities of welfare states. We analyzed different measurement methods, included indirect taxes, and discussed possible second-order effects. We also referred to different principles of distributive justice by considering varying inequality concepts. However, primarily due to data limitations, some problems with respect to the analysis of redistributive effects remained unsolved. For example, throughout the book, we did not consider lifetime earnings. Therefore, we were not able to separate redistribution from rich to poor from pure redistribution over the life cycle. The separation of these effects should be subject of future research. Also, in Chapter 4, we revealed the importance of second-order effects

induced by redistributive policies. However, so far, the analysis is restricted to labor market-related incentive effects, although other behavioral responses might be equally important. In fact, further analyses of the incentive effects induced by different redistributive policies might also be an interesting task for future research, specifically distinguishing the incentive effects related to opportunity equalizing policies from those induced by outcome equalizing policies.

Bibliography

Aaberge, R. and Colombino, U. (2006). Designing optimal taxes with a microeconometric model of household labour supply, IZA Discussion Paper No. 2468.

Aaberge, R. and Colombino, U. (2011). Accounting for family background when designing optimal income taxes: A microeconometric simulation analysis, *Journal of Population Economics* **forthcoming**.

Aaberge, R., Langørgen, A., Mogstad, M. and Østensen, M. (2008). The impact of local public services and geographical cost of living differences on poverty estimates, IZA Discussion Paper No. 3686.

Aaberge, R., Mogstad, M. and Peragine, V. (2011). Measuring long-term inequality of opportunity, *Journal of Public Economics* **95**(3-4): 193–204.

Adema, W. and Ladaique, M. (2009). How expensive is the welfare state?: Gross and net indicators in the OECD social expenditure database (SOCX), OECD Social, Employment and Migration Working Papers No. 92.

Alderson, A. S. and Nielsen, F. (2002). Globalization and the great U-turn: Income inequality trends in 16 OECD countries, *American Journal of Sociology* **107**(5): 1244–1299.

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. O. Jackson and A. Bisin (eds), *Handbook of Social Economics*, Amsterdam: North-Holland, pp. 93–132.

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

Alm, J., Lee, F. and Wallace, S. (2005). How fair? Changes in federal income taxation and the distribution of income, 1978 to 1998, *Journal of Policy Analysis and Management* **24**(1): 5–22.

Almås, I. (2008). Equalizing income versus equalizing opportunity: A comparison of the United States and Germany, *Research on Economic Inequality* **16**: 129–156.

Almås, I., Cappelen, A. W., Lind, J. T., Sørensen, E. and Tungodden, B. (2011). Measuring unfair (in)equality, *Journal of Public Economics* **95**(7-8): 488–499.

Altonji, J. and Blank, R. (1999). Race and gender in the labor market, *in* O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics, Vol. 3C*, Amsterdam: North-Holland, pp. 3143–3251.

Anand, S. and Segal, P. (2008). What do we know about global income inequality?, *Journal of Economic Literature* **46**(1): 57–94.

Ankrom, J. (1993). An analysis of horizontal and vertical equity in Sweden, the U.S. and the U.K, *Scandinavian Journal of Economics* **95**(1): 119–24.

Arellano, M. and Bond, S. R. (1991). Some test of specification for panel data: Monte Carlo evidence and an application to employment equations, *Review of Economic Studies* **58**(2): 277–297.

Arellano, M. and Bover, O. (1995). Another look at the instrumental variable estimation of error-components models, *Journal of Econometrics* **68**(1): 29–51.

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

Atkinson, A. B. (1970). On the measurement of inequality, *Journal of Economic Theory* **2**(3): 244–263.

Atkinson, A. B. (1975). *The Economics of Inequality*, Oxford University Press.

Atkinson, A. B. (1995). *Public Economics in Action: The Basic Income/Flat Tax Proposal*, Oxford: Oxford University Press.

Atkinson, A. B. and Brandolini, A. (2001). Promise and pitfalls in the use of "secondary" data-sets: Income inequality in OECD countries as a case study, *Journal of Economic Literature* **39**(3): 771–799.

Atkinson, A. B. and Brandolini, A. (2004). The panel-of-countries approach to explaining income inequality: An interdisciplinary research agenda, Working Paper Mannheim.

Atkinson, A. B. and Micklewright, J. (1991). Unemployment compensation and labor market transitions: A critical review, *Journal of Economic Literature* **29**(4): 1679–1727.

Autor, D., Katz, L. and Kearney, M. (2008). Trends in US wage inequality: Revising the revisionists, *Review of Economics and Statistics* **90**(2): 300–323.

Bach, S. (2005). Mehrwertsteuerbelastung der privaten Haushalte - Dokumentation des Mehrwertsteuermoduls des Konsumsteuer-Mikrosimulationsmodells des DIW Berlin auf Grundlage der Einkommens- und Verbrauchsstichprobe, Data Documentation 10, DIW Berlin.

Bagger, J., Christensen, B. J. and Mortensen, D. T. (2010). Wage and productivity dispersion: Labor quality or rent sharing?, Working Paper.

Bargain, O. and Callan, T. (2010). Analysing the effects of tax-benefit reforms on income distribution: A decomposition approach, *Journal of Economic Inequality* **8**(1): 1–21.

Bargain, O., Dolls, M., Immervoll, H., Neumann, D., Peichl, A., Pestel, N. and Siegloch, S. (2011). Tax policy and income inequality in the U.S., 1978-2009: A decomposition approach, IZA Discussion Paper No. 5910.

Barr, N. (1992). Economic theory and the welfare state: A survey and interpretation, *Journal of Economic Literature* **30**(2): 741–803.

Barr, N. (2004). *The Economics of the Welfare State*, Oxford: Oxford University Press.

Barro, R. J. (2000). Inequality and growth in a panel of countries, *Journal of Economic Growth* **5**(1): 5–32.

Basinger, S. and Hallerberg, M. (1998). Internationalization and changes in tax policy in OECD countries: The importance of domestic veto players, *Comparative Political Studies* **31**(3): 321–352.

Becker, I., Frick, J. R., Grabka, M. M., Hauser, R., Krause, P. and Wagner, G. G. (2003). A comparison of the main household income surveys for Germany:

EVS and SOEP, *in* R. Hauser and I. Becker (eds), *Reporting on Income Distribution and Poverty*, Berlin: Springer-Verlag, pp. 55–90.

Bentham, J. (1789). *An Introduction to the Principles of Morals and Legislation*, printed for T. Payne, and Son, London.

Bergh, A. (2005). On the counterfactual problem of welfare state research: How can we measure redistribution?, *European Sociological Review* **21**(4): 345–357.

Betts, J. and Roemer, J. (2006). Equalizing opportunity for racial and socioeconomic groups in the United States through educational finance reform, *in* L. Woessmann and P. Peterson (eds), *Schools and the Equal Opportunity Problem*, Cambridge: MIT Press, pp. 209–238.

Björklund, A. and Jäntti, M. (1997). Intergenerational income mobility in Sweden compared to the United States, *American Economic Review* **87**(5): 1009–1018.

Björklund, A. and Jäntti, M. (2009). Intergenerational income mobility and the role of family background, *in* W. Salverda, B. Nolan and T. Smeeding (eds), *Handbook of Economic Inequality*, Oxford: Oxford University Press, pp. 491–522.

Björklund, A., Jäntti, M. and Lindquist, M. J. (2009). Family background and income during the rise of the welfare state: Brother correlations in income for Swedish men born 1932-1968, *Journal of Public Economics* **93**(5–6): 671–680.

Björklund, A., Jäntti, M. and Roemer, J. (2011). Equality of opportunity and the distribution of long-run income in Sweden, *Social Choice and Welfare* **forthcoming**.

Björklund, A., Roine, J. and Waldenström, D. (2010). Intergenerational top income mobility in Sweden: Capitalist dynasties in the land of equal opportunity?, SISR Working Paper No. 9/2010.

Blackburn, M. L. (2007). Estimating wage differentials without logarithms, *Labour Economics* **14**(1): 73–98.

Blundell, R. (2000). Work incentives and 'in-work' benefit reforms: A review, *Oxford Review of Economic Policy* **16**(1): 27–44.

Blundell, R. and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data model, *Journal of Econometrics* **87**(1): 115–143.

Blundell, R., Meghir, C. and Smith, S. (2002). Pension incentives and the pattern of early retirement, *Economic Journal* **112**(478): C153–C170.

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

Bradley, D., Huber, E., Moller, S., Nielsen, F. and Stephens, J. D. (2003). Distribution and redistribution in postindustrial democracies, *World Politics* **55**(2): 193–228.

Bucovetsky, S. and Wilson, J. (1991). Tax competition with two tax instruments, *Regional Science and Urban Economics* **21**(3): 333–350.

Buhmann, B., Rainwater, L., Schmaus, G. and Smeeding, T. (1988). Equivalence scales, well-being, inequality and poverty: Sensitivity estimates across ten countries using the Luxembourg Incomes Study database, *Review of Income and Wealth* **34**(2): 115–142.

Bulir, A. and Gulde, A. M. (1995). Inflation and income distribution - further evidence on empirical links, IMF Working Papers No. 95/86.

Burniaux, J.-M., Dang, T.-T., Fore, D., Förster, M., Mira d'Ercole, M. and Oxley, H. (1998). Income distribution and poverty in selected OECD countries, OECD Working Papers No. 189.

Busemeyer, M. R. (2009). From myth to reality: Globalization and public spending in OECD countries revisited, *European Journal of Political Research* **48**(4): 455–482.

Calderón, C. and Chong, A. (2009). Labor market institutions and income inequality: An empirical exploration, *Public Choice* **138**(1): 65–81.

Cameron, D. R. (1978). The expansion of the public economy: A comparative analysis, *American Political Science Review* **722**(4): 1243–1261.

Caspersen, E. and Metcalf, G. (1994). Is a value added tax progressive? Annual versus lifetime incidence measures, *National Tax Journal* **47**(4): 731–746.

Chandra, A. (2000). Labor-market dropouts and the racial wage gap: 1940–1990, *American Economic Review, Papers and Proceedings* **90**(2): 333–338.

Checchi, D. and García-Peñalosa, C. (2008). Labour market institutions and income inequality, *Economic Policy* **23**(56): 601–49.

Checchi, D. and García-Peñalosa, C. (2010). Labour market institutions and the personal distribution of income in the OECD, *Economica* **77**(307): 413–50.

Checchi, D. and Peragine, V. (2011). Regional disparities and inequality of opportunity: The case of Italy, *Journal of Economic Inequality* **forthcoming**.

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

Clark, T. and Leicester, A. (2004). Inequality and two decades of British tax and benefit reform, *Fiscal Studies* **25**(2): 129–158.

Clarke, G. R. G., Xu, L. C. and Zou, H. (2006). Finance and income inequality: What do the data tell us?, *Southern Economic Journal* **72**(3): 578–596.

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

Corak, M. and Heisz, A. (1999). The intergenerational earnings and income mobility of Canadian men: Evidence from longitudinal income tax data, *Journal of Human Resources* **34**(3): 504–533.

Corneo, G. (2005). Verteilungsarithmetik der rot-grünen Einkommensteuerreform, *Zeitschrift für Wirtschafts- und Sozialwissenschaften* **125**(2): 299–314.

Cowell, F. A. (2000). Measurement of inequality, *in* A. B. Atkinson and F. Bourguignon (eds), *Handbook of Income Distribution*, Amsterdam: North-Holland, pp. 87–166.

Cowell, F. and Kuga, K. (1981). Additivity and the entropy concept: An axiomatic approach to inequality measurement, *Journal of Economic Theory* **25**(1): 131–143.

Cusack, T. R. and Beramendi, P. (2006). Taxing work, *European Journal of Political Research* **45**(1): 43–73.

Dalton, H. (1923). *Principles of Public Finance*, London: Routledge.

Danziger, S., Haveman, R. and Plotnick, R. (1981). How income transfer programs affect work, savings, and the income distribution: A critical review, *Journal of Economic Literature* **19**(3): 975–1028.

Dardanoni, V., Fields, G. S., Roemer, J. and Sánchez-Puerta, M. L. (2005). How demanding should equality of opportunity be, and how much have we achieved?, *in* S. Morgan, D. Grusky and G. Fields (eds), *Mobility and Inequality: Frontiers of Research in Sociology and Economics*, Stanford: Stanford University Press, pp. 59–82.

Dardanoni, V. and Lambert, P. (2002). Progressivity comparisons, *Journal of Public Economics* **86**(1): 99–122.

De Deken, J. and Kittel, B. (2007). Social expenditure under scrutiny. The problem of using aggregate spending data for assessing welfare state dynamics, *in* J. Clasen and N. A. Siegel (eds), *Investigating Welfare State Change: The 'Dependent Variable Problem' in Comparative Analysis*, Cheltenham: Edward Elgar.

Decoster, A., De Swerdt, K., Loughrey, J., O'Donoghue, C. and Verwerft, D. (2009). Comparative analysis of the distributional impact of combined changes in direct and indirect taxes and benefits for five European countries, Workpackage 3.6 of Accurate Income Measurement for the Assessment of Public Policies (AIM-AP, EU-Contract no 028412), KULeuven.

Devereux, M. P., Lockwood, B. and Redoano, M. (2008). Do countries compete over corporate tax rates?, *Journal of Public Economics* **92**(5-6): 1210–1235.

Devereux, M. P. and Sørensen, P. B. (2006). The corporate income tax: International trends and options for fundamental reform, European Economy - Economic Papers No. 264.

Devooght, K. (2008). To each the same and to each his own: A proposal to measure responsibility-sensitive income inequality, *Economica* **75**(298): 280–295.

Dreher, A. and Gaston, N. (2008). Has globalization increased inequality?, *Review of International Economics* **16**(3): 516–536.

Duncan, D. and Sabirianova Peter, K. (2008). Tax progressivity and income inequality, Andrew Young School of Policy Studies Research Paper Series No. 08-26.

Dunnzlaff, L., Neumann, D., Niehues, J. and Peichl, A. (2011). Equality of opportunity and redistribution in Europe, *Research on Economic Inequality* **forthcoming**.

Dustmann, C., Ludsteck, J. and Schönberg, U. (2009). Revisiting the German wage structure, *The Quarterly Journal of Economics* **124**(2): 843–881.

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**(3): 283–345.

Edwards, S. (1997). Trade policy, growth, and income distribution, *American Economic Review Paper and Proceedings* **87**(2): 205–210.

Esping-Andersen, G. (1990). *The Three Worlds of Welfare Capitalism*, Princeton: Princeton University Press.

Esping-Andersen, G. and Myles, J. (2009). Economic inequality and the welfare state, *in* W. Salverda, B. Nolan and T. M. Smeeding (eds), *The Oxford Handbook of Economic Inequality*, Oxford: Oxford University Press, pp. 639–664.

European Commission (2011). *VAT Rates Applied in the Member States of the European Union*.

Eurostat (1996). ESSPROS Manual - The European System of integrated Social PROtection Statistics (ESSPROS).

Feldstein, M. S. (1974). Social security, induced retirement, and aggregate capital accumulation, *Journal of Political Economy* **82**(5): 905–926.

Feldstein, M. S. (1999). Reducing poverty, not inequality, *The Public Interest* **137**(Fall 1999): 33–41.

Ferrarini, T. and Nelson, K. (2003). Taxation of social insurance and redistribution: A comparative analysis of ten welfare states, *Journal of European Social Policy* **13**(1): 21–33.

Ferreira, F. H. G. and Gignoux, J. (2011). The measurement of inequality of opportunity: Theory and an application to Latin America, *Review of Income and Wealth* **forthcoming**.

Ferrera, M. (1996). The 'Southern Model' of welfare in social Europe, *Journal of European Social Policy* **6**(1): 17–37.

Fleurbaey, M. (1995). Three solutions for the compensation problem, *Journal of Economic Theory* **65**(2): 505–521.

Fleurbaey, M. (2008). *Fairness, Responsibility, and Welfare*, Oxford: Oxford University Press.

Fleurbaey, M. and Peragine, V. (2009). Ex ante versus ex post equality of opportunity, ECINEQ Working Paper No. 141.

Fong, C. (2001). Social preferences, self-interest, and the demand for redistribution, *Journal of Public Economics* **82**(2): 225–246.

Foster, J. E. and Ok, E. A. (1999). Lorenz dominance and the variance of logarithms, *Econometrica* **67**(4): 901–908.

Foster, J. and Shneyerov, A. (2000). Path independent inequality measures, *Journal of Economic Theory* **91**(2): 199–222.

Fritzsche, B., Kambeck, R. and von Loeffelholz, H. D. (2003). Empirische Analyse der effektiven Inzidenz des deutschen Steuersystems, Untersuchungen des Rheinisch-Westfälischen Instituts für Wirtschaftsforschung 42, Esssen.

Frässdorf, A., Grabka, M. M. and Schwarze, J. (2011). The impact of household capital income on income inequality - a factor decomposition analysis for Great Britain, Germany and the USA, *Journal of Economic Inequality* **9**(1): 35–56.

Fuchs-Schündeln, N., Krueger, D. and Sommer, M. (2010). Inequality trends for Germany in the last two decades: A tale of two countries, *Review of Economic Dynamics* **13**(1): 103–132.

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 Weichenrieder, A. J. (2002). Tax competition and profit shifting: On the relationship between personal and corporate tax rates, *Ifo Studien* **48**(4): 611–32.

Gaertner, W. and Schokkaert, E. (2011). *Empirical Social Choice*, Cambridge University Press, forthcoming.

Galli, R. and van der Hoeven (2001). Is inflation bad for income inequality, ILO Employment Paper No. 19.

Galor, O. and Tsiddon, D. (1996). Income distribution and growth: The Kuznets hypothesis revisted, *Economica, Supplements* **63**(250): S103–17.

Ganghof, S. (2006a). *The Politics of Income Taxation - a Comparative Analysis*, Colchester: ECPR Press.

Ganghof, S. (2006b). The politics of tax strucutre, MPIfG Working Paper No. 06/1.

Ganghof, S. (2006c). Tax mixes and the size of the welfare state: Causal mechanisms and policy implications, *Journal of European Social Policy* **16**(4): 360–373.

Ganghof, S. and Genschel, P. (2008). Taxation and democracy in the EU, *Journal of European Public Policy* **15**(1): 58–77.

Garfinkel, I., Rainwater, L. and Smeeding, T. M. (2006). A re-examination of welfare states and inequality in rich nations: How in-kind transfers and indirect taxes change the story, *Journal of Policy Analysis and Management* **25**(4): 897–919.

Garrett, G. and Mitchell, D. (2001). Globalization, government spending and taxation in the OECD, *European Journal of Political Research* **39**(2): 145–177.

Genschel, P. (2000). Der Wohlfahrtsstaat im Steuerwettbewerb, *Zeitschrift für Internationale Beziehungen* **7**(2): 267–296.

Genschel, P. (2005). Globalization and the transformation of the tax state, *European Review* **13**(1): 53–71.

Gini, C. (1914). Di una misura della dissomiglianza tra due gruppi di quantita e delle sue applicazioni allo studio delle relazioni statistiche, *Atti R. I. Veneto* **74**: 185–312.

Gottschalk, P. and Smeeding, T. M. (1997). Cross-national comparisons of earnings and income inequality, *Journal of Economic Literature* **35**(2): 633–687.

Gruber, J. and Wise, D. A. (1998). Social security and retirement: An international comparison, *American Economic Review* **88**(2): 158–63.

Haig, R. M. (1921). The concept of income, *in* R. M. Haig (ed.), *The Federal Income Tax*, New York: Columbia University Press, pp. 1–28.

Haisken-DeNew, J. and Frick, J. (2003). DTC: Desktop Compendium to The German Socio- Economic Panel Study (GSOEP), DIW.

Hall, P. A. and Soskice, D. (2001). An introduction to varieties of capitalism, *in* P. A. Hall and D. Soskice (eds), *Varieties of Capitalism. The Institutional Foundations of Comparative Advantage*, New York: Oxford University Press.

Huber, E. and Stephens, J. D. (2001). *Development and Crisis of the Welfare State: Parties and Policies in Global Markets*, Chicago: University of Chicago Press.

Hugget, M., Ventura, G. and Yaron, A. (2011). Sources of lifetime inequality, *American Economic Review* **forthcoming**.

Immervoll, H. (2004). Average and marginal effective tax rates facing workers in the EU: A micro-level analysis of levels, distributions and driving factors, OECD Social, Employment and Migration Working Papers No. 19.

Immervoll, H., Levy, H., Lietz, C., Mantovani, D., O'Donoghue, C., Sutherland, H. and Verbist, G. (2005). Household incomes and redistribution in the European Union: Quantifying the equalising properties of taxes and benefits, Economic Series 184.

Iversen, T. (2005). *Capitalism, Democracy, and Welfare*, New York: Cambridge University Press.

Iversen, T. and Cusack, T. R. (2000). The cause of welfare state expansion: Deindustrialization or globalization, *World Politics* **52**(3): 313–349.

Jenkins, S. P. (1991). The measurement of income inequality, *in* L. Osberg (ed.), *Economic Inequality and Poverty: International Perspectives*, New York: M. E. Sharpe, Inc, pp. 3–38.

Jenkins, S. P. (1995). Accounting for inequality trends: Decomposition analyses for the UK, 1971-86, *Economica* **62**(245): 29–63.

Jenkins, S. P. and Micklewright, J. (2007). New directions in the analysis of inequality and poverty, *in* . S. P. Jenkins and J. Micklewright (eds), *Inequality and Poverty Re-Examined*, Oxford: Oxford University Press, pp. 3–33.

Jenkins, S. P. and Van Kerm, P. (2009). The measurement of economic inequality, *in* W. Salverda, B. Nolvan and T. M. Smeeding (eds), *Oxford Handbook of Economic Inequality*, Oxford: Oxford University Press, pp. 40–70.

Jäntti, M. (1997). Inequality in five countries in the 1980s: The role of demographic shifts, markets and government policies, *Economica* **64**(255): 415–40.

Kakwani, N. C. (1977). Measurement of tax progressivity: An international comparison, *Economic Journal* **87**(345): 71–80.

Kammer, A. and Niehues, J. (2011). Fiscal redistribution in modern welfare states: Dynamic evidence from Germany and the United Kingdom, University of Cologne Working Paper.

Kammer, A., Niehues, J. and Peichl, A. (2011). Welfare state regimes and distributional outcomes in Europe, University of Cologne Working Paper.

Kasten, R., Sammartino, F. and Toder, E. (1994). Trends in federal tax progressivity, 1980-93, *in* J. Slemrod (ed.), *Tax Progressivity and Income Inequality*, Cambridge University Press, pp. 9–50.

Kato, J. (2003). *Regressive taxation and welfare state path dependence and policy diffusion*, Cambridge: Cambridge Univ. Press.

Katz, L. and Autor, D. (1999). Changes in the wage structure and earnings inequality, *in* O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics, Vol. 3A,*, Amsterdam: North-Holland, pp. 1463–1558.

Katzenstein, P. J. (1985). *Small States in World Markets. Industrial Policy*, Ithaca and London: Cornell University Press.

Kenworthy, L. (2008). *Jobs with Equality*, Oxford: Oxford University Press.

Kenworthy, L. (2009). Tax myths, *Contexts* **8**(3): 28–32.

Konow, J. (2003). Which is the fairest one of all? A positive analysis of justice theories, *Journal of Economic Literature* **41**(4): 1188–1239.

Korpi, W. and Palme, J. (1998). The paradox of redistribution and strategies of equality: Welfare state institutions, inequality, and poverty in the Western countries, *American Sociological Review* **63**(5): 661–687.

Kuznets, S. (1955). Economic growth and income inequality, *American Economic Review* **45**(1): 1–28.

Lambert, P. J. (2001). *The Distribution and Redistribution of Income*, 3 edn, Manchester and New York: Manchester University Press.

Lambert, P. J. and Thoresen, T. O. (2009). Base independence in the analysis of tax policy effects: with an application to Norway 1992-2004, *International Tax and Public Finance* **16**(2): 219–252.

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.

Li, H., Xie, D. and Zou, H. (2000). Dynamics of income distribution, *Canadian Journal of Economics* **33**(4): 937–961.

Lietz, C. and Mantovani, D. (2006). Lessons from building and using EUROMOD, Euromod working paper No. EM5/06.

Luongo, P. (2010). The Implication of Partial Observability of Circumstances on the Measurement of EOp, Working Paper, University of Bari.

Mahler, V. A. and Jesuit, D. K. (2006). Fiscal redistribution in the developed countries: New insights from the Luxembourg Income Study, *Socio-Economic Review* **4**(3): 483–511.

Meltzer, A. H. and Richard, S. F. (1981). A rational theory of the size of government, *Journal of Political Economy* **89**(5): 914–927.

Metcalf, G. E. (1994). Life cycle versus annual perspectives of the incidence of the value added tax, *in* J. M. Poterba (ed.), *Tax Policy and the Economy, Vol. 8*, Cambridge (MA): MIT Press, pp. 45–64.

Meyer, B. (2002). Unemployment and workers' compensation programmes: Rationale, design, labour supply and income support, *Fiscal Studies* **23**(1): 1–49.

Milanovic, B. (2007). Why we all care about inequality (but some of us are loathe to admit it), *Challenge* **50**(6): 109–120.

Mintz, J. (1995). The corporation tax: A survey, *Fiscal Studies* **16**(4): 23–68.

Mitchell, D. (1991). *Income Transfers in Ten Welfare States*, Aldershot: Avebury.

Moene, K. O. and Wallerstein, M. (2001). Inequality, social insurance, and redistribution, *American Political Science Review* **95**(4): 859–874.

Musgrave, R. and Thin, T. (1948). Income tax progression, 1929-1948, *Journal of Political Economy* **56**: 498–514.

Niehues, J. (2010). Social spending generosity and income inequality: A dynamic panel approach, SOEPpapers on Multidisciplinary Panel Data Research No. 336.

Niehues, J. and Peichl, A. (2011). Lower and upper bounds of unfair inequality: Theory and evidence for Germany and the US, IZA Discussion Paper No. 5834.

Ochmann, R. and Peichl, A. (2006). Measuring distributional effects of fiscal reforms, CPE discussion paper 06-09, University of Cologne.

O'Donoghue, C., Baldini, M. and Mantovani, D. (2004). Modelling the redistributive impact of indirect taxes in Europe: An application of EUROMOD, EUROMOD Working Papers No. EM7/01.

OECD (2011). Growing income inequality in OECD countries: What drives it and how can policy tackle it?, OECD Forum on Tackling Inequality, Paris 2 May.

Ooghe, E. and Peichl, A. (2010). Fair and efficient taxation under partial control: Theory and evidence, IZA Discussion Paper No. 5388.

Paulus, A., Sutherland, H. and Tsakloglou, P. (2009). The distributional impact of in kind public benefits in European countries, IZA Discussion Paper No. 4581.

Peichl, A., Pestel, N. and Schneider, H. (2011). Does size matter? The impact of changes in household structure on income distribution in Germany, *Review of Income and Wealth* **forthcoming**.

Peichl, A., Schneider, H. and Siegloch, S. (2010). Documentation IZAΨMOD: The IZA Policy SImulation MODel, IZA Discussion Paper No. 4865.

Pestieau, P. (2006). *The Welfare State in the European Union: Economic and Social Perspectives*, Oxford: Oxford University Press.

Pfähler, W. and Lambert, P. (1991/92). Die Messung von Progressionswirkungen, *Finanzarchiv* **49**.

Piketty, T. and Saez, E. (2006). The evolution of top incomes: A historical and international perspecitve, *American Economic Review, Papers and Proceedings* **96**(2): 200–2005.

Piketty, T. and Saez, E. (2007). How progressive is the U.S. federal tax system? A historical and international perspective, *Journal of Economic Perspectives* **21**(1): 3–24.

Pistolesi, N. (2009). Inequality of opportunity in the land of opportunities, 1968–2001, *Journal of Economic Inequality* **7**(4): 411–433.

Plotnick, R. (1981). A measure of horizontal inequity, *The Review of Economics and Statistics* **63**(2): 283–288.

Polanyi, K. (1944). *The Great Transformation*, Boston: Beacon.

Prasad, M. and Deng, Y. (2009). Taxation and the worlds of welfare, *Socio-Economic Review* **7**(3): 431–457.

Rawls, J. (1971). *A Theory of Justice*, Cambridge (Ma): Harvard University Press.

Reynolds, M. and Smolensky, E. (1977). *Public Expenditures, Taxes, and the Distribution of Income: The United States, 1950, 1961, 1970*, New York: Academic Press.

Rodrik, D. (1998). Why do more open economies have bigger governments?, *Journal of Political Economy* **106**(5): 997–1032.

Roemer, J. E. (1993). A pragmatic theory of responsibility for the egalitarian planer, *Philosophy and Public Affairs* **22**(2): 146–166.

Roemer, J. E. (1998). *Equality of Opportunity*, Cambridge (Ma.): Harvard University Press.

Roemer, J. E. (2002). Equality of opportunity: A progress report, *Social Choice and Welfare* **19**(2): 455–471.

Roemer, J. E., Aaberge, R., Colombino, U., Fritzell, J., Jenkins, S. P., Marx, I., Page, M., Pommer, E., Ruiz-Castillo, J., Segundo, M. J. S., Tranæs, T., Wagner, G. G. and Zubiri, I. (2003). To what extent do fiscal regimes equalize opportunities for income acquisition among citizens?, *Journal of Public Economics* **87**(3-4): 539–565.

Roodman, D. (2009a). A note on the theme of too many instruments, *Oxford Bulletin of Economics and Statistics* **71**(1): 135–158.

Roodman, D. (2009b). How to do xtabond2: An introduction to difference and System GMM in Stata, *Stata Journal* **9**(1): 86–136.

Røed, K. and Strøm, S. (2002). Progressive taxes and the labour market: Is the trade-off between equality and efficiency inevitable?, *Journal of Economic Surveys* **16**(1): 77–100.

Sabirianova Peter, K., Buttrick, S. and Duncan, D. (2009). Global reform of personal income taxation, 1981-2005: Evidence from 189 countries, IZA Discussion Paper No. 4228.

Scharpf, F. W. (1987). *Sozialdemokratische Krisenpolitik in Europa*, Frankfurt/Main; New York: Campus Verlag.

Scharpf, F. W. (1997). Economic integration, democracy and the welfare state, *Journal of European Public Policy* **4**(1): 18–36.

Sen, A. (1973). *On Economic Inequality*, Oxford: Oxford University Press.

Sen, A. (1980). Equality of what?, *in* S. McMurrin (ed.), *Tanner Lectures on Human Values*, Cambridge University Press, pp. 195–220.

Sen, A. (1985). *Commodities and Capabilities*, Amsterdam: North-Holland.

Sen, A. (1992). *Inequality Reexamined*, Oxford: Clarendon Press.

Shorrocks, A. (1980). The class of additively decomposable inequality measures, *Econometrica* **48**(3): 613–625.

Shorrocks, A. (1982). Inequality decomposition by factor components, *Econometrica* **50**(1): 193–211.

Shorrocks, A. (1983). The impact of income components on the distribution of family incomes, *Quarterly Journal of Economics* **98**(2): 311–326.

Simons, H. C. (1938). *Personal Income Taxation: The Definition of Income as a Problem of Fiscal Policy*, Chicago: University of Chicago Press.

Sinn, H.-W. (1995). A theory of the welfare state, *Scandinavian Journal of Economics* **97**(4): 495–526.

Solon, G. (1999). Intergenerational mobility in the labor market, *in* O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Vol. 3A, Amsterdam: North-Holland, pp. 1761–1800.

Stark, O., Taylor, E. T. and Yitzhaki, S. (1986). Remittances and inequality, *The Economic Journal* **96**(383): 722–740.

Steinmo, S. (1993). *Taxation and Democracy. Swedish, British and American Approaches to Financing the Modern State*, New Haven [u.a.]: Yale University Press.

Suits, D. (1977). Measurement of tax progressivity, *American Economic Review* **67**(4): 747–752.

Sutherland, H. (2001). EUROMOD: An integrated European benefit-tax model - final report, 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*, Amsterdam: Elsevier, pp. 483–488.

Swank, D. (2006). Tax policy in an era of internationalization: Explaining the spread of neoliberalism, *International Organization* **60**(4): 847–882.

Swank, D. and Steinmo, S. (2002). The new political economy of taxation in advanced capitalist democracies, *American Journal of Political Science* **46**(3): 642–655.

The Canberra Group, E. (2001). *Final Report and Recommendations*, Ottawa: The Canberra Group.

Timmons, J. F. (2005). The fiscal contract: States, taxes, and public services, *World Politics* **57**(4): 530–567.

Van de gaer, D. (1993). Equality of opportunity and investment in human capital, Working Paper, KU Leuven.

van Kerm, P. (2004). What lies behind income mobility? Reranking and distributional change in Belgium, Western Germany and the USA, *Economica* **71**(281): 223–239.

Wagner, G. G., Frick, J. R. and Schupp, J. (2007). The German Socio-Economic Panel (SOEP): Scope, evolution and enhancements, *Schmoller's Jahrbuch - Journal of Applied Social Science Studies* **127**(1): 139–169.

Wagstaff, A., van Doorslaer, E., van der Burg, H., Calonge, S., Christiansen, T., Citoni, G., Gerdtham, U.-G., Gerfin, M., Gross, L. and Hakinnen, U. (1999). Redistributive effect, progressivity and differential tax treatment: Personal income taxes in twelve OECD countries, *Journal of Public Economics* **72**(1): 73–98.

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.

Wilensky, H. L. (2002). *Rich Democracies. Political Economy, Public Policy, and Performance*, Berkeley: University of California Press.

Zandvakili, S. (1994). Income distribution and redistribution through taxation: An international comparison, *Empirical Economics* **19**(3): 473–491.