Unequal Inequality in Europe: differences between East and West

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Abstract

How do different components of the tax and transfer systems affect disposable income inequality? This paper explores the redistributive effects of different tax benefit instruments in the enlarged EU based on two approaches. 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 contribute slightly positive to inequality. On the contrary, here taxes and social contributions are by far the most important contributors to income inequality reduction. We explain these partly contradictory results with the different normative focus of the two approaches and show that benefits have other aims than redistribution.

Keywords: Inequality, Redistribution, Decomposition, tax benefit systems

JEL Codes: D31, D60, H20
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 it is one of the main objectives of the European Union (EU) 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 12 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 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 the size 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-national comparisons.

When assessing the overall distributional impact of different tax benefit instruments, one can generally distinguish 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), Immer-
voll 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 possibility to assess the impact of different income components such as taxes and transfers on income inequality is the factor source decomposition approach as 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 incomes as part of total income (e.g., Jenkins (1995), Jäntti (1997), Frässdorf et al. (2008)).

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 systematically compare the two approaches with regard to the resulting redistributive effects of tax benefit systems. The 2007 wave is the first to provide information on both gross and net incomes for all 25 EU member states (except Malta). Thus, we do not only investigate the redistributive importance of tax benefit instruments across countries, but also whether the results differ with respect to the underlying method. Particularly, we identify the positions of the (Eastern European) new member states in the European inequality ordering.
Our results suggest that tax and transfer systems substantially reduce income inequality in all European countries. But the two measurement approaches described above generate 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. Here, taxes and social contributions are by far the most important contributors to income inequality reduction. We explain these partly contradictory results with the different normative focus of the two approaches and show that many benefits seem to have objectives other than reducing disposable income inequality.

The setup of the paper is organized as follows: Section 2 describes the data and methodologies used throughout the paper. In Section 3, we provide some descriptives about inequality levels in EU countries and household income composition. Section 4 presents the results of the redistributive effects of tax benefit instruments based on both, the sequential and the decomposition approach and differences are discussed. Section 5 concludes by summarizing the main results and discussing their implications.

2 Data and methodology

2.1 Data

The EU-SILC (European Union Statistics on Income and Living Conditions) micro data set provides harmonized cross-sectional and longitudinal multidimensional micro data on income and social exclusion in European countries. Since 2005, the
dataset covers the EU-25 member states (except Malta), plus Norway and Iceland, 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 wave with gross income information for all 26 countries.

For our analysis of the impacts of different income sources it is used that individual income data can be split into different categories. These are factor incomes (earnings, income from self-employment and capital incomes), income taxes, social security contributions (employer and employee) and social transfers. In order to make incomes comparable across countries, we adjust national income amounts by the multilateral current purchasing power parities provided by Eurostat. Throughout the analysis, we use equivalized incomes to compensate for different household structures and possible economies of scales within households.$^2$

In our application, overall equivalized disposable household income (DPI) is exhaustively decomposed into its equivalized components: factor income, income taxes, social insurance contributions (SIC), social benefits and public pensions, based on the following identity:

$$DPI = (original\ income + SIC\ employer) - taxes - SIC + benefits + pensions$$

Note that our concept of factor income includes social insurance contributions paid by the employer as they can be very different across countries.$^3$ 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.$^4$ 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 house-
holds. 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 can not be taken into account, either.

2.2 Inequality measurement

Consider a population of $n$ persons (or households), $i = 1, \ldots, n$, with $x_i$ as the income of individual $i$, $\bar{x}$ be the average income and a population weight $w_i$ ($N = \sum_{i=1}^{n} w_i$). Following Atkinson (1970) and Kolm (1969), a relative measure of inequality can be derived from a relationship between inequality, mean income and social welfare as:

$$I = 1 - \frac{W(x)}{\bar{x}}$$  \hspace{1cm} (2)

where $W(x)$ is the average or mean social welfare function (see Maasoumi (1999)). The Generalized Entropy (GE) class of inequality indices (Shorrocks (1980)) is given by:

$$I_\alpha = \frac{1}{\alpha(\alpha - 1)} \int_0^\infty x_i \left[ \left( \frac{x_i}{\bar{x}} \right)^\alpha - 1 \right] dF$$  \hspace{1cm} (3)

where $F$ is the CDF of income and $\alpha$ being a parameter indicating the sensitivity towards a particular part of the income distribution. The discretized formula of the GE family used for empirical applications is given by

$$I_\alpha = GE(\alpha) = \begin{cases} \frac{1}{\alpha(\alpha-1)} \left( \sum_{i=1}^{n} \frac{w_i}{N} \left( \frac{x_i}{\bar{x}} \right)^\alpha \right) - 1, & \alpha \in R - \{0, 1\} \\ \sum_{i=1}^{n} \frac{w_i}{N} \log \frac{x_i}{\bar{x}}, & \alpha = 0 \\ \sum_{i=1}^{n} \frac{w_i}{N} x_i \log \frac{x_i}{\bar{x}}, & \alpha = 1 \end{cases}$$  \hspace{1cm} (4)
GE(0) is also known as the mean log deviation and GE(1) as the Theil index (see Theil (1967)).

2.3 Sequential accounting approach

To determine the effective distributional impact of different tax benefit instruments, we will first use what we call the sequential approach of analyzing the distribution and redistribution. 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 which is illustrated in Figure 1. Accordingly, income from wages and salaries, self-employment, investment incomes and in our case also employers’ social contributions sum to “factor income”, the inclusion of state retirement pensions then gives “market income”. Market income plus all different types of cash benefits accounts to “gross income”, subtracting personal income taxes gives post-tax income and finally subtracting social insurance contributions results in “cash disposable income”, respectively. All income concepts are based on equivalized incomes in order to account for different household structures. With the accounting framework, a number of measures of the redistributive impact of the tax benefit system can be constructed by comparing inequality measures at the different stages of household income. For instance, the relative redistribution achieved by social benefits equals the percentage change between the inequality of equivalent market income and equivalent gross income:

\[
\frac{GE(\alpha)_{Market} - GE(\alpha)_{Gross}}{GE(\alpha)_{Market}}
\]

The impact of taxes is evaluated by comparing the inequality of the distribution of equivalized gross incomes and post-tax incomes and so on.
However, the framework is static and linear which implies a number of limitations. For example, there are no interactions between the different stages of redistribution. In reality, however, in some countries benefits might also be taxable. By first adding benefits to factor income, we necessarily overestimate the redistributive effects of benefits in such countries (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.

2.4 Factor source decomposition approach

As total (disposable) income is usually composed from several sources, it is useful to express total inequality in disposable income 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, given the large number of income sources, it must be defined for zero incomes. In practice, the easiest measure to decompose in this way is GE(2) which can also be expressed as half the squared coefficient of variation $CV$:

$$GE(2) = \frac{1}{2} \left( \sum_{i=1}^{n} \left[ \frac{w_i}{N} \left( \frac{x_i}{\bar{x}} \right)^2 \right] - 1 \right)$$

$$= \frac{1}{2} (CV)^2 = \frac{1}{2} \left( \frac{\sqrt{Var(x)}}{\bar{x}} \right)^2 = \frac{1}{2} \frac{Var(x)}{\bar{x}^2} \quad (6)$$

Suppose disposable income $X$ can be written as the sum of $f = 1, ..., K$ different
income sources \( x_f \): \( x = \sum_{f=1}^{K} x_f \) and \( \rho_f \) is the correlation between \( x \) and \( x_f \) and \( \mu_f = \frac{\gamma_f}{x} \) is \( f \)'s factor share.

\[
I_2 = GE(2) = \sum_{f=1}^{K} S_f = \sum_{f=1}^{K} s_f I_2 = \sum_{f=1}^{K} \rho_f \mu_f \sqrt{GE_2^f GE_2^f} \tag{7}
\]

where \( GE_2^f \) denotes the inequality for factor source \( f \) and \( S_f \) the (absolute) contribution of factor \( f \) to total (disposable income) inequality. Note that income source \( f \) provides a disequalizing effect if \( S_f > 0 \), and an equalizing effect if \( S_f < 0 \). \( s_f = \frac{S_f}{x} \) is the relative contribution of \( f \) to total inequality and indicates the importance of \( f \).

3 Descriptive evidence

3.1 Income distribution and redistribution

To illustrate the variations in inequality levels 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 popularity in comparable micro studies. When first looking at the former EU-15\(^6 \) countries as one single economic unit, irrespective in which country the individuals live, we find an overall inequality level in equivalized factor income of 0.51 and of 0.31 in disposable income. Adding the nine additional member states\(^7 \) yields inequality levels of 0.53 and 0.34, respectively. This highlights the significant increase in overall inequality since the enlargement of the EU. The substantial variation in inequality levels, particularly since the recent enlargement, is also confirmed when looking at the inequality levels in the different member states, which are illustrated in
Figure 2. The Figure displays inequality levels in factor income, market income and disposable income, with the income concepts corresponding to the income accounting framework explained in Figure 1.

The distance between the inequality in factor incomes and the inequality in disposable incomes 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 disposable income as opposed to factor income. It is rather low in Cyprus and Iceland, as well as in the Baltic States.

Looking at the inequality of factor incomes, huge disparities among the European countries emerge, with Gini coefficients ranging from 0.38 in Iceland to 0.54 in Portugal. Factor income inequality is comparatively high in the Anglo-Saxon countries as well as in Lithuania, Germany, Greece, Portugal and Hungary (>0.50). Rather low inequality levels can be found in Cyprus, Iceland, the Slovak Republic and Slovenia. Particularly within the group of Eastern European countries there are substantial differences. The group encompasses countries with very high market inequality such as Hungary and Poland but also countries with comparatively low market inequality such as the Slovak Republic and Slovenia. The difference between the Gini coefficients of factor income and the ones of market income demonstrates the different strength of the redistributive character of pensions across European countries. It emerges that pensions have huge redistributive power in the Continental countries such as France, Germany and Austria, who now achieve a substantially higher rank regarding the equality of incomes. This is also true for Poland and the Czech Republic. On the other hand, the inclusion of pensions leads to a significant lower equality ranking of the Baltic states and Denmark.
Looking at the inequality of equivalized disposable income (DPI), first of all, it should be noted, that post-government inequality is significantly lower than the pre-government inequality, indicating a substantial degree of redistribution in all countries. Also, the ranking of countries in transition from factor to disposable income changes substantially. Here the group of Nordic countries can be identified with very low inequality levels (around 0.25) and also the Central Eastern European countries Slovenia, the Slovak and the Czech Republic display low disposable income inequalities. On the other hand, the distribution of post-government income is comparatively unequal in the Baltic, Southern and Anglo-Saxon countries (>0.30).

Whereas the factor income inequality suggests a very heterogeneous country clustering, with regard to disposable income inequality, the importance of public pension schemes and overall redistribution, for the EU-15 countries we find a very similar country clustering as suggested by the famous welfare state typology of the political and social science literature (Esping-Andersen (1990), later modified by Ferrera (1996)). Interestingly, the Eastern European member states do not really form a homogeneous group of countries. On the one hand, there are the Baltic States which are characterized by high factor income inequality, low redistribution and high inequality in disposable incomes. They show some similarities with the Southern European countries, still, their level of redistribution is substantially lower. Hungary and Poland show high factor income inequalities, however, combined with more extensive redistribution schemes and therefore comparatively lower inequality in disposable incomes. The other countries Slovenia, the Slovak and Czech Republic represent low inequality in factor incomes, above-average redistribution and very low inequality in disposable incomes. Therefore, with regard to inequality and overall redistribution levels, they show similar characteristics as the Nordic and Continental countries.
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 3 illustrates the composition of total disposable income in terms of original factor income, income taxes, social contributions, cash benefits and public pensions. Here, we also show the importance of employers’ social contributions in disposable income separately in order to visualize our concept of factor income. All incomes are equivalized. It should be noted that this perspective does not allow 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 3 can be interpreted as showing how much factor income is necessary to achieve a certain level of disposable income 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 income taxes.

If we look at original income without the social contributions of the employer, the majority of countries reveals shares in original income close to 100%. The share of original income is significantly larger than 105% only in Denmark, Iceland 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 benefits. If we consider the social contributions by the employer as part of the factor income, in all countries except Cyprus the share of factor income is significantly higher than 100%. Also, the economic weight of employers’ social 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
income sources, total social contributions (SIC) make up a greater proportion of equivalized disposable income than income taxes in almost all countries. On average their share in disposable income is about 10 percentage points higher. Exceptions are the Nordic countries and Poland where income taxes play a more important role. The high share of social contributions 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, Ireland and Norway. Also, Figure 3 suggests that 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 disposable income is particularly high in some Continental countries (Austria, France, Germany) as well as in the Southern European countries Italy, Greece and Portugal (>20%), whereas it is rather low in Iceland, Ireland, Cyprus and the Baltic States. Social benefits are most important in the Nordic countries, but also in Hungary and Ireland (>15%). They only make up a small part of disposable income in Southern European countries. With regard to the burden side, the share of taxes is particularly high in the Nordic countries and Iceland and it is low in the Central Eastern European countries Slovenia, the Slovak and the Czech Republic as well as in Cyprus. Social contributions, on the contrary, are most important in the Continental countries such as the Netherlands, Belgium, France and Germany, which is again in line with the welfare state typology from the political science literature. Their share is also relatively high in Slovenia, the Slovak and Czech Republic, whose share of income taxes is rather low.

Overall, the importance of different tax benefit components, as measured by
the micro composition of disposable income, again suggests a similar clustering for the EU-15 countries, as suggested by the political and social science welfare state typologies. But again, the Eastern European countries do not seem to form a homogeneous and distinct group. With regard to the importance of tax benefit components in disposable income, 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 rather group together with some traditional EU-15 welfare states. However, this analysis only considers the economic importance of tax benefit instruments in disposable income and does not take into account their particular distribution across households and therefore their redistributive impact on the distribution of incomes. This is what the following section deals with.

4 Inequality contribution of tax benefit instruments

In this section, we look at the redistributive importance of the different tax benefit instruments across countries. To determine the redistributive impact of tax benefit instruments we need an inequality measure which is naturally decomposable. As outlined in Section 2, we refer to the GE measures of inequality. More specifically, we use the GE(2) measure because it is naturally decomposable and also defined for zero incomes. Furthermore, we apply two different approaches to measure the redistributive impact of taxes and benefits. First, we use the sequential accounting approach of distributional analysis which bases on the income accounting framework outlined above. Second, we apply the factor source decomposition approach as suggested by Shorrocks (1982, 1983) which determines the contribution of each tax benefit instrument to inequality in disposable incomes simultaneously. Finally, we
compare the results and discuss the differences.

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 as illustrated in Figure 1. The results are presented on the left hand side of Table 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 3, there are some important differences in the rankings of the countries. Particularly for the GE(2) inequality in disposable income, 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, Iceland, Cyprus and Estonia now achieve 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 disposable income 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.9

However, here we are not interested in the overall redistributive effect of the tax benefit system as a whole, but in the redistributive importance of the main tax benefit instruments, such as public pensions, social benefits, incomes taxes and social insurance contributions. The amount of redistribution achieved by a certain tax benefit instrument is measured as the percentage change between two consecutive
income concepts as suggested by Figure 1. The results are presented at the right hand side of Table 1, which shows the results of the redistributive effects of different tax benefit instruments for the 26 European countries.

Regarding the overall redistributive importance of the different instruments, it first becomes obvious that public pensions are responsible for most of the reduction in income inequality of factor incomes. Exceptions are the Anglo-Saxon countries as well as Denmark and Norway. With respect to the other redistributive instruments, in half of the countries benefits play a more important role than income taxes, in the other countries it is the other way round. Also, the results suggest that social contributions are least important in redistributing income in almost all EU member states. In some countries the inclusion of social contributions even leads to an increase in income inequality implying a regressive incidence. The regressive impact is particularly strong in those countries where there is a maximum amount of earnings for contribution purposes, such as Germany, Cyprus and the UK. Only in Slovenia contributions play the most important role in redistributing income. In Belgium, France, Lithuania and Poland they are more important than income taxes. With respect to the redistributive importance of single welfare state components across countries, public pensions are particularly important in the Continental countries (France, Austria and Germany) as well as in the Slovak Republic, Poland and Italy (around 40%). They lead to comparatively low inequality reductions in Cyprus, Iceland, 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 income taxes is relatively high in the UK, Hungary and Italy (>25%), and low in Poland, Iceland and Cyprus and Denmark (<10%). Finally, social contributions have high redistributive effects in Slovenia, France, Belgium
and Hungary. On the other hand they lead to substantial increases in inequality in Germany, Cyprus, Estonia and Iceland (<-10%).

Although we find some hints to a country clustering in the case of public pensions and social benefits, we cannot really identify certain welfare state groups with regard to 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 corresponds to the economic weight of these instruments as outlined in the previous section. On the contrary, this sequential approach of redistributional analysis suggests that public pensions are the most important source of inequality reduction, benefits and taxes are on average similarly important, and contributions only lead to significant inequality reduction in a small set of European countries.

As argued above, the results for the redistributive impact of single tax benefit instruments may be sensitive with respect to the assumed sequence of instruments of the income accounting framework.\textsuperscript{11} Therefore we also followed the approach suggested by Immervoll et al. (2005) and started for each instrument from the hypothetical situation without the instrument in question (DPI - instrument) and asked by how much inequality is reduced by introducing it. Using this approach instead of the sequential approach, however, did not qualitatively change the results. As expected, it only lowers the size of the redistributive effect of benefits.

### 4.2 Decomposition approach

This section reports the results of the inequality decomposition analysis by factor components as suggested by Shorrocks, i.e. determining the relative inequality contribution $s_f$ of the different tax benefit instruments to overall inequality. The results are illustrated in Figure 4. It becomes evident that the results substantially differ
from the previous analysis based on the sequential accounting approach. In almost all countries income taxes and social contributions are by far the most important source of income inequality reductions. The contribution of benefits is almost negligible.

The results reveal that, interestingly, while taxes and social insurance contributions have a significant equalizing effect in all countries, the effect of social benefits and public pensions is not so clear across countries. Particularly, whereas taxes and contributions reduce income inequality by on average about 30%, social benefits do not seem to have any significant impact on inequality (<5% in all countries except Cyprus and Sweden), also the influence of public pensions is comparatively small. In fact, in the majority of countries public pensions have disequalizing effects on the inequality in disposable incomes. On average they increase inequality by 6%. The positive effect of public pensions on inequality is particularly large in Austria, Portugal and Cyprus (>20%). According to this factor source decomposition approach pensions only have a significant equalizing impact in the Czech Republic, Estonia, Denmark and Lithuania. Also, social benefits positively contribute to the inequality in disposable incomes in at least seven countries. The disequalizing effect is particularly evident in the Baltic States and Cyprus. Social benefits only have noteworthy equalizing effects in the Nordic countries, Slovenia, the Czech Republic, Austria and the Netherlands (>3%). With regard to the burden side, the equalizing effect of 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%, as suggested by the Shorrocks decomposition method. The equalizing effect of taxes is comparatively small in Cyprus, Latvia and the Slovak Republic. Regarding the inequality contribution of social contributions, the equalizing effect is particularly high in Slovenia, Belgium, France and Latvia (>40%). The effect is small in
Portugal, Cyprus, Iceland, Denmark and the Anglo Saxon countries.

Again, we find some hints for a certain 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 overall inequality contribution of the different tax benefit instruments.

4.3 Discussion of the results

When comparing both approaches, they lead to the same amount of inequality in disposable income. However, the two approaches seem to lead to partly 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 (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 inequality in disposable incomes.

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
7 suggests, the size of a factor’s relative inequality contribution \( s_f \) depends on its within factor inequality \( I^f_2 \), the income share \( \mu_f \) of the corresponding factor source \( f \) and its correlation with disposable income \( \rho_f \). From Table 2 it becomes obvious that, in those countries where benefits positively contribute to inequality, the correlation coefficient \( \rho_f \) has a positive sign. The opposite is true for the other countries, where they have an equalizing effect. However, the correlation between disposable income and social 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 disposable income and public pensions is rather small as well. Taxes, on the other hand show a substantial negative correlation with disposable incomes 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 pensions) is as high as that for tax payments which can be explained due to the large share of people not paying taxes (receiving benefits). The within inequality of social contributions is much lower for most countries and closer to the one of factor income. 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 of benefits with disposable income (together with a low factor share).

Our finding that 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 earlier finding that benefits on the whole reduced income inequality - as revealed by the sequential accounting approach to distributional analysis in Section 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 mix. Therefore, unless the correlation between benefits and disposable incomes 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) imposed 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. Within the sequential approach, therefore, equally distributed transfers imply an inequality reduction. In the decomposition approach, such transfers have a zero inequality contribution because their correlation with disposable income is zero. In this framework, an income component has to be higher in absolute terms for lower incomes in order to achieve a negative contribution to overall inequality. Therefore, these two different normative foundations of the two approaches are to some extent responsible for the differing results.

These differing results have important implications for the policy conclusions. It would be wrong to conclude from their positive contribution to overall inequality in the Shorrocks approach that benefits increase inequality and should therefore, for instance, 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 of benefits and disposable income it can be learned that benefits seem to have other objectives than 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 from 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 taking the (weak) correlation into account and therefore highlights the different functions of taxes and benefits for redistributing income.

5  Conclusion

The enhancement of economic and social cohesion is a key target of EU policies. Nonetheless, the descriptive evidence suggests that there are sizeable differences across EU member states in the levels of within country income inequality - especially since the recent enlargement towards Eastern Europe. This holds true for the inequality in disposable incomes as well as the inequality in pre-tax incomes, hinting at the substantial variety in the national income tax benefit systems. From a policy perspective, differences in the inequality of disposable incomes and, in particular, factors explaining these differences, including the tax and transfer system, are of particular interest in order to evaluate the different welfare state designs of European countries. In this paper, we have evaluated the impact of different tax benefit instruments (income taxes, social contributions, pensions, transfers) on income inequality and specifically ask the question if the role of instruments differs
across countries.

Our results reveal that according to the GE(2) sequential accounting approach, benefits are the most important source of inequality reduction in most European tax and transfer systems, taxes are less important. Also, public pensions play an important role in lowering the inequality in disposable incomes, when comparing the hypothetical situation without public pensions. The factor source decomposition approach as suggested by Shorrocks, however, leads to very different results: taxes and social insurance contributions are by far the most important contributors to income inequality and the contribution of benefits is close to zero. Public pensions even positively contribute to the inequality in disposable incomes in most countries.

An explanation for these partly contradictory results lies in the different normative focus of the two approaches as discussed in Section 4.3. Furthermore, it can be argued that many transfers have purposes other than income distribution. Whereas taxes and social contributions are clearly correlated with income, transfers have a much less clear effect on the income distribution, but they address other issues. This is clearly illustrated by the almost negligible correlation between social benefits and disposable income. A clear negative correlation to disposable income can be found only for some specific transfers like means-tested benefits for the long term unemployed and benefits for social exclusion; but these are only a small part of overall transfers in most countries.

With regard to the question how the redistributive importance of tax benefit instruments differs across countries, for Western Europe we basically observe the 'typical' welfare state clustering as suggested by Esping-Andersen (1990) and later modified by Ferrera (1996). Particularly the Nordic countries reveal very similar characteristics with regard to the redistributive effects of their tax benefit instruments in both approaches. Also the Continental and Southern European form rather
distinct groups of countries. However, as opposed to large parts of the welfare state literature, we do not find the Eastern European countries to be a clear distinguished group when we look at the 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. They 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 the pre-tax income distribution. However, any behavioral effects caused by redistributive policies are not captured. Second, the study is static 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 or indirect taxes which have different distributional impacts in different countries. This should be subject of future research when comparative data on these elements become available.
Notes

*Andreas Peichl is grateful for financial support by Deutsche Forschungsgemeinschaft DFG (PE1675). We would like to thank John Bishop, Mark Rider, John Roemer, Ulrich Walwei as well as participants of the 2009 Conference on Government Programs, Distribution, and Equity at the Andrew Young School of Policy Studies, the 2009 SMYE and Verein fuer Socialpolitik conferences as well as seminar participants in Bonn, Cologne and Nuremberg for helpful comments and suggestions. The usual disclaimer applies.

1For 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.

2For 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, which 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.

3E.g. Ankrom (1993) also follows this approach. He argues that ignoring employers’ social 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.

4Pensions 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)).

5See, e.g., Cowell and Kuga (1981). The more positive (negative) $\alpha$ is, the more sensitive $I_\alpha$ is to changes at the top (bottom) of the income distribution.
6Austria (AT), Belgium (BE), Denmark (DK), Germany (DE), Greece (EL), Spain (ES), Finland (FI), France (FR), Italy (IT), Luxembourg (LU), Netherlands (NL), Portugal (PT), Sweden (SE), United Kingdom (UK).

7Cyprus (CY), Czech Republic (CZ), Estonia (EE), Hungary (HU), Lithuania (LT), Latvia (LV), Poland (PL), Slovenia (SI), Slovakia (SK).

8Note that indirect taxes are not taken into account here. This explains why it is possible that the share of factor income in overall income may be below 100%.

9There are more observations at the very top of the distribution in the data for the Nordic countries and the spread of these observations is also larger. In order to tackle this problem we applied top-coding and trimming to the data at the top and recomputed all measures. The ranking of the countries with respect to the overall level of inequality changes into the direction of the results reported for the Gini coefficient in Section 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 with the Gini coefficient as a sensitivity check. The results are qualitatively the same and can be obtained from the authors upon request.

10Note that a large part of this redistributive effect of public pensions is due to a pure re-ranking of individuals. A majority of pensioners are assigned zero factor incomes. Considering public pensions just achieves their pre-retirement income position and this re-ranking effect makes up a large part of the inequality reduction of pensions (see Whiteford (2008) for a discussion).

11As outlined by Burniaux et al. (1998) on p. 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.
See also Burniaux et al. (1998) for a discussion of the effect of equally distributed income components in the Shorrocks decomposition.
References


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Author biographies

Clemens Fuest is currently Research Director at the Oxford University Centre for Business Taxation as of October 2008. He received his PhD from the University of Cologne and his Habilitation from the University of Munich. He was previously Professor of Economics at the Faculty of Economics and Social Sciences of the University of Cologne. His fields of research are public economics, corporate taxation and international taxation. He is currently Chairman of the Scientific Advisory Board of the German Federal Ministry of Finance. He was also a member of a tax reform commission which developed a proposal for the reform of the German corporate and personal income tax system (Kommission Steuerreform der Stiftung Marktwirtschaft). Clemens Fuest has published widely on international taxation and public economics.

Andreas Peichl is a research associate at the Institute for the Study of Labor (IZA). He received his PhD from the University of Cologne and is also a research associate at the Institute for Social and Economic Research (ISER) at the University of Essex, UK. His current research interests include public economics, applied micro-econometrics and labor and welfare economics with particular reference to tax reforms and their empirical evaluation, tax benefit microsimulation, the analysis of income distribution and especially the measurement of richness at the top of the distribution.

Judith Niehues is a PhD student at the Cologne Graduate School (CGS) and a member of the research training group GK SOCLIFE. Her main research interests include applied public and labor economics, in particular the analysis of income inequality and tax benefit systems in a comparative perspective.
### Tables

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Table 1: GE(2) Inequality measures and redistributive instruments
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Source: Own calculations based on EU-SILC. $I_2$ stands for inequality in total income ($DI_2$). $I_2$ represents the within factor income inequality of income component $f$, $I_2$ its correlation with disposable income and $s_f$ the size of a relative factor’s relative inequality contribution.
Figures

Figure 1: Income accounting framework

Figure 2: Gini income inequality and absolute redistribution
Source: Own calculations based on EU-SILC. Countries are sorted in ascending order of the inequality in disposable incomes.
Figure 3: Factor shares of tax benefit instruments
Source: Own calculations based on EU-SILC. Note that here we consider the social contributions by employers and original income separately. In the factor shares $\mu_f$ of Table 2, on the contrary, employers’ contributions are included in the concept of factor income.

Figure 4: 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 disposable incomes. The size of the different bars correspond to the relative inequality contributions $s_f$ in Table 2.