The redistributive effects of tax benefit systems in the enlarged EU

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Abstract

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 states in income inequality. From a policy perspective, it is important to know to what extent the differences in disposable income inequality levels are driven by different gross income distributions and to what extent by different redistributive policies. In this paper, we evaluate the inequality contribution of the welfare state and different pre-tax income components to overall inequality. Our decomposition results reveal that while taxes have a highly inequality decreasing effect, surprisingly in the majority of countries inequality and benefits are positively associated. Overall, our study contributes to a better understanding of inequality patterns across EU countries and identifies which matters have to be assessed to reduce inequality.

JEL Codes: D31, D60, H20

Keywords: Income Inequality, Redistribution, Decomposition

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1 Introduction

The European Union (EU) can be seen as a rather prosperous and homogeneous group of countries - at least from a global perspective. Nonetheless there are sizeable differences across member states in the levels of within country income inequality. This is true especially since the enlargement of the EU in 2004 and 2007, when in total 12 additional countries, mostly from Eastern Europe, joined the EU. One of the main targets of the EU is the enhancement of economic and social cohesion (see Article 2 of the Treaty on European Union). Therefore, convergence of the EU regions - in terms of growth, employment, sustainable development and social coherence - is a fundamental element of EU policies. Inequality is usually measured in terms of disposable income. The distribution of post-government income is affected by the pre-tax income distribution and various redistributive policies. Different sources of inequality need the application of different policy measures to counteract them. Therefore, from a policy perspective, it is important to know to what extent the differences in inequality levels between EU countries are driven by the gross income distribution and to what extent by different welfare state designs.

The analysis of income inequality, the design of the welfare state and the size of redistribution has a long tradition in economic and social science literature. Especially regarding the analysis of the development of income inequality across countries and time, there exist almost an infinite number of empirical studies (see Anand and Segal (2008) for a recent overview). In particular since the availability of comparable micro data sets, there has been much progress in cross-national inequality analyses. For instance, Gottschalk and Smeeding (1997) and recently Brandolini and Smeeding (2007) use data from the Luxembourg Income Study (LIS) to compare inequality trends in industrialized countries. Due to data limitations, the development of the size of redistribution across countries and time is not as extensively analysed as inequality. However, Mahler and Jesuit (2006) use LIS data for a detailed discussion of fiscal redistribution in developed countries, as well as the importance of taxes and benefits for redistribution. Similarly for the EU-15 Immervoll et al. (2005) analyse the equalising effects of taxes and benefits using the microsimulation model EUROMOD. Very recently, Figari et al. (2008) extended this analysis by also including four new Eastern European member states.

The present paper extends this line of research by using a decomposition approach to identify the inequality contributions of different pre-tax income compon-

ents as well as taxes and benefits on overall inequality in disposable incomes. We use EU-SILC (Statistics on Income and Living Conditions) micro data of 2005 to evaluate the design of the tax and transfer system in a comparable manner in the EU member states. In the first step, we compare the structure and the redistributive impact of the tax benefit systems across EU countries. In the second step, we apply the factor source decomposition approach as suggested by Shorrocks (1982), Shorrocks (1983) to analyse the impact of different disposable income components. As total disposable income can be exhaustively divided into different pre-tax income sources as well as taxes and benefits, it is possible to calculate the contribution (equalising or disequalising effect) of each factor to overall inequality. The size of a factor´s inequality contribution then depends on its within factor inequality, the income share of the corresponding factor source and its correlation with disposable income. This allows us to compare the contributions of different components to overall inequality across countries and to cluster countries with respect to their design of the welfare state and the importance of the pre-tax distribution.

Our results suggest that while taxes have a highly inequality decreasing effect in all countries, surprisingly in the majority of countries government benefits have a disequalising impact on disposable income inequality. A further decomposition of the results indicates that the positive contribution is due to the fact that in most countries, social benefits and disposable incomes are positively correlated. Yet, separating the benefits by function reveals, that those benefits which are mainly targeted at the poor and disadvantaged (such as benefits for social exclusion) display the expected equalizing effects in most countries.

The setup of the paper is organised as follows: In Section 2 describes the data set and shows illustrative descriptive results about pre-tax and post-tax income inequality in the different countries. Section 3 we describe the methodology of the regression-based decomposition analysis. In Section 4 presents the results of the decomposition analysis. Section 6 concludes by summarizing the main results and discussing their implications.

2 Data and Descriptives

EU-SILC (European Union Statistics on Income and Living Conditions) is the successor of ECHP data. The EU-SILC provides harmonised cross-sectional and lon-

gitudinal multidimensional micro data on income and social exclusion in European countries. After its start in 2003 with 7 European countries, in the 2004 wave it covered all old EU-15 member states except Germany, Netherlands and the UK who have derogations until 2005. Since 2005, the dataset covers the 25 EU member states, plus Norway and Iceland, and it is the largest comparative survey of European income and living conditions.

In the micro dataset, all monetary amounts are expressed in national currency, so when comparing across countries differences in national purchasing power have to be taken into account. In order to make income comparable across countries we adjust national income amounts by the multilateral current purchasing power parities provided by Eurostat.

Income Tax Systems

The existing income tax systems in the 26 European countries under consideration offer considerable variety. As Table 1 shows, all Western European countries except Iceland have graduated rate schedules with a number of brackets ranging from 2 (Ireland) to 16 (Luxembourg), with the top marginal income tax rate ranging from 38% (Luxembourg) to 59% in Denmark. Iceland is the only Western European country which has recently introduced a flat tax rate of 36% combined with a basic allowance of 7.860 Euro.

There are also considerable differences across the Eastern European countries. Half of these countries have adopted a flat tax system, with a single tax rate and a basic allowance. The flat tax rates vary from 15% (2008 in Czech Republic) to 27% in Lithuania. The basic allowances range from the very small amount of only 72 Euro in Latvia to 2.600 Euro in the Slovak Republic. Other Eastern European countries also apply graduated tax schedules, but with a comparatively small number of brackets (2-3) and relatively low top marginal rates. Interestingly, Slovenia and Poland have very similar income tax schedules as the Western European countries, with highest rates around 40%, but with a lower amount belonging to the 0% bracket.

	No of brackets	Lowest (pos) rate	Highest rate	Form of main tax relief	Comments
AT	4	38.3%	50.0%	0% bracket (10,000 EUR)	
BE	5	25.0%	50.0%	tax allowance (6,040 EUR)	
CY	3	20.0%	30.0%	0% bracket (19,500 EUR)	
CZ	4	12.0%	32.0%	tax credit	since 2008 flat tax (15%)
DE	formula	15,8%	44,3%	0% bracket (7,664 EUR)	
DK	3	state 5.48%, local 24.6%	state 15%, local 24.6%	tax allowance	tax ceiling at 59%, 8 % health tax
EE	flat tax	22.0%	22.0%	basic allowance 1,304 EUR	flat tax introduced in 1994
ES	4	24.0%	43.0%	tax allowance (5,151 EUR)	
FI	4	state 8.5%, local 16%	state 31.5%, local 21%	0% bracket (12,600 EUR), state tax allowance, local	
FR	4	5.5%	40.0%	0% bracket (5,614 EUR)	
GR	3	15.0%	40.0%	0% bracket (12,000 EUR)	
HU	2	18.0%	36.0%	tax credit	
IE	2	20.0%	41.0%	tax allowance	
IS	flat tax	36.0%	36.0%	basic allowance (7860 EUR)	flat tax introduced 2007
IT	5	23.0%	43.0%	tax credit	
LT	flat tax	27.0%	27.0%	basic allowance 1,304 EUR	flat tax introduced in 1994
LU	16	8.0%	38.0%	0% bracket (10,335 EUR)	
LV	flat tax	25.0%	25.0%	basic allowance 72 EUR	flat tax introduced in 1997
NL	4	33,6%	52.0%	tax credit	
NO	3	state 13.5%, local 28%	state 19.5% local 28%	0% bracket (state)	
PL	3	19.0%	40.0%	0% bracket (3,091 EUR)	
PT	6	10.5%	40.0%	tax credit	
SE	2	state 20%, local 31,6%	state 25%, local 31,6%	tax allowance	
SI	3	16.0%	41.0%	tax allowance (2,800 EUR)	
SK	flat tax	19.0%	19.0%	basic allowance 2,600 EUR	flat tax introduced in 2004
UK	3	10.0%	40.0%	tax allowance (5,225 EUR)	

Table 1: Income tax systems

	Total Taxes	Indirect Taxes	Direct Taxes	Social Contr.	Social Expen.
AT	42.0	14.7	12.9	14.5	28.8
BE	45.5	13.9	17.8	13.9	29.7
CY	35.6	17.1	10.2	8.3	18.2
CZ	36.3	11.9	9.3	15.1	19.1
DE	38.8	12.1	10.3	16.3	29.4
DK	50.3	17.9	31.4	1.1	30.1
EE	30.9	13.5	7.1	10.4	12.5
ES	35.6	12.5	11.4	12.2	20.8
FI	43.9	14.1	17.9	12.0	26.7
FR	44.0	15.8	11.9	16.4	31.5
GR	34.4	12.9	9.5	12.1	24.2
HU	38.5	15.8	9.1	13.6	21.9
IE	30.8	13.6	12.4	4.8	18.2
IS	.	.	.	.	.
IT	40.6	14.5	13.5	12.6	26.4
LT	28.9	11.5	9.1	8.2	13.2
LU	38.2	13.4	14.1	10.7	21.9
LV	29.4	12.9	8.0	8.5	12.4
NL	38.2	13.1	11.9	13.1	28.2
NO	44.3	12.5	22.9	9.1	23.9
PL	34.2	13.9	7.0	13.7	19.6
PT	35.3	15.3	8.6*	11.3	24.7*
SE	51.3	17.3	20.1	13.8	32.0
SI	40.5	16.4	9.3	14.8	23.4
SK	29.3	13.0	6.1	10.8	16.9
UK	37.0	13.3	16.8	6.9	26.8

Table 2: Tax benefit mix (as % of GDP) in 2005
Notes: * Numbers for Portugal are from 2004

Tax benefit systems

European countries do not only differ in their income tax schedules but also differ in the design of their system of social protection and redistribution. In each country, direct and indirect taxes as well as social insurance contributions (SIC) are used to finance the welfare state (see Table 2 for an overview). The weight in the tax mix of these components depends on the structural design of the tax benefit system in each country. For the Continental countries it is evident that the SIC are more important to finance the welfare state than the direct taxes. This is also true for Eastern Europe. Only in the Baltic states Lativa and Lithuania the SIC play only a minor role, similar as in the Nordic countries. Denmark relies almost exclusively on taxes for financing the welfare state. In Southern European countries, indirect taxes tend to play the most important role. This is even more true for Eastern Europe and the Baltic states. The level of social protection (in terms of expenditures as % of GDP) is high in Nordic and Continental countries (exceptions are Norway and Luxembourg) and particularly low in the Eastern Europe and Baltic states (exception Slovenia) as well as Ireland. A perhaps trivial but still interesting observation from Table 2 is that the level of social expenditures is correlated with the level of taxes and contributions. Figure 1 plots these expenditures against the sum of all taxes and contributions and reveals an increasing trend (i.e. a positive correlation as the linear fit predicts), as expected. Still, there are some interesting observations from the Figure. First, the countries can almost perfectly be grouped according to their geographic grouping (see the circles). Then the spending in social protection of those countries placed above the linear fit is higher than the average expected level of social expenditure relative to total revenues. For the countries situated below the line, rather the opposite is true. It reveals that Continental countries have relatively high social expenditures compared to their tax revenues. The Southern countries have a middle level of tax revenues (35-40%) but comparatively high social expenditure levels (20-25%). Nordic countries have the highest tax revenues per GDP, but a comparatively lower part is spent on social protection than in the Continental countries. The Baltic countries emerge as the group of countries with very low tax revenues and their expenditure on social protection is clearly below the average expected level. The Eastern Europe countries reveal somewhat higher tax revenues and social expenditures. The two Anglo-Saxon countries, Ireland and the UK, situate between the Southern and Eastern Europe countries.

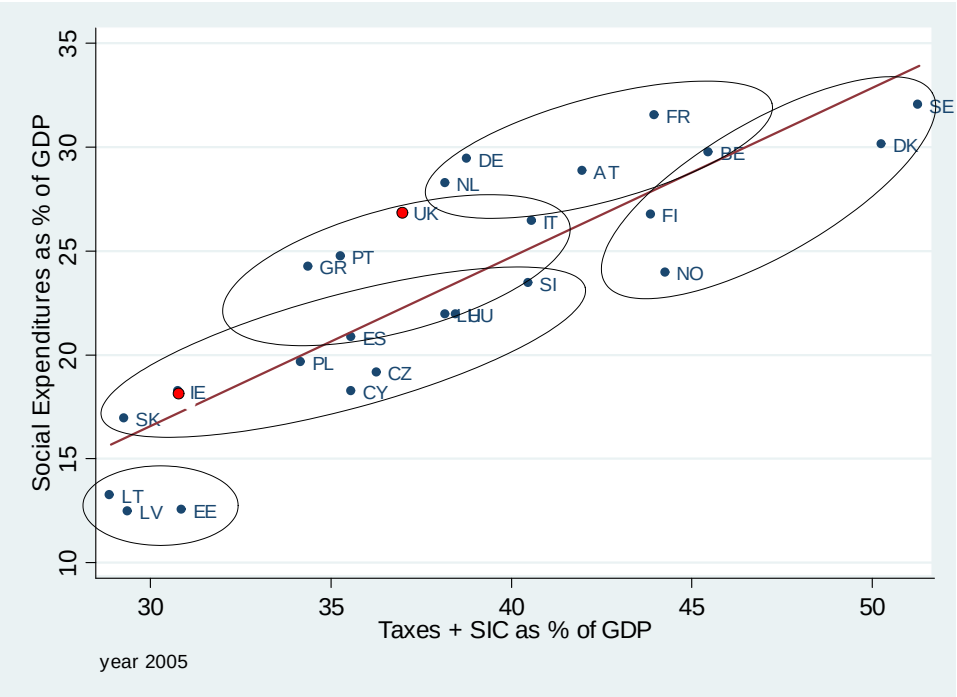

Figure 1: Correlation between social expenditures and government revenue

Income distribution and Redistribution

To find further similarities or differences between European countries or groups of countries we compute a number of distributional measures. Table 3 presents the Gini coefficients for market and disposable incomes. Looking at the inequality of market incomes first, huge disparities among the European countries emerge, with Gini coefficients ranging from 0.36 in Iceland to 0.553 in Hungary. Market inequality is comparatively high in the Anglo-Saxon countries, the Baltic states, as well as in a couple of Continental countries such as Germany, Belgium and the Netherlands (>0.48). Rather low inequality levels can be found in the Nordic countries, except Norway and Finland which display higher inequality levels. 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 Slovenia (0.453). Table 3 also reports the Gini coefficients of market income including pensions. The difference between the Gini coefficients of market income and the ones of market incomes plus pensions demonstrates the difference of the strength of the redistributive

character of pensions across European countries. It emerges, that pensions have huge redistributive power in Germany and Austria, who now achieve a higher rank regarding the equality of incomes. On the other hand the inclusion of pensions leads to a lower ranking of the Nordic countries and Ireland, showing the lower redistributive importance of pensions in those countries.

Looking at the inequality of 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. Although there are significant differences in the size of redistribution, the overall inequality ranking of the countries basically remains the same. It becomes obvious, that the Southern European countries, for which data on market incomes is not available, are situated among the countries with the highest inequality of disposable income. A closer look at the differences in the size of redistribution is useful and is also illustrated in Table 3. Redistribution - measured as the percentage change between the Gini coefficient of market income and disposable income - is particularly high in the Nordic countries (except Norway and Iceland) and the Continental countries (>40%) and rather low in Cyprus and Iceland, as well as in the Baltic States (around 30%). Looking at the Eastern European countries, again there are substantial differences in the size of redistribution The redistributive effect is rather high in Slovenia, the Slovak and the Czech Republic (around 45%) and rather low in the other Eastern Europe countries (around 35%).

After having measured the redistributive effect of the tax benefit system as a whole, now we look at the redistributive impact of each single tax benefit instrument. Obviously, when measuring the redistributive effect of single tax benefit instruments, the results are sensitive to the assumed sequence of instruments, since, for example, some benefits are also taxable. To avoid these problems we follow Immervoll et al. (2005) and start from a situation without the instrument in question (DPI - instrument) and ask by how much inequality is reduced by introducing it. Table 4 illustrates the results for those EU member states which also report information on gross incomes and therefore also on taxes in the EU-SILC 2005 dataset[1]. First, it becomes obvious, that the exclusion of any policy instrument in all countries results in an increase in inequality, represented by larger Gini coefficients (only the benefits for "social exclusion not elsewhere classified" have no impact at all in some

[1]Norway is excluded from the following analysis because of data problems.

countries). It also emerges, that in almost all countries, public pensions entail a larger redistributive effect than the sum of other social benefits. The only exception is Ireland. Still, the exclusion of social benefits results in a larger increase in Gini coefficients than the elimination of income taxes. Regarding the other tax benefit instruments, unemployment benefits reveal a relatively high redistributive effect in Belgium and Denmark and family benefits in Ireland and Hungary. The benefits for social exclusion only seem to have a significant redistributive impact in the Netherlands. On the other hand, the residual category of benefits, which contains sickness, disability, education-related allowances and survivor benefits, display a substantial effect in all countries, particularly in the Nordic countries such as Denmark and Sweden.

	Gini Coefficients			Redistribution (%change in Gini)	
	DPI	Market	Market + Pensions	all taxes and benefits	except pensions
AT	0.253	0.467	0.342	45.8	25.9
BE	0.278	0.496	0.392	43.9	29.1
CY	0.288	0.388	0.324	25.8	11.3
CZ	0.253	0.468	0.349	45.9	27.4
DE	0.270	0.517	0.368	47.8	26.5
DK	0.237	0.458	0.372	48.1	36.3
EE	0.333	0.488	0.392	31.7	15.0
ES	0.320	0.468	0.360	31.6	11.1
FI	0.259	0.480	0.380	46.1	32.0
FR	0.273	.	.		
GR	0.341	.	.		
HU	0.333	0.553	0.433	39.8	23.1
IE	0.319	0.513	0.455	37.7	29.8
IS	0.260	0.362	0.321	28.0	18.8
IT	0.321	.	.		
LT	0.349	0.509	0.414	31.5	15.8
LU	0.280	0.472	0.364	40.7	23.1
LV	0.392	.	.		
NL	0.264	0.480	0.381	44.9	30.5
NO	0.296	0.475	0.387	37.7	23.5
PL	0.333	0.531	0.400	37.4	16.8
PT	0.377	.	.		
SE	0.238	0.458	0.353	48.0	32.6
SI	0.237	0.453	0.350	47.6	32.2
SK	0.283	0.461	0.347	38.6	18.5
UK	0.324	0.518	0.432	37.5	25.0

Table 3: Income Inequality and Redistribution

	DPI	DPI excl taxes	DPI ecxl benefits	DPI excl pensions	DPI excl unempl ben	DPI excl family ben	DPI excl social ben	DPI excl other ben	Redistributive Effect (% change in Gini)						
									taxes	benefits	pensions	unempl	family	social	other
EU	0.369	0.401	0.424	0.488	0.381	0.378	0.376	0.389	8.7	14.9	32.2	3.3	2.4	1.9	5.4
AT	0.304	0.329	0.349	0.453	0.316	0.319	0.304	0.317	8.2	14.8	49.0	3.9	4.9	0.0	4.3
BE	0.324	0.362	0.392	0.439	0.361	0.329	0.326	0.339	11.7	21.0	35.5	11.4	1.5	0.6	4.6
CY	0.316	0.331	0.331	0.370	0.316	0.323	0.317	0.321	4.7	4.7	17.1	0.0	2.2	0.3	1.6
CZ	0.299	0.336	0.353	0.398	0.302	0.315	0.307	0.322	12.4	18.1	33.1	1.0	5.4	2.7	7.7
DE	0.312	0.339	0.372	0.477	0.333	0.319	0.319	0.325	8.7	19.2	52.9	6.7	2.2	2.2	4.2
DK	0.299	0.330	0.427	0.402	0.352	0.302	0.299	0.356	10.4	42.8	34.4	17.7	1.0	0.0	19.1
EE	0.373	0.399	0.401	0.454	0.374	0.387	0.373	0.385	7.0	7.5	21.7	0.3	3.8	0.0	3.2
ES	0.344	0.363	0.360	0.441	0.351	0.344	0.344	0.352	5.5	4.7	28.2	2.0	0.0	0.0	2.3
FI	0.316	0.350	0.399	0.429	0.343	0.325	0.319	0.351	10.8	26.3	35.8	8.5	2.8	0.9	11.1
HU	0.361	0.398	0.429	0.462	0.370	0.392	0.362	0.384	10.2	18.8	28.0	2.5	8.6	0.3	6.4
IE	0.353	0.394	0.440	0.400	0.367	0.392	0.353	0.376	11.6	24.6	13.3	4.0	11.0	0.0	6.5
IS	0.302	0.328	0.339	0.343	0.304	0.316	0.304	0.320	8.6	12.3	13.6	0.7	4.6	0.7	6.0
LT	0.381	0.411	0.408	0.459	0.383	0.388	0.383	0.397	7.9	7.1	20.5	0.5	1.8	0.5	4.2
LU	0.307	0.340	0.352	0.424	0.318	0.321	0.312	0.321	10.7	14.7	38.1	3.6	4.6	1.6	4.6
NL	0.299	0.350	0.373	0.436	0.310	0.303	0.321	0.330	17.1	24.7	45.8	3.7	1.3	7.4	10.4
PL	0.344	0.364	0.398	0.481	0.353	0.354	0.346	0.372	5.8	15.7	39.8	2.6	2.9	0.6	8.1
SE	0.290	0.318	0.381	0.424	0.308	0.297	0.294	0.340	9.7	31.4	46.2	6.2	2.4	1.4	17.2
SI	0.287	0.336	0.339	0.370	0.289	0.300	0.293	0.313	17.1	18.1	28.9	0.7	4.5	2.1	9.1
SK	0.334	0.358	0.368	0.416	0.336	0.344	0.342	0.347	7.2	10.2	24.6	0.6	3.0	2.4	3.9
UK	0.350	0.397	0.415	0.440	0.352	0.366	0.364	0.375	13.4	18.6	25.7	0.6	4.6	4.0	7.1

Table 4: Redistributive effect of separated tax-benefit instruments

Notes: The question here is: starting from the situation without the instrument in question (DPI - instrument) how much inequality is reduced by introducing it?

3 Decomposition approach

Consider a population of n persons (or households), $i = 1, ...n$, with x_i as the income of individual i, $\overline{x}$ 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:

$$I = 1 - \frac{W(\mathbf{x})}{\overline{x}} \tag{1}$$

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

$$I_\alpha = \frac{1}{\alpha(\alpha-1)} \int_0^\infty \frac{x_i}{\overline{x}} \left[\left(\frac{x_i}{\overline{x}} \right)^\alpha - 1 \right] dF \tag{2}$$

where F is the CDF of income and with α being a parameter indicating the sensitivity towards a particular part of the income distribution.[2] The discretized formula of the GE family used for empirical applications is given by

$$I_\alpha = GE(\alpha) = \begin{cases} \frac{1}{\alpha(\alpha-1)} \left(\sum_{i=1}^{n} \left[\frac{w_i}{N} \left(\frac{x_i}{\overline{x}} \right)^\alpha \right] - 1 \right) & , \alpha \in R - \{0, 1\} \\ \sum_{i=1}^{n} \frac{w_i}{N} \log \frac{\overline{x}}{x_i} & , \alpha = 0 \\ \sum_{i=1}^{n} \frac{w_i}{N} \frac{x_i}{\overline{x}} \log \frac{x_i}{\overline{x}} & , \alpha = 1 \end{cases} \tag{3}$$

$GE(0)$ is also known as the mean log deviation and $GE(1)$ as the Theil index (see Theil (1967)). The GE measures can be related to the (ordinally equivalent) Atkinson (1970) measure of inequality using the following relationship of the inequality

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

aversion paramters: $\alpha = 1 - \epsilon$:

$$A(\epsilon) = 1 - \left(\sum_{i=1}^{n} \frac{w_i}{N} \left(\frac{x_i}{\overline{x}} \right)^{1-\epsilon} \right)^{\frac{1}{1-\epsilon}} \tag{4}$$

$$GE(\alpha) = \frac{(1 - A(\epsilon))^{1-\epsilon} - 1}{\epsilon (\epsilon - 1)} \tag{5}$$

The GE measure of inequality can be interpreted in an economic way (Dahlby (1987)) using the Harsanyi (1953, 1977) framework which is a particular form of utilitarianism based on the veil of ignorance and equiprobability assumption (expected utility: $EU = \frac{1}{n} \sum U(x_i)$ with U a Neumann-Morgenstern utility function with $U\prime > 0$ and $U" < 0$). Using a constant relative risk aversion (CRRA) utility function it has been shown that

$$I_\alpha = \frac{U(\overline{x}) - EU}{\overline{x} U'(\overline{x})} \frac{1}{1 - \alpha} \tag{6}$$

where $\frac{U(\overline{x}) - EU}{\overline{x} U'(\overline{x})}$ is an approximation to the relative risk premium divided by the coefficient of relative risk aversion in the Harsanyi framework.

Subgroup decomposition: Now suppose the population is divided into $k = 1, ..., K$ mutually exclusive subgroups. It has been shown that each $GE(\alpha)$ index can be additively decomposed into within-group and between-group inequality (Shorrocks (1980), Shorrocks (1984)):

$$GE(\alpha) = GE(\alpha)^{within} + GE(\alpha)^{between} \tag{7}$$

For values of $\alpha \in R - \{0, 1\}$, the within-group and between-group inequality terms can be written as:

$$\begin{aligned} GE(\alpha) &= \frac{1}{\alpha(\alpha - 1)} \left(\sum_{i=1}^{n} \left[\frac{w_i}{N} \left(\frac{x_i}{\overline{x}} \right)^{\alpha} \right] - 1 \right) \\ &= \frac{1}{\alpha(\alpha - 1)} \left[\sum_{k=1}^{K} \left(\frac{N_k}{N} \right)^{1-\alpha} \left(\frac{\overline{x}_k}{\overline{x}} \right)^{\alpha} \frac{1}{N_k} \left(\sum_{i=1}^{n_k} \left(\frac{x_i}{\overline{x}} \right)^{\alpha} - 1 \right) + \left(\sum_{k=1}^{K} \frac{N_k}{N} \left(\frac{\overline{x}_k}{\overline{x}} \right)^{\alpha} - 1 \right) \right] \\ &= \sum_{k} \left(p^k \right)^{1-\alpha} \left(\mu^k \right)^{\alpha} GE_\alpha^k + \left(\sum_{k} p^k \left(\mu^k \right)^{\alpha} - 1 \right) \\ &= GE(\alpha)^{within} + GE(\alpha)^{between} \end{aligned} \tag{8}$$

where $p^k = \frac{N_k}{N}$ is the population share of subgroup k (i.e. the sum of the weights

in subgroup k divided by the sum of the weights for the full sample) and $\mu^k = \frac{\overline{x}_k}{\overline{x}}$ is the share of total income held by k's members (subgroup income share). GE^k_α denotes the inequality for subgroup k and is calculated as if the subgroup was a separate population. Therefore the first term of the decomposition equation (8) is a simple weighted sum of the subgroup inequality values and describes the within-group inequality. The relative weight in the summation of the subgroups' within inequalities GE^k_α depends on the size of the group and their mean income relative to that of the whole population (economic weight). The second term in (8) is the between-group inequality, reflecting the inequality contribution solely due to differences in the subgroup mean incomes, i.e. it is derived assuming every person within a given subgroup k received k's mean income, $\overline{x}_k$. Therefore the higher the differences between average incomes across subgroups, the higher is this between inequality component. If all subgroups' average incomes were equal, this term would be zero.

Decomposition by factor source: Besides decomposition by population subgroups, decomposition by factor source is another important mechanism to provide further insights about income inequality (Shorrocks (1982) and Shorrocks (1983)). Total income is usually composed from several sources: labour earnings, capital and business income, private and public transfers, etc. Therefore, it is useful to express total inequality as the sum of these factor's contributions. 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 :

$$\begin{aligned} GE(2) &= \frac{1}{2}\left(\sum_{i=1}^{n}\left[\frac{w_i}{N}\left(\frac{x_i}{\overline{x}}\right)^2\right]-1\right) \\ &= \frac{1}{2}(CV)^2 = \frac{1}{2}\left(\frac{\sqrt{Var(x)}}{\overline{x}}\right)^2 = \frac{1}{2}\frac{Var(x)}{\overline{x}^2} \end{aligned} \tag{9}$$

Suppose total 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 ρ_f is the correlation between x and x_f and

$\mu_f = \frac{\overline{x}_f}{\overline{x}}$ is is f's factor share.

$$I_2 = GE(2) = \sum_{f=1}^{K} S_f = \sum_{f=1}^{K} s_f I_2 = \sum_{f=1}^{K} \rho_f \mu_f \sqrt{GE_2 GE_2^f} \tag{10}$$

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

The factor source decomposition can be derived from a univariate OLS regression of x_f on x:

$$x_f = \beta_0 + \beta_1 x \tag{11}$$

It can be shown that $\widehat{\beta}_1 = s_f$. In the simple OLS regression, $\widehat{\beta}_1$ is defined as:

$$\widehat{\beta}_1 = \frac{Cov(x_f, x)}{Var(x)} = \frac{Cov(x_f, x)}{\sqrt{Var(x)Var(x_f)}} \sqrt{\frac{Var(x_f)}{Var(x)}} = \rho_f \sqrt{\frac{Var(x_f)}{Var(x)}} \tag{12}$$

The relative contribution of factor f to overall inequality s_f is defined as:

$$\begin{aligned} s_f &= \frac{S_f}{I} = \rho_f \mu_f \sqrt{\frac{GE_2^f}{GE_2}} = \rho_f \mu_f \sqrt{\frac{\frac{1}{2}(CV_f)^2}{\frac{1}{2}(CV)^2}} \\ &= \rho_f \frac{\overline{x}_f}{\overline{x}} \sqrt{\frac{\frac{1}{2}\frac{Var(x_f)}{\overline{x}_f^2}}{\frac{1}{2}\frac{Var(x)}{\overline{x}^2}}} = \rho_f \frac{\overline{x}_f}{\overline{x}} \sqrt{\frac{\overline{x}^2}{\overline{x}_f^2}\frac{Var(x_f)}{Var(x)}} \\ &= \rho_f \sqrt{\frac{Var\left(x_f\right)}{Var(x)}} = \widehat{\beta}_1 = \frac{Cov(x_f, x)}{Var(x)} \end{aligned} \tag{13}$$

Therefore, the factor source inequality decomposition according to I_2 can be written as[3]:

[3]It is also possible to show this using the formula for the $GE(2)$ measure:

$$
\begin{aligned}
I_2 &= \sum_{f=1}^{K} s_f I_2 = \sum_{f=1}^{K} \rho_f \mu_f \sqrt{\frac{GE_2^f}{GE_2}} GE_2 \\
&= \sum_{f=1}^{K} s_f GE_2 = \sum_{f=1}^{K} \widehat{\beta} GE_2 \\
&= \sum_{f=1}^{K} \frac{Cov(x_f, x)}{Var(x)} \frac{1}{2} \frac{Var(x)}{\overline{x}^2} = \sum_{f=1}^{K} \frac{1}{2} \frac{Cov(x_f, x)}{\overline{x}^2}
\end{aligned} \tag{14}
$$

When looking at the interpretation of the inequality contribution of factor f (S_f), one might also be interested in a statement like "income component f contributes an amount C_f to inequality of total incomes" (see Shorrocks (1982), p. 209). To do so, Shorrocks (1982) further defines two counterfactuals:

- (A): the inequality which would be observed if income component f was the only source of income differences,
- (B): the amount by which inequality would fall if differences in factor f income receipts were eliminated.

In case of I_2 as the measure of inequality, (A) and (B) can be formalised as follows:

$$
\begin{aligned}
s_f &= \rho_f \mu^f \sqrt{\frac{GE_2^f}{GE_2}} = \rho_f \frac{\overline{x}_f}{\overline{x}} \sqrt{\frac{\frac{1}{2}\left(\frac{1}{n}\sum_{i=1}^{n}\left[\left(\frac{x_i^f}{\overline{x}_f}\right)^2\right] - 1\right)}{\frac{1}{2}\left(\frac{1}{n}\sum_{i=1}^{n}\left[\left(\frac{x_i}{\overline{x}}\right)^2\right] - 1\right)}} \\
&= \rho_f \frac{\overline{x}_f}{\overline{x}} \sqrt{\frac{\left(\frac{1}{n}\sum_{i=1}^{n}\left[\frac{(x_i^f)^2}{(\overline{x}_f)^2}\right] - 1\right)}{\left(\frac{1}{n}\sum_{i=1}^{n}\left[\frac{(x_i)^2}{(\overline{x})^2}\right] - 1\right)}} = \rho_f \frac{\overline{x}_f}{\overline{x}} \sqrt{\frac{\frac{1}{(\overline{x}_f)^2}\left(\sum_{i=1}^{n}\left[\left(x_i^f\right)^2\right] - (\overline{x}_f)^2\right)}{\frac{1}{(\overline{x})^2}\left(\sum_{i=1}^{n}\left[(x_i)^2\right] - (\overline{x})^2\right)}} \\
&= \rho_f \frac{\overline{x}_f}{\overline{x}} \sqrt{\frac{(\overline{x})^2}{(\overline{x}_f)^2} \frac{Var\,(x_f)}{Var(x)}} = \rho_f \sqrt{\frac{Var\,(x_f)}{Var(x)}} = \widehat{\beta}
\end{aligned}
$$

$$C_f^A = \frac{1}{2}\frac{Var(x_f)}{\overline{x}^2} \tag{15}$$

$$C_f^B = \frac{1}{2}\frac{Var(x_f) + 2Cov(x_f, x - x_f)}{\overline{x}^2} \tag{16}$$

It can be shown that C_f^A and C_f^B are related to S_f :

$$\begin{aligned} S_f &= \frac{1}{2}\left(C_f^A + C_f^B\right) \qquad (17) \\ &= \frac{1}{2}\left(\frac{1}{2}\frac{Var(x_f)}{\overline{x}^2} + \frac{1}{2}\frac{Var(x_f) + 2Cov(x_f, x - x_f)}{\overline{x}^2}\right) \\ &= \frac{1}{4}\left(\frac{2Var(x_f) + 2Cov(x_f, x) - 2Cov(x_f, x_f)}{\overline{x}^2}\right) \\ &= \frac{1}{2}\frac{Cov(x_f, x)}{\overline{x}^2} \qquad (18) \end{aligned}$$

4 Results

This section reports the results of the inequality decomposition analysis. The section is divided into two parts. The first part deals with the standard decomposition analysis, thereby determining the inequality contribution of the different tax benefit instruments to overall inequality, the second part then tries to futher interpret and explain our findings. Unfortunately, again only 18 EU countries (plus Iceland) are included in this decomposition analysis, because only these countries report gross incomes. Additionally, we compute the figures if the EU is seen as one single economic unit.

Table 5 reports the results of the inequality decomposition, when overall inequality in disposable household income is exhaustively decomposed into market income, taxes and benefits ($dpi = market\ income - taxes + benefits$) in order to investigate the redistributive effect of the overall tax benefit system. The results reveal that interestingly, while taxes have a highly inequality decreasing effect in all countries, surprisingly in the majority of countries transfers are associated with higher inequality. This hold also true if the EU is seen as one single country (as indicated in the first row of Table 5). Regarding the inequality contribution of market incomes - which is higher than 100% if there is at least some redistribution -

	Market	Taxes	Transfers
EU	1.312	-0.357	0.045
AT	1.257	-0.361	0.102
BE	1.595	-0.589	-0.012
CY	1.100	-0.171	0.067
CZ	1.431	-0.396	-0.037
DE	1.190	-0.219	0.025
DK	1.613	-0.542	-0.072
EE	1.298	-0.295	-0.004
ES	1.184	-0.234	0.048
FI	1.397	-0.385	-0.013
HU	1.243	-0.254	0.005
IE	1.196	-0.197	-0.001
IS	1.346	-0.371	0.023
LT	1.272	-0.291	0.016
LU	1.368	-0.394	0.017
NL	1.705	-0.692	-0.019
PL	1.344	-0.395	0.048
SE	1.617	-0.609	-0.025
SI	1.259	-0.310	0.021
SK	1.158	-0.311	0.153
UK	1.443	-0.494	0.049

Table 5: Relative Inequality Contribution of Tax Benefit System

the contribution is the higher the greater the difference between inequality in disposable incomes and market incomes (compare descriptive statistics in Section 2). For example, the inequality contribution is highest for the Nordic countries such as Sweden and Denmark, who also displayed the highest redistributive effect in the descriptive statistics. Also it is very high for some Continental countries such as the Netherlands and Belgium. On the other hand it is rather low in the Eastern European countries, except the Czech Republic (which also displayed a comparatively high redistributive effect). Correspondingly, the equalising effect of taxes is also highest in those countries. Apart from the fact, that the part of inequality in disposable incomes which can be explained by transfers is fairly small (<10% in all countries except Slovak Republic), it has only a significant equalising effect in the Nordic countries, Belgium, the Netherlands and the Czech Republic.

One might argue that this surprising result is due to the special role of public pensions which are still included in the transfers. Therefore we also estimate the inequality contribution of state benefits without pensions and 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. This function of public pensions is particularly true for countries which apply insurance-based systems. As Table 8 in the Appendix indicates, the number of countries with an equalising effect of benefits does not change, but instead of Sweden now Poland is among those countries. Also it emerges, that as opposed to other benefits, public pensions have an equalising effect in most countries. This effect is particularly high in the Nordic countries (in Sweden this effect was responsible for the equalising effect of the overall transfers) and in Germany. The importance of public pensions in those countries was also pointed out before. In order to show if the different purpose of means-tested and non means-tested benefits is responsible for the result, we further decompose state benefits into unemployment benefits, family/child related benefits, benefits for "social exclusion not elsewhere" classified and a residual category embedding the other benefits. The results are illustrated in Table 9 in the Appendix. Indeed, the unemployment benefits and the benefits for social exclusion - which are mainly targeted at disadvantaged people - display equalising effects in most countries. On the other hand, family related allowances - also including child benefits - which are not necessarily targeted at low-income households are positively associated with inequality in disposable household incomes. Table 10 in the Appendix also lists the factor

shares of each tax benefit system component in total disposable income to give an impression about the economic importance of the different tax benefit instruments across EU member states.

As mentioned at the beginning, in the following part we compute further statistics in order to explain our counterintuitive findings. Therefore now we basically try to answer the question: why do we find benefits and post–tax-income-inequality to be positively associated in our analysis? First, beside the absolute and relative inequality contribution (S_f and s_f) of the different tax benefit system components f, Table 6 also reports the factor source inequality of the different components I_2^f, the income share in total disposable income μ_f and most importantly the correlation between income component f and disposable income, measured by ρ_f. As outlined above, the overall inequality contribution of an income component depends on the within factor inequality, the income share of the corresponding factor source and its correlation with disposable income. From the Table it becomes obvious, that in those countries in which benefits positively contribute to inequality, the correlation coefficient ρ_f displays a positive sign as opposed to in the other countries. Taxes, on the other hand show a substantial negative correlation with disposable incomes in all countries, thereby representing the progressivity of tax systems in the EU member states and explaining their inequality decreasing effect in our decomposition analysis. So this further decomposition of the results reveals, that the disequalizing impact of benefits in most countries is due to the positive correlation (ρ_f) between disposable income and social transfers. Table 11 in the Appendix also indicates the correlation coefficients of the separated social benefit catogories with disposable income.

	DPI	ORIG					Taxes					Benefits					Pensions				
	I_2	I_2^f	μ_f	ρ_f	S_f	s_f	I_2^f	μ_f	ρ_f	S_f	s_f	I_2^f	μ_f	ρ_f	S_f	s_f	I_2^f	μ_f	ρ_f	S_f	s_f
EU	0.383	0.753	1.028	0.909	0.502	1.310	1.090	-0.293	-0.717	-0.136	-0.354	1.674	0.116	0.094	0.009	0.023	6.785	0.026	0.056	0.008	0.022
AT	0.177	0.409	0.984	0.843	0.223	1.260	0.527	-0.311	0.674	-0.064	-0.361	1.038	0.130	0.192	0.011	0.060	1.814	0.196	0.064	0.007	0.040
BE	0.439	1.026	1.098	0.949	0.700	1.594	1.568	-0.364	-0.846	-0.255	-0.582	1.081	0.141	0.061	0.006	0.013	2.420	0.124	-0.090	-0.012	-0.026
CY	0.264	0.400	0.954	0.930	0.288	1.092	1.061	-0.102	-0.782	-0.042	-0.161	2.428	0.067	0.183	0.010	0.037	4.506	0.081	0.091	0.008	0.031
CZ	0.216	0.504	0.988	0.949	0.309	1.432	0.816	-0.220	-0.923	-0.085	-0.395	0.992	0.103	-0.064	-0.003	-0.014	1.518	0.129	-0.069	-0.005	-0.024
DE	0.258	0.586	0.969	0.858	0.323	1.253	0.743	-0.296	-0.555	-0.072	-0.279	1.404	0.149	0.183	0.016	0.063	1.792	0.178	-0.081	-0.010	-0.038
DK	0.219	0.462	1.205	0.923	0.353	1.616	0.379	-0.503	-0.822	-0.119	-0.545	0.782	0.200	-0.038	-0.003	-0.014	3.664	0.098	-0.143	-0.013	-0.058
EE	0.271	0.475	1.010	0.968	0.351	1.295	0.667	-0.200	-0.925	-0.079	-0.290	1.243	0.080	0.149	0.007	0.025	1.419	0.110	-0.120	-0.008	-0.030
ES	0.239	0.434	0.966	0.908	0.282	1.182	0.833	-0.164	-0.753	-0.055	-0.230	4.552	0.049	0.136	0.007	0.029	1.781	0.149	0.048	0.005	0.019
FI	0.360	0.719	1.049	0.942	0.502	1.396	0.774	-0.336	-0.776	-0.138	-0.383	0.730	0.164	0.060	0.005	0.014	2.385	0.124	-0.085	-0.010	-0.027
HU	0.421	0.879	0.948	0.926	0.534	1.268	1.619	-0.232	-0.605	-0.116	-0.275	0.828	0.129	0.006	0.000	0.001	1.413	0.155	0.019	0.002	0.005
IE	0.423	0.712	0.980	0.945	0.508	1.201	1.298	-0.193	-0.591	-0.085	-0.200	0.878	0.142	-0.034	-0.003	-0.007	3.442	0.071	0.027	0.002	0.006
IS	0.228	0.318	1.242	0.931	0.311	1.366	0.410	-0.387	-0.750	-0.089	-0.390	1.481	0.086	0.070	0.004	0.016	5.076	0.059	0.029	0.002	0.008
LT	0.279	0.494	1.019	0.948	0.359	1.285	0.895	-0.211	-0.794	-0.084	-0.300	1.725	0.074	0.131	0.007	0.024	1.350	0.118	-0.035	-0.003	-0.009
LU	0.191	0.457	1.000	0.897	0.265	1.387	0.920	-0.256	-0.722	-0.077	-0.405	0.958	0.106	0.067	0.003	0.016	2.257	0.149	0.005	0.000	0.002
NL	0.225	0.529	1.219	0.920	0.387	1.721	0.621	-0.483	-0.876	-0.158	-0.702	1.688	0.116	-0.040	-0.003	-0.013	2.827	0.148	-0.012	-0.001	-0.006
PL	0.233	0.520	1.004	0.895	0.313	1.344	0.493	-0.320	-0.843	-0.091	-0.392	1.444	0.096	-0.033	-0.002	-0.008	1.203	0.220	0.113	0.013	0.056
SE	0.161	0.443	1.074	0.919	0.264	1.634	0.441	-0.412	-0.894	-0.098	-0.609	0.694	0.196	0.074	0.005	0.030	2.602	0.142	-0.096	-0.009	-0.055
SI	0.145	0.387	1.040	0.893	0.220	1.515	0.709	-0.311	-0.784	-0.078	-0.539	0.829	0.128	0.060	0.003	0.018	1.303	0.144	0.012	0.001	0.005
SK	0.714	1.366	0.930	0.901	0.828	1.160	2.896	-0.175	-0.887	-0.223	-0.313	1.582	0.088	0.066	0.006	0.009	5.353	0.156	0.338	0.103	0.144
UK	0.300	0.650	1.069	0.920	0.434	1.447	1.140	-0.285	-0.890	-0.148	-0.494	1.490	0.093	-0.109	-0.007	-0.022	4.122	0.123	0.153	0.021	0.070

Table 6: Factor shares and Factor Correlations

To further illustrate this finding, Table 7 reports the values of mean social transfers (in PPP terms) received by the members of each income decile in the different EU member states. The second line then represents the relative proportions of social transfers in total disposable income in each decile. It emerges, that in most countries it is primarily households at the upper end of the income distribution which receive the highest mean social transfers and they are lowest in the bottom decile. This supports our previous finding of the positive correlation and inequality contribution of social transfers. In contrast, regarding the relative proportions, social transfers clearly make up the largest part of total income in the bottom deciles. This hints at the fact, that actually, social transfers should contribute to an overall decline in inequality, as also represented by the Gini coefficients in Section 2. As Stark et al. (1986) explain in the context of a Gini decomposition by factor components, our finding that benefits account for a positive share of total inequality in most countries - as revealed by the inequality decomposition above - is perfectly consistend with our earlier finding that benefits on the whole reduced income inequality - as revealed in the analysis of Gini coefficients in Section 2. They compare the 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 ist 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. So next, following Paul (2004), we will show, in how far our counterintuitive findings are due to some underlying axioms of Shorrocks (1982) decomposition approach and replicate our decomposition results using several other inequality measures.

	1	2	3	4	5	6	7	8	9	10
EU	1,711	2,547	3,021	3,350	3,782	4,060	4,482	4,331	4,102	4,170
	30.4%	22.5%	19.7%	17.3%	16.1%	14.3%	13.4%	10.9%	8.4%	5.6%
AT	2,404	2,512	3,183	3,611	4,072	5,214	5,135	5,989	4,916	6,893
	37.6%	22.4%	20.8%	18.7%	17.1%	18.4%	15.3%	15.1%	10.0%	9.0%
BE	2,645	3,936	5,237	4,504	5,532	5,111	5,241	4,830	5,125	5,795
	41.4%	34.8%	34.2%	23.3%	23.5%	18.2%	15.6%	12.3%	10.4%	7.8%
CY	571	1,214	1,345	1,619	1,616	1,965	2,213	1,767	2,859	4,063
	9.2%	10.5%	8.8%	8.4%	6.8%	6.9%	6.7%	4.5%	5.8%	4.8%
CZ	1,656	2,301	2,390	2,080	1,829	1,918	1,651	1,696	1,295	766
	26.3%	20.6%	15.7%	10.9%	7.8%	6.8%	5.0%	4.3%	2.7%	1.0%
DE	3,106	3,462	3,731	3,764	3,892	4,334	5,531	4,995	5,600	7,612
	47.6%	30.5%	24.3%	19.4%	16.5%	15.3%	16.5%	12.5%	11.4%	10.1%
DK	4,019	5,114	6,051	7,299	8,973	10,001	7,374	6,277	5,358	4,399
	69.5%	43.1%	39.9%	37.6%	38.3%	35.2%	22.0%	15.8%	11.0%	6.0%
EE	787	1,204	1,598	1,275	1,340	1,821	1,349	1,557	975	3,233
	17.4%	10.7%	10.6%	6.6%	5.7%	6.5%	4.1%	3.9%	2.0%	4.5%
ES	715	1,046	868	1,341	1,413	1,495	1,672	1,681	1,851	2,439
	19.4%	9.3%	5.7%	6.9%	6.0%	5.3%	5.0%	4.2%	3.8%	2.9%
FI	3,516	4,364	4,425	5,179	6,331	7,409	5,958	5,362	4,999	5,767
	50.8%	39.3%	28.6%	26.7%	26.8%	26.2%	17.7%	13.4%	10.2%	7.8%
HU	1,801	2,167	2,296	2,186	1,971	2,147	1,621	2,200	1,731	1,878
	32.2%	19.5%	15.0%	11.5%	8.5%	7.6%	4.9%	5.6%	3.7%	2.2%
IE	3,553	5,064	7,828	7,906	8,952	7,226	7,763	5,322	5,646	5,279
	48.5%	43.6%	50.3%	40.7%	37.6%	25.4%	23.1%	13.4%	11.5%	6.7%
IS	1,197	2,174	3,822	3,548	3,104	4,729	3,863	3,971	4,090	4,075
	25.5%	18.7%	25.1%	18.1%	13.1%	16.8%	11.6%	9.9%	8.3%	5.1%
LT	724	976	1,170	780	1,512	1,079	1,899	1,795	937	1,531
	15.3%	8.7%	7.6%	4.1%	6.5%	3.9%	5.5%	4.7%	1.9%	2.5%
LU	3,498	5,751	4,889	5,524	4,114	4,590	5,228	5,639	7,948	6,844
	63.7%	49.8%	31.9%	28.4%	17.4%	16.1%	15.8%	14.3%	16.0%	8.4%
NL	3,089	6,399	4,940	5,042	4,797	4,371	3,723	3,719	3,382	2,952
	70.9%	56.8%	32.0%	26.2%	20.2%	15.4%	11.1%	9.4%	6.9%	4.4%
PL	1,422	1,617	1,573	1,518	1,424	1,083	917	1,109	1,297	670
	25.4%	14.6%	10.4%	7.9%	6.1%	3.8%	2.8%	2.7%	2.5%	1.0%
SE	2,191	4,276	4,364	4,691	6,653	7,994	7,747	6,217	5,577	4,907
	46.2%	37.7%	28.2%	24.2%	28.1%	28.2%	23.1%	15.7%	11.5%	7.4%
SI	1,632	3,161	3,937	4,039	4,260	4,541	4,169	4,399	4,325	4,132
	26.4%	27.8%	25.3%	20.9%	18.0%	16.0%	12.5%	11.1%	8.9%	5.9%
SK	1,088	1,452	1,476	1,593	1,520	1,728	2,731	2,357	1,382	3,673
	19.8%	13.1%	9.7%	8.3%	6.5%	6.2%	8.2%	6.0%	2.9%	4.3%
UK	2,250	3,946	5,278	5,453	5,660	4,915	3,973	4,388	3,039	2,317
	40.0%	34.3%	34.3%	28.3%	24.2%	17.4%	11.9%	11.0%	6.2%	3.1%

Table 7: Social benefits per decile in absolute and relative terms

Notes: The first line reports the mean value of social benefits in PPP terms, the second line the mean proportion of social benefits in total decile 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 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 inequality contribution of the welfare state, different income components and individual characteristics to overall inequality.

Our decomposition results reveal that while taxes have a highly inequality decreasing effect in all countries, surprisingly in the majority of countries inequality and government benefits are positively associated. This holds even true for the case in which public pensions are accounted for separately. A further decomposition of the results shows, that the disequalizing impact of benefits is due to the positive correlation between disposable income and social transfers. Yet, separating the benefits by function reveals, that those benefits which are mainly targeted at the poor and disadvantaged (such as benefits for social exclusion) display the expected equalizing effects in most countries. Overall, our study contributes to a better understanding of inequality patterns across EU member countries and identifies which matters actually have to be assessed to successfully reduce income inequality.

Note 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 behavioural effects caused be redistributive policies are not captured, neither any in-kind transfers from governments to households. Second, the study is static which means that the distribution of lifetime incomes is not taken into account.

This is a preliminary version, future extensions include:

- distribution of benefits across equivalised income deciles

- income mobility matrix
- compute Shorrocks' counterfactuals
- compute decomposition for several measures of inequality (see Paul (2004))
- compute marginal effects on inequality of marginal percentage changes in component income
- use social welfare function to evaluate marginal changes in income components

Appendix

	Market	Taxes	Benefits	Pensions
EU	1.312	-0.357	0.023	0.022
AT	1.257	-0.361	0.061	0.040
BE	1.594	-0.588	0.014	-0.026
CY	1.097	-0.170	0.040	0.028
CZ	1.431	-0.396	-0.014	-0.023
DE	1.189	-0.219	0.063	-0.037
DK	1.613	-0.542	-0.014	-0.058
EE	1.297	-0.294	0.026	-0.030
ES	1.184	-0.234	0.029	0.019
FI	1.397	-0.385	0.014	-0.027
HU	1.243	-0.254	0.002	0.003
IE	1.196	-0.197	-0.007	0.006
IS	1.346	-0.371	0.016	0.007
LT	1.272	-0.291	0.025	-0.009
LU	1.368	-0.394	0.017	0.000
NL	1.705	-0.692	-0.012	-0.008
NO*	1.003	-0.052	0.001	-0.007
PL	1.344	-0.395	-0.008	0.055
SE	1.611	-0.603	0.032	-0.057
SI	1.259	-0.310	0.018	0.004
SK	1.158	-0.311	0.009	0.144
UK	1.441	-0.492	-0.022	0.070

Table 8: Inequality Contribution of Public Pensions

	Market	Taxes	Unempl	Family	Social	Other	Pensions
EU	1.312	-0.357	0.004	0.014	0.000	0.005	0.022
AT	1.256	-0.361	-0.003	0.031	0.008	0.025	0.041
BE	1.592	-0.587	0.002	0.018	-0.001	-0.004	-0.026
CY	1.097	-0.169	0.026	0.003	-0.001	0.011	0.028
CZ	1.431	-0.396	-0.002	-0.005	-0.008	-0.000	-0.023
DE	1.188	-0.219	0.015	0.028	0.003	0.018	-0.037
DK	1.613	-0.542	-0.022	0.017	0.000	-0.009	-0.058
EE	1.297	-0.295	0.001	0.022	-0.000	0.003	-0.030
ES	1.184	-0.234	0.003	0.005	-0.000	0.022	0.019
FI	1.396	-0.384	-0.009	0.021	-0.002	0.004	-0.027
HU	1.243	-0.254	-0.002	0.003	-0.000	0.001	0.003
IE	1.196	-0.197	0.007	-0.006	-0.000	-0.008	0.006
IS	1.346	-0.371	-0.001	0.008	-0.001	0.011	0.007
LT	1.272	-0.291	-0.000	0.021	-0.001	0.005	-0.009
LU	1.366	-0.394	-0.004	0.032	-0.005	-0.005	0.000
NL	1.703	-0.691	-0.001	0.009	-0.008	-0.012	-0.008
NO*	1.003	-0.052	-0.000	0.003	-0.000	-0.001	-0.007
PL	1.344	-0.394	0.001	-0.003	-0.002	-0.003	0.055
SE	1.613	-0.605	-0.004	0.037	-0.005	0.003	-0.057
SI	1.259	-0.309	-0.000	0.012	-0.006	0.012	0.004
SK	1.158	-0.311	0.001	0.009	-0.002	0.002	0.144
UK	1.442	-0.492	-0.001	-0.000	-0.009	-0.011	0.070

Table 9: Further Decomposition of Benefits

	Market	Taxes	Unempl	Family	Social	Other	Pensions
EU	1.034	-0.299	0.025	0.043	0.011	0.040	0.146
AT	0.983	-0.308	0.025	0.068	0.003	0.034	0.195
BE	1.099	-0.364	0.059	0.056	0.002	0.024	0.125
CY	0.954	-0.102	0.012	0.027	0.001	0.028	0.081
CZ	0.988	-0.220	0.007	0.035	0.009	0.052	0.129
DE	0.972	-0.300	0.043	0.063	0.014	0.029	0.178
DK	1.206	-0.506	0.076	0.034	0.000	0.091	0.099
EE	1.010	-0.200	0.003	0.051	0.000	0.026	0.110
ES	0.965	-0.162	0.019	0.004	0.001	0.026	0.148
FI	1.049	-0.337	0.044	0.056	0.004	0.060	0.124
HU	0.950	-0.234	0.013	0.066	0.001	0.048	0.156
IE	0.979	-0.192	0.030	0.075	0.001	0.036	0.071
IS	1.244	-0.389	0.004	0.038	0.001	0.043	0.059
LT	1.019	-0.211	0.003	0.032	0.002	0.037	0.118
LU	0.994	-0.249	0.016	0.064	0.005	0.022	0.149
NL	1.220	-0.485	0.021	0.024	0.024	0.048	0.148
PL	1.004	-0.320	0.019	0.023	0.002	0.052	0.220
SE	1.074	-0.412	0.035	0.057	0.005	0.098	0.143
SI	1.040	-0.311	0.006	0.043	0.012	0.067	0.144
SK	0.930	-0.175	.	.	.	.	0.156
UK	1.069	-0.285	0.004	0.037	0.017	0.036	0.123

Table 10: Factor Shares of Tax Benefit System

	Orig	Taxes	Unempl	Family	Social Excl	Other	Pensions
EU	0.909	-0.717	0.030	0.153	-0.004	0.037	0.056
AT	0.843	-0.674	-0.024	0.196	0.138	0.121	0.064
BE	0.949	-0.846	0.012	0.191	-0.059	-0.044	-0.090
CY	0.930	-0.782	0.157	0.043	-0.045	0.098	0.091
CZ	0.949	-0.923	-0.050	-0.048	-0.112	0.000	-0.069
DE	0.858	-0.555	0.070	0.245	0.025	0.096	-0.081
DK	0.923	-0.822	-0.089	0.254	.	-0.034	-0.143
EE	0.968	-0.925	0.038	0.154	-0.016	0.029	-0.120
ES	0.908	-0.753	0.031	0.101	-0.026	0.120	0.048
FI	0.942	-0.776	-0.072	0.176	-0.091	0.022	-0.085
HU	0.926	-0.605	-0.032	0.018	-0.020	0.007	0.019
IE	0.945	-0.591	0.052	-0.058	-0.065	-0.087	0.027
IS	0.931	-0.750	-0.049	0.062	-0.072	0.059	0.029
LT	0.948	-0.794	-0.005	0.164	-0.053	0.040	-0.035
LU	0.897	-0.722	-0.024	0.230	-0.107	-0.036	0.005
NL	0.920	-0.876	-0.003	0.168	-0.040	-0.062	-0.012
NO	0.972	-0.348	-0.008	0.045	-0.028	-0.015	-0.055
PL	0.895	-0.843	0.009	-0.036	-0.109	-0.020	0.113
SE	0.919	-0.894	-0.022	0.208	-0.074	0.002	-0.096
SI	0.893	-0.784	-0.005	0.073	-0.085	0.053	0.012
SK	0.901	-0.887	0.027	0.091	-0.066	0.020	0.338
UK	0.920	-0.890	-0.040	-0.007	-0.125	-0.095	0.153

Table 11: Correlation coefficient ρ_f of separated benefits with disposable income

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