Heterogeneity of Income Inequality Patterns: A Comparative Analysis of European Countries

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Abstract

This paper compares the determinants of within country income inequality across EU member states. We use comparable micro data from 2005 and a set of three income-generating functions to evaluate the impact of the welfare state, different income components and individual characteristics on overall inequality. By means of an integrated regression-based decomposition approach we simultaneously identify the inequality contribution of each explanatory factor. Our regression results suggest that while taxes have a highly inequality decreasing effect in all member countries, surprisingly, in the majority of countries government benefits are positively associated with inequality. We also reveal that beside unobserved household characteristics, particularly the presence of tertiary education, total housing costs and the number of earners are important for explaining income inequality.

JEL Codes: D31, D60, H20

Keywords: Income Inequality, Redistribution, Decomposition

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1 Introduction

Although the European Union (EU) can be seen as a rather homogeneous area, at least from a global perspective, 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, when 10 additional countries, mostly from Eastern Europe, joined the union. 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 the paper, we compare income inequality across member states and ask to which extent the differences in income inequality are driven by country specific factors.

There are several studies which exploit comparable micro datasets such as ECHP (European Community Household Panel) and EU-SILC (Statistics on Income and Living Conditions) to study the development of income inequality in the EU. For example, Beblo and Knaus (2001), for the EU-15, and Brandolini (2007), for the enlarged EU, look at the EU as one supranational unit, thereby analysing the current state of social cohesion in this area. Other studies analyse processes of income convergence (Alvarez-García et al. (2004), Welsch and Bonn (2007)). However, the number of studies which conduct a comprehensive study of the explanatory factors of income inequality in the EU as a whole as well as in the different member countries is small. We use EU-SILC micro data from 2005 and a set of three income-generating functions to evaluate the impact of the welfare state, different income components and individual characteristics of the society on national inequality patterns of EU member countries. By means of an integrated regression-based decomposition approach we identify the inequality contribution of each explanatory factor simultaneously. In fact, the regression-based decomposition analysis has recently gained some interest, but the existing studies (Fields and Yoo (2000), Morduch and Sicular (2002), Wan (2004) and Cowell and Fiorio (2008)) focus on one particular country (only Cowell and Fiorio (2008) compare Finland and the US) and one single income-generating-function, thereby neglecting the influence of redistribution and income components. As far as we know, an integrated analysis of the role of the welfare state and of social characteristics is still missing in the existing literature on income inequality explanations.

Our analysis proceeds in two steps. Firstly, we define the theoretical basis for our analysis. For this purpose, we introduce a structural model with three income-

generating-functions in order to derive the explanatory factors of disposable household income and the inequality of its distribution. In the first equation, disposable income is exhaustively decomposed into market income and the redistributive power of the welfare state through taxes and benefits. On the second stage, market income itself is then separated into earning income on the one hand and capital and other income components on the other. The final step is the explanation of the gross household earnings. Based on theoretical considerations we build an earning-generating-function consisting of observable individual income-determining characteristics such as age, education and gender. Regarding our estimation strategy we apply a regression-based decomposition approach as suggested by Fields (2003) and further developed and applied by Cowell and Fiorio (2008).

Our first preliminary regression results suggest that while taxes have a highly inequality decreasing effect in all countries, surprisingly in the majority of countries inequality and government benefits are positively correlated. This holds even true for the case in which public pensions are accounted for separately. Also, in most countries capital incomes explain substantially more inequality than their economic weight would suggest, therefore indicating their more unequal distribution compared to other earnings. The estimation of the earning-generating-function on the third stage then reveals, that especially the presence of tertiary education, the number of earners (part-time and full-time) and housing costs have the highest contribution on the inequality of household earnings. Though there a considerable variations in the size of the effects across countries, in all countries the largest part of inequality accounting is left in the unobserved characteristics of the household.

The setup of the paper is organised as follows: In Section 2 our model with three income-generating-functions is introduced. Section 3 describes the data set and shows illustrative descriptive results about pre-tax and post-tax income inequality in the different countries. In Section 4 we describe the methodology of the regression-based decomposition analysis. Section 5 presents the results. Section 6 concludes by summarizing the main results and discussing their implications.

2 Basic Model

We develop a model with three baseline income-generating-functions (1)-(3) to systematically explain inequality in disposable household incomes in three stages.

These income-generating functions of our baseline model are explained in the following.

$$dpi = f(market\ income, taxes, benefits) \tag{1}$$

$$market\ income = g(earnings, capital, other) \tag{2}$$

$$earnings = h(individual\ characteristics,\ family\ characteristics) \tag{3}$$

First, household disposable income (dpi) is a function of income earned at the market on the one hand and the amount which is redistributed via the state on the other. Therefore in equation (1) household disposable income is expressed as a function of market income, taxes and of benefits. In a next step we further divide benefits into public pensions and other social benefits. We consider the effect 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. To further differentiate between the different functions of the various government benefits, for example the difference between means-tested and non-means-tested benefits, we further decompose the social benefits into family-related benefits, unemployment benefits, benefits to the socially excluded and a residual category. In fact, there are numerous studies which investigate the difference between pre-tax and post-tax income and thereby also the redistributive effect. For example, Mahler and Jesuit (2006) use Luxembourg Income Study (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, thereby also focusing on the effects of EU enlargement. Still, rather than decomposing disposable income inequality in taxes and benefits as explanatory factors, they look at the composition of disposable income and investigate the distributive effect of introducing redistributive instruments.

Then, on the second stage, market income can be exhaustively decomposed into 'earned' income, capital income and other income components. This relation is

expressed in equation (2). Here we also further divide household earnings in earnings derived from employed work versus those earned from self-employment activity. The analysis of the importance of different income components for income inequality goes mainly back to the methods for decomposing inequality by income source (or 'factor components', see Shorrocks (1982) and Shorrocks (1983) for an empirical application). In fact, there is empirical evidence, that capital incomes account for large parts of inequality in the US, UK and Germany (see for e.g. Frässdorf et al. (2008)) and also that self-employment earnings account for a disproportional high part of inequality compared to paid employment earnings (Torrini (2006) for the EU).

On the third stage we then want to explain the household gross earnings. On this stage we apply a similar income-generating-function as the earnings function proposed by Mincer (1974). But instead of using his strict human capital framework[1] we include different personal and family characteristics which are thought to have a predetermined effect on the level of labor earnings (see for e.g. Fields and Schultz (1982)). Therefore in our baseline equation we include a set of family variables (number of earners, number of children under age 18, number of household members aged over 64, household size) and variables referring to the household head only (age, gender and years of education) to explain variations in household labor earnings. As we can only use a proxy for the years of education we also include the number of household members with tertiary education in our baseline equation to account for the effects of higher levels of education. We also conduct several robustness checks by implying additional control variables and different specifications.

3 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 longitudinal 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 mem-

[1] In his highly simplified income-generating-function only schooling, experience and experience squared are included as explanatory variables to explain log earnings. But this specification allows for interpreting the coefficient on schooling as rate of return to education.

ber states, plus Norway and Iceland, and it is the largest comparative survey of European income and living conditions.

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)	

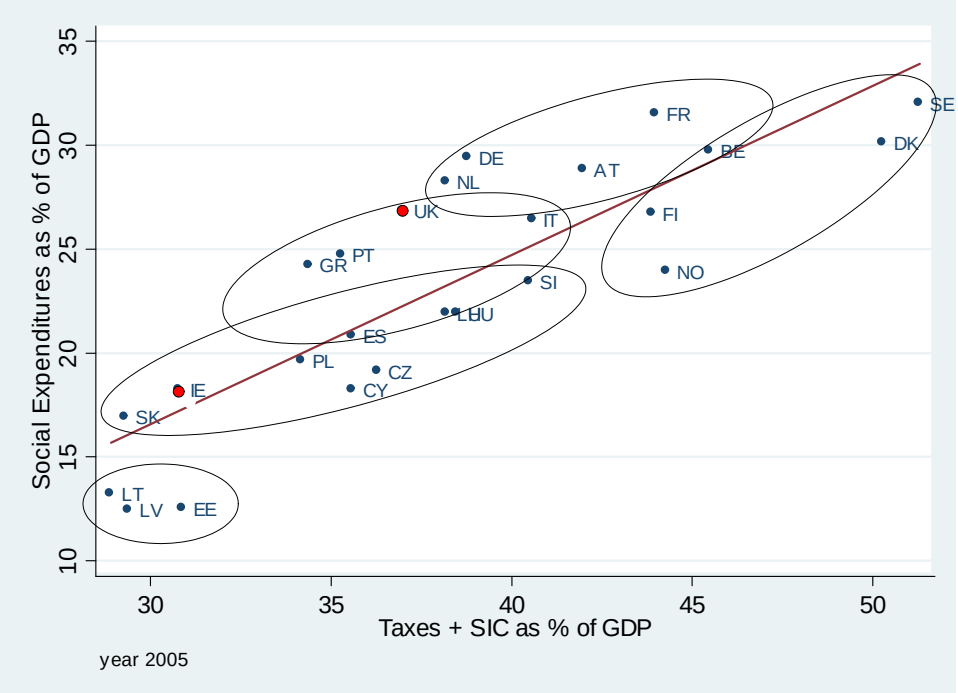
Table 1: Income tax systems

	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 3 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.



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%).

	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

Society Characteristics

(to be completed)

Aggregated measures of income components, age, education etc.

4 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:

$$I = 1 - \frac{W(\mathbf{x})}{\overline{x}} \tag{4}$$

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:

$$I_\alpha = \frac{1}{\alpha(\alpha-1)} \int_0^\infty \frac{x_i}{\overline{x}} \left[\left(\frac{x_i}{\overline{x}} \right)^\alpha - 1 \right] dF \tag{5}$$

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

$$I_\alpha = GE(\alpha) = \begin{cases} \frac{1}{\alpha(\alpha-1)} \left(\sum_{i=1}^{n} \left[\frac{w_i}{N} \left(\frac{x_i}{\overline{x}} \right)^\alpha \right] - 1 \right) & , \alpha \in R - \{0, 1\} \\ \sum_{i=1}^{n} \frac{w_i}{N} \log \frac{\overline{x}}{x_i} & , \alpha = 0 \\ \sum_{i=1}^{n} \frac{w_i}{N} \frac{x_i}{\overline{x}} \log \frac{x_i}{\overline{x}} & , \alpha = 1 \end{cases} \tag{6}$$

$GE(0)$ 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: $\alpha = 1 - \epsilon$:

$$A(\epsilon) = 1 - \left(\sum_{i=1}^{n} \frac{w_i}{N} \left(\frac{x_i}{\overline{x}} \right)^{1-\epsilon} \right)^{\frac{1}{1-\epsilon}} \tag{7}$$

$$GE(\alpha) = \frac{(1 - A(\epsilon))^{1-\epsilon} - 1}{\epsilon (\epsilon - 1)} \tag{8}$$

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

$$I_\alpha = \frac{U(\overline{x}) - EU}{\overline{x} U'(\overline{x})} \frac{1}{1 - \alpha} \tag{9}$$

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)):

$$GE(\alpha) = GE(\alpha)^{within} + GE(\alpha)^{between} \tag{10}$$

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

$$\begin{aligned} GE(\alpha) &= \frac{1}{\alpha(\alpha - 1)} \left(\sum_{i=1}^{n} \left[\frac{w_i}{N} \left(\frac{x_i}{\overline{x}} \right)^{\alpha} \right] - 1 \right) \\ &= \frac{1}{\alpha(\alpha - 1)} \left[\sum_{k=1}^{K} \left(\frac{N_k}{N} \right)^{1-\alpha} \left(\frac{\overline{x}_k}{\overline{x}} \right)^{\alpha} \frac{1}{N_k} \left(\sum_{i=1}^{n_k} \left(\frac{x_i}{\overline{x}} \right)^{\alpha} - 1 \right) + \left(\sum_{k=1}^{K} \frac{N_k}{N} \left(\frac{\overline{x}_k}{\overline{x}} \right)^{\alpha} - 1 \right) \right] \\ &= \sum_{k} \left(p^k \right)^{1-\alpha} \left(\mu^k \right)^{\alpha} GE_\alpha^k + \left(\sum_{k} p^k \left(\mu^k \right)^{\alpha} - 1 \right) \\ &= GE(\alpha)^{within} + GE(\alpha)^{between} \end{aligned} \tag{11}$$

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 (11) 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 (11) 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 :

$$\begin{aligned} GE(2) &= \frac{1}{2}\left(\sum_{i=1}^{n}\left[\frac{w_i}{N}\left(\frac{x_i}{\overline{x}}\right)^2\right]-1\right) \\ &= \frac{1}{2}(CV)^2 = \frac{1}{2}\left(\frac{\sqrt{Var(x)}}{\overline{x}}\right)^2 = \frac{1}{2}\frac{Var(x)}{\overline{x}^2} \end{aligned} \tag{12}$$

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.

$$I_2 = GE(2) = \sum_{f=1}^{K} S_f = \sum_{f=1}^{K} s_f I_2 = \sum_{f=1}^{K} \rho_f \mu_f \sqrt{GE_2 GE_2^f} \tag{13}$$

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:

$$x_f = \beta_0 + \beta_1 x \tag{14}$$

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

$$\widehat{\beta}_1 = \frac{Cov(x_f, x)}{Var(x)} = \frac{Cov(x_f, x)}{\sqrt{Var(x)Var(x_f)}} \sqrt{\frac{Var(x_f)}{Var(x)}} = \rho_f \sqrt{\frac{Var(x_f)}{Var(x)}} \tag{15}$$

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

$$\begin{aligned} s_f &= \frac{S_f}{I} = \rho_f \mu_f \sqrt{\frac{GE_2^f}{GE_2}} = \rho_f \mu_f \sqrt{\frac{\frac{1}{2}(CV_f)^2}{\frac{1}{2}(CV)^2}} \\ &= \rho_f \frac{\overline{x}_f}{\overline{x}} \sqrt{\frac{\frac{1}{2}\frac{Var(x_f)}{\overline{x}_f^2}}{\frac{1}{2}\frac{Var(x)}{\overline{x}^2}}} = \rho_f \frac{\overline{x}_f}{\overline{x}} \sqrt{\frac{\overline{x}^2}{\overline{x}_f^2}\frac{Var(x_f)}{Var(x)}} \\ &= \rho_f \sqrt{\frac{Var\left(x_f\right)}{Var(x)}} = \widehat{\beta}_1 = \frac{Cov(x_f, x)}{Var(x)} \end{aligned} \tag{16}$$

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:

$$
\begin{aligned}
I_2 &= \sum_{f=1}^{K} s_f I_2 = \sum_{f=1}^{K} \rho_f \mu_f \sqrt{\frac{GE_2^f}{GE_2}} GE_2 \\
&= \sum_{f=1}^{K} s_f GE_2 = \sum_{f=1}^{K} \widehat{\beta} GE_2 \\
&= \sum_{f=1}^{K} \frac{Cov(x_f, x)}{Var(x)} \frac{1}{2} \frac{Var(x)}{\overline{x}^2} = \sum_{f=1}^{K} \frac{1}{2} \frac{Cov(x_f, x)}{\overline{x}^2}
\end{aligned} \tag{17}
$$

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:

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

$$C_f^A = \frac{1}{2}\frac{Var(x_f)}{\overline{x}^2} \tag{18}$$

$$C_f^B = \frac{1}{2}\frac{Var(x_f) + 2Cov(x_f, x - x_f)}{\overline{x}^2} \tag{19}$$

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

$$\begin{aligned} S_f &= \frac{1}{2}\left(C_f^A + C_f^B\right) \qquad (20) \\ &= \frac{1}{2}\left(\frac{1}{2}\frac{Var(x_f)}{\overline{x}^2} + \frac{1}{2}\frac{Var(x_f) + 2Cov(x_f, x - x_f)}{\overline{x}^2}\right) \\ &= \frac{1}{4}\left(\frac{2Var(x_f) + 2Cov(x_f, x) - 2Cov(x_f, x_f)}{\overline{x}^2}\right) \\ &= \frac{1}{2}\frac{Cov(x_f, x)}{\overline{x}^2} \qquad (21) \end{aligned}$$

Regression based decomposition: Inequality decomposition by population subgroups and factor sources can be interpreted as ex ante approaches and are purely descriptive. Multivariate regression based decomposition approaches allow to incorporate different explanatory variables in the analysis and to control for the effects on total inequality of each variable. Cowell and Fiorio (2008) assume a linear data generating process which is estimated using OLS to obtain:

$$x = \beta_0 + \sum_{f=1}^{K} \beta_f x_f + u \tag{22}$$

where u is the OLS residual. Cowell and Fiorio (2008) show that both decomposition approaches can be used for a suitable inequality index $I(x)$ and provide the formulas for their computation. For the decomposition by factor source, the estimated contributions of the K factors and the residual to total inequality are defined as $Z_f = z_f I(x)$ (analog to equation 13). The z_f are the estimated relative contributions of factor f to inequality and estimated as

$$z_f = \begin{cases} \beta_f^2 \frac{Var(x_f)}{Var(y)}, f = 1, ..., K \\ \frac{Var(u)}{Var(y)}, f = K + 1 \end{cases} \tag{23}$$

Thus, the factor source decomposition can be written as

$$I(x) = \sum_{f=1}^{K+1} Z_f = \sum_{f=1}^{K+1} z_f I(x) = \sum_{f=1}^{K} \left(\beta_f^2 \frac{Var(x_f)}{Var(x)} I(x) \right) + \frac{Var(u)}{Var(x)} I(x) \tag{24}$$

The decomposition by population subgroup ...

Extension to SIMULTANEOUS EQUATIONS?

To estimate our basic model derived in section 2, we regard the income-generating-functions as a set of reduced form equations, summarizing the relationship between income and various personal and locational characteristics. Therefore in operationalized form the reduced form income-generating equations can be expressed as:

$$DPI_i = \alpha_1 \cdot ORIG_i + \alpha_2 \cdot TAX_i + \alpha_3 \cdot SOC_i + \varepsilon_i \tag{25}$$

$$ORIG_i = \beta_1 \cdot EARN_i + \beta_2 \cdot CAP_i + \beta_3 \cdot other_i + \nu_i \tag{26}$$

$$\log(EARN)_i = \gamma_0 + \sum_{j=1}^{J} \gamma_j \cdot x^j_{i\ household\ head} + \sum_{k=1}^{K} \gamma_k \cdot x^k_{i\ family} + \sum_{l=1}^{L} \gamma_l \cdot X^l_i + \varepsilon_i \tag{27}$$

with i the income or characteristic of i, $\log(EARN)_i$ the logarithm of annual labor earnings of household i, $x^j_{i\ household\ head}$ characteristics of the household head of household i, $x^k_{i\ family}$ characteristics of the family of household i and ε_i the error term. X^l_i are additional control variables which will be discussed when the results are presented. Following the decomposition approach suggested by Cowell and Fiorio (2008) as outlined above, these reduced form equations can then be estimated using standard regression techniques such as OLS, given the usual assumptions. As shown, this approach also enables us to compute the inequality contribution of each explanatory variable in overall inequality of the dependent variable.

5 Results

This section reports the results of the regression-based inequality decomposition analysis. The section is divided into three subparts respective to the estimation of the three income-generating functions. For simplicity, the reported tables only show the inequality contribution of the explanatory factors to overall inequality in the

	Residual	Market	Taxes	Transfers
EU	0.013	1.257	-0.330	0.060
AT	0.003	1.257	-0.361	0.102
BE	0.006	1.595	-0.589	-0.012
CY	0.004	1.100	-0.171	0.067
CZ	0.002	1.431	-0.396	-0.037
DE	0.005	1.190	-0.219	0.025
DK	0.001	1.613	-0.542	-0.072
EE	0.001	1.298	-0.295	-0.004
ES	0.002	1.184	-0.234	0.048
FI	0.001	1.397	-0.385	-0.013
HU	0.006	1.243	-0.254	0.005
IE	0.002	1.196	-0.197	-0.001
IS	0.002	1.346	-0.371	0.023
LT	0.003	1.272	-0.291	0.016
LU	0.009	1.368	-0.394	0.017
NL	0.006	1.705	-0.692	-0.019
NO*	0.056	1.003	-0.052	-0.007
PL	0.003	1.344	-0.395	0.048
SE	0.017	1.617	-0.609	-0.025
SI	0.029	1.259	-0.310	0.021
SK	0.000	1.158	-0.311	0.153
UK	0.002	1.443	-0.494	0.049

Table 4: Relative Inequality Contribution of Tax Benefit System
Notes: The data for Norway should be treated with some caution, as there seems to be a data problem.

dependent variable. The first column of each table displays the inequality contribution of the residuals, therefore the part of inequality which cannot be explained by the included covariates (corresponding to $1 - R^2$ of the OLS regression). Unfortunately, in these estimations only 19 EU countries (plus Iceland and Norway) can be included, as only these countries also report gross incomes.

Tax benefit system

Table 4 reports the results of the estimation of the first income-generating-function (25), where inequality in disposable household income is explained by market income, taxes and benefits in order to investigate the redistributive effect of the tax benefit system. The inequality contribution of the residuals in this case is obvi-

ously very small (less than 1% in most cases) because we deal with an identity ($dpi = market\ income - taxes + benefits$). In this case the results can be also replicated with the standard factor source decomposition as suggested by Shorrocks (1982). 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 4). Regarding the inequality contribution of market incomes - which is higher than 100% if there is at least some redistribution - the contribution is the higher the greater the difference between inequality in disposable incomes and market incomes (compare descriptive statistics). 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 an equalising effect in the Nordic countries, 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. As Table 12 in the Appendix indicates the number of countries with 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 13 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 14 in the Appendix also lists the factor shares of each tax benefit system component in total disposable income)

Further Decomposition of the effects

"Why are benefits and post-income-inequality positively associated?"

	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
NO	1.502	1.614	1.065	0.972	1.613	1.074	0.520	-0.330	-0.348	-0.101	-0.067	0.735	0.173	0.002	0.000	0.000	2.820	0.091	-0.055	-0.010	-0.007
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 5: Factor shares and Factor Correlations

	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 6: Correlation coefficient ρ_f of separated benefits with disposable income

		Deciles of DPI											
		1	2	3	4	5	6	7	8	9	10		
ORIG	1	37.3	24.1	15.4	10.1	6.2	3.4	1.8	1.2	0.4	0.2		
	2	19.3	18.6	17.9	16.3	13.5	8.1	3.9	1.5	0.8	0.3		
	3	32.6	19.0	13.7	10.8	8.9	7.1	4.1	2.1	1.0	0.6		
	4	9.9	32.2	21.5	13.5	9.4	6.4	3.4	2.1	0.9	0.7		
	5	0.4	5.6	27.6	27.1	17.2	10.7	6.4	3.2	1.6	0.4		
	6	0.2	0.4	3.4	19.4	31.2	23.0	11.9	6.5	3.3	0.8		
	7	0.1	0.0	0.3	2.3	12.0	32.6	32.4	13.7	5.4	1.2		
	8	0.1	0.1	0.2	0.3	1.5	8.3	31.5	40.0	15.3	2.7	Immobility ratio	32.9
	9	0.1	0.0	0.0	0.1	0.2	0.5	4.3	28.8	52.9	13.2	Downward mobility	39.3
	10	0.1	0.0	0.0	0.1	0.0	0.0	0.2	1.0	18.5	80.1	Upward mobility	27.8
		Deciles of Post-tax ORIG											
Deciles of		1	2	3	4	5	6	7	8	9	10		
ORIG	1	31.5	68.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	2	55.6	27.5	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	3	11.2	3.5	73.3	11.9	0.0	0.0	0.0	0.0	0.0	0.0		
	4	1.0	0.2	8.3	74.5	16.1	0.0	0.0	0.0	0.0	0.0		
	5	0.2	0.1	1.0	11.6	66.7	20.4	0.0	0.0	0.0	0.0		
	6	0.2	0.0	0.2	1.6	15.0	59.7	23.1	0.2	0.0	0.0		
	7	0.1	0.1	0.1	0.3	1.8	17.4	56.4	23.6	0.2	0.0		
	8	0.0	0.0	0.1	0.1	0.4	2.1	19.1	58.1	19.9	0.1	Immobility ratio	60.1
	9	0.1	0.0	0.1	0.0	0.1	0.3	1.2	17.6	67.0	13.6	Downward mobility	18.4
	10	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.5	12.9	86.3	Upward mobility	21.5
		Deciles of DPI											
Deciles of		1	2	3	4	5	6	7	8	9	10		
DPI pre-benefits	1	52.2	15.9	11.8	8.1	5.3	3.2	2.2	0.9	0.4	0.2		
	2	47.8	30.6	8.7	5.4	3.9	1.7	1.0	0.4	0.2	0.3		
	3	0.0	53.5	27.1	8.3	5.0	3.0	2.0	0.8	0.2	0.2		
	4	0.0	0.0	52.4	29.3	9.6	4.8	2.6	1.0	0.3	0.0		
	5	0.0	0.0	0.0	48.9	32.4	10.4	4.7	2.7	1.0	0.1		
	6	0.0	0.0	0.0	0.0	43.9	39.6	11.0	3.9	1.5	0.2		
	7	0.0	0.0	0.0	0.0	0.0	37.5	48.0	11.2	3.0	0.4		
	8	0.0	0.0	0.0	0.0	0.0	0.0	28.6	60.7	9.7	1.1	Immobility ratio	48.604
	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	75.1	6.5	Downward mobility	33.981
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	91.1	Upward mobility	17.412
		Deciles of post-benefits ORIG											
Deciles of		1	2	3	4	5	6	7	8	9	10		
ORIG	1	41.8	25.3	15.7	8.5	4.7	2.4	1.1	0.4	0.2	0.1		
	2	21.8	19.5	18.8	16.2	12.5	6.9	2.5	1.3	0.5	0.2		
	3	32.4	21.5	15.1	11.1	8.3	6.2	2.8	1.4	0.8	0.4		
	4	4.0	33.7	27.3	15.7	9.2	5.3	2.6	1.0	0.9	0.3		
	5	0.0	0.0	23.1	38.9	19.7	10.3	5.0	2.3	0.6	0.2		
	6	0.0	0.0	0.0	9.7	45.7	26.4	11.1	5.2	1.5	0.4		
	7	0.0	0.0	0.0	0.0	0.0	42.7	43.5	10.1	3.2	0.6		
	8	0.0	0.0	0.0	0.0	0.0	0.0	31.4	57.9	9.5	1.3	Immobility ratio	40.268
	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.6	73.0	6.4	Downward mobility	36.257
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	90.1	Upward mobility	23.474

Table 7: Relative Income Mobility Matrix for the EU as a whole

	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
NO	0.338	0.357	0.428	0.427	0.343	0.350	0.342	0.400	5.6	26.6	26.3	1.5	3.6	1.2	18.3
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 8: 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?

	Progression Taxes					Progression Benefits					Progression Pensions				
	P_{MT}	P_{Suits}	P_{RS}	R	P_{RE}	P_{MT}	P_{Suits}	P_{RS}	R	P_{RE}	P_{MT}	P_{Suits}	P_{RS}	R	P_{RE}
EU	1.053	0.149	0.038	0.007	0.032	1.080	-0.548	0.066	0.019	0.047	1.098	-0.758	0.080	0.023	0.057
AT	1.038	0.105	0.031	0.006	0.025	1.059	-0.418	0.056	0.017	0.039	1.039	-0.553	0.056	0.030	0.026
BE	1.061	0.135	0.047	0.008	0.039	1.084	-0.473	0.067	0.014	0.052	1.082	-0.838	0.067	0.015	0.052
CY	1.023	0.181	0.017	0.001	0.016	1.022	-0.342	0.023	0.008	0.015	1.071	-0.754	0.064	0.018	0.045
CZ	1.055	0.185	0.039	0.002	0.037	1.083	-0.581	0.065	0.012	0.054	1.164	-0.770	0.116	0.018	0.099
DE	1.040	0.135	0.039	0.012	0.027	1.083	-0.491	0.077	0.024	0.053	1.091	-0.834	0.079	0.022	0.058
DK	1.046	0.079	0.036	0.005	0.031	1.102	-0.564	0.089	0.023	0.066	1.033	-0.897	0.029	0.006	0.023
EE	1.043	0.149	0.027	0.001	0.026	1.041	-0.405	0.032	0.007	0.025	1.143	-0.749	0.092	0.014	0.078
ES	1.031	0.160	0.023	0.003	0.020	1.024	-0.476	0.024	0.008	0.016	1.133	-0.734	0.106	0.029	0.077
FI	1.052	0.116	0.036	0.002	0.034	1.093	-0.512	0.078	0.020	0.059	1.059	-0.769	0.054	0.015	0.039
HU	1.062	0.195	0.043	0.005	0.037	1.105	-0.570	0.077	0.016	0.061	1.187	-0.740	0.135	0.034	0.101
IE	1.068	0.246	0.044	0.003	0.041	1.155	-0.649	0.102	0.015	0.087	1.065	-0.661	0.051	0.012	0.039
IS	1.038	0.077	0.030	0.004	0.026	1.050	-0.499	0.044	0.011	0.034	1.023	-0.545	0.024	0.008	0.016
LT	1.051	0.174	0.033	0.003	0.030	1.045	-0.451	0.036	0.009	0.027	1.143	-0.702	0.095	0.017	0.078
LU	1.049	0.162	0.036	0.004	0.032	1.051	-0.426	0.045	0.011	0.034	1.053	-0.714	0.063	0.028	0.035
NL	1.078	0.122	0.055	0.005	0.051	1.063	-0.565	0.056	0.013	0.042	1.048	-0.768	0.047	0.015	0.032
NO	1.029	0.060	0.023	0.004	0.019	1.121	-0.571	0.097	0.025	0.072	1.046	-0.776	0.037	0.008	0.030
PL	1.032	0.082	0.025	0.004	0.020	1.070	-0.600	0.056	0.013	0.043	1.084	-0.590	0.095	0.044	0.052
SE	1.041	0.085	0.030	0.002	0.028	1.102	-0.516	0.093	0.027	0.066	1.033	-0.769	0.039	0.015	0.023
SI	1.074	0.196	0.055	0.005	0.049	1.075	-0.500	0.065	0.016	0.050	1.106	-0.646	0.093	0.024	0.069
SK	1.036	0.147	0.025	0.001	0.023	1.052	-0.480	0.045	0.012	0.033	1.139	-0.686	0.121	0.040	0.081
UK	1.078	0.197	0.050	0.004	0.047	1.111	-0.720	0.078	0.013	0.065	1.092	-0.757	0.074	0.019	0.055

Table 9: Progressivity of separated tax-benefit instruments

Notes: P_{MT} equals the effective progression index of Musgrave and Thin, P_{Suits} is the global progression measure of Suits, P_{RS} the progressivity measure of Reynolds and Smolensky, R the reranking effect and P_{RE} the overall redistributive effect ($P_{RS}-R$)

Income Components

Table 10 illustrates the estimation results of the second income-generating function, therefore the inequality contribution to total market income inequality of employment earnings, earnings from self-employment and capital incomes. First, from Table 10 it becomes obvious, that the inequality contribution of employment earnings is substantially higher than from the other income sources, which is obviously due to their higher economic weight. This is true for the EU as a whole and especially in Estonia, Slovenia and Lithuania. Here the inequality contribution of employed labor earnings is particularly high (more than 90%). On the other hand it is rather low in Ireland and Belgium, where it accounts for less than half of overall inequality of market incomes. The highest contributions of self-employment earnings to inequality can be found in Ireland (almost 50%), Czech Republic (43,7%) and Germany (32,5%), the lowest in Estonia and Iceland (less than 5%). In the majority of countries earnings from self-employment account for a greater inequality proportion than capital incomes, exceptions are Belgium, Cyprus, Estonia, Finland and Iceland. Those exceptions also display comparatively high inequality contributions of capital incomes.

The reported size of inequality contributions becomes more comprehensible, when compared with the factor shares of the different income components in total market income, which are also illustrated in Table 10. The reported factor shares do not always exactly add up to 100% because there is also a residual income category (as this category includes taxes, the factor shares of the reported income components can even exceed 100%). In almost all countries as well as in the EU as a whole, the inequality contribution of employment earnings is significantly less than their factor share would suggest. Only for Estonia, Lithuania, Poland, Slovenia and the Slovak Republic they account for slightly more inequality than their economic weight. As suggested by the EU as a whole and most member states, the opposite is true for self-employment and capital incomes, for which in most cases the inequality contribution substantially exceeds the respective factor share. For example, the inequality contribution of earnings from self-employments in Denmark is four times higher than their factor share in market income. Regarding capital incomes, this is particularly true for Belgium, Cyprus, Iceland and Finland. These findings indicate the more unequal distribution of self-employment earnings and capital incomes compared to earnings from employed labor. Additional computations of inequality measures of

	Inequality Contribution (s_f)				Factor Share (μ_f)		
	Residual	Empl	Self-empl	Capital	Empl	Self-empl	Capital
EU	0.001	0.662	0.178	0.159	0.853	0.107	0.068
AT	0.000	0.795	0.169	0.036	0.850	0.120	0.029
BE	0.000	0.474	0.084	0.442	0.868	0.108	0.053
CY	0.000	0.702	0.130	0.168	0.805	0.145	0.050
CZ	0.000	0.541	0.437	0.022	0.775	0.199	0.020
DE	0.000	0.615	0.325	0.060	0.829	0.113	0.055
DK	0.005	0.618	0.308	0.068	0.881	0.077	0.096
EE	0.006	0.953	0.014	0.026	0.793	0.013	0.204
ES	0.000	0.785	0.181	0.034	0.862	0.114	0.023
FI	0.005	0.566	0.062	0.367	0.774	0.077	0.164
HU	0.000	0.671	0.316	0.013	0.820	0.171	0.020
IE	0.000	0.473	0.499	0.028	0.792	0.199	0.029
IS	0.000	0.741	0.015	0.244	0.949	0.042	0.082
LT	0.002	0.908	0.072	0.018	0.892	0.096	0.018
LU	0.000	0.702	0.264	0.034	0.887	0.074	0.038
NL	0.001	0.750	0.137	0.112	0.945	0.086	0.080
NO*	0.000	0.154	0.071	0.775	0.864	0.089	0.118
PL	0.001	0.851	0.142	0.007	0.836	0.146	0.014
SE	0.000	0.816	0.104	0.080	0.940	0.045	0.033
SI	0.000	0.910	0.073	0.016	0.884	0.076	0.006
SK	0.000	0.893	0.104	0.003	0.884	0.106	0.006
UK	0.000	0.795	0.175	0.029	0.915	0.112	0.040

Table 10: Relative Inequality Contribution of Income Components

the different income components (not reported here) support these findings.

Society Characteristics

Table 11 reports the results of the estimation of the baseline estimation of the third income-generating-function. In this estimation the number of earners, children aged under 18, household members older than 64, household size and the number of household members with tertiary education are included as family explanatory variables. Age, age squared, years of education and the gender of the household head are used as variables referring to the household head only. First, the size of the residuals shows, that only in some countries the included explanatory variables can explain more than half of the variation of total household gross earnings. Those countries are Cyprus, the Czech Republic, Iceland and Slovenia. In the other countries un-

observed household characteristics are by far the most important factor. Regarding the covariates, age (negatively) and age squared (positively) substantially contribute to household earnings inequality in all countries. The approximated years of education of the household head only account for a small part of inequality. Only in Luxembourg and Poland the contribution reaches values around 5%. On the other hand, the number of household members with tertiary education has a significant inequality contribution in most countries, in Ireland, Lithuania and Luxembourg this contribution even exceeds 10%. The gender of the household head and the number of children in a household does not seem to have any importance, because those variables account for less than 5% of inequality in all countries. The household size has an inequality contribution of more than 5% only in Iceland and Denmark, the number of household members aged over 64 only in Cyprus.

Table 15 in the Appendix shows the results when a number of additional control variables are added to the baseline estimation. The additional explanatory factors are dummies for occupation and industry of the household head, if the household head is married and self-employed, working hours, if the house is owned or rented and total housing costs. It first emerges that through the additional control variables the size of the residuals can be reduced. Now, also in Finland, Ireland, Luxembourg and the UK more than half of the variation in household gross earnings can be explained by the included covariates. Also, the relationship between the age variables and inequality in gross earnings seems to have reversed: Now age is mainly positively associated with inequality, age squared negatively. Also the size of their inequality contribution has become significantly smaller. Regarding the other variables, the occupation of the household head, the working hours, house ownership and the housing costs have noteworthy inequality contributions in some countries.

	Resid	Age	Age2	Educ Years	Sex	Num Earners	Child	Mem > 64	HH Size	Tertiary Educ
EU	0.681	-0.050	0.114	0.014	0.021	0.142	0.006	0.010	-0.012	0.074
AT	0.658	-0.005	0.052	0.012	0.023	0.201	-0.004	0.003	0.026	0.034
BE	0.620	-0.015	0.051	0.012	0.018	0.239	0.005	0.003	-0.012	0.079
CY	0.437	-0.251	0.387	0.049	0.005	0.202	-0.007	0.051	0.035	0.092
CZ	0.469	-0.131	0.200	0.020	0.020	0.370	0.000	0.009	-0.009	0.053
DE	0.653	-0.102	0.217	0.002	0.035	0.146	-0.007	0.012	0.006	0.037
DK	0.560	0.339	-0.251	-0.001	0.021	0.266	-0.035	0.011	0.056	0.033
EE	0.526	-0.198	0.309	0.013	0.037	0.247	0.000	0.008	-0.005	0.063
ES	0.578	-0.044	0.092	0.032	0.011	0.252	0.001	0.003	-0.008	0.085
FI	0.477	-0.163	0.303	0.004	0.018	0.262	-0.024	0.029	0.031	0.062
HU	0.577	-0.077	0.131	0.027	0.005	0.264	0.000	-0.002	-0.005	0.079
IE	0.550	0.063	-0.013	0.020	0.028	0.265	-0.001	0.001	-0.017	0.105
IS	0.499	-0.063	0.218	0.010	0.032	0.189	-0.034	0.033	0.057	0.058
LT	0.532	-0.267	0.371	0.037	0.009	0.199	-0.001	-0.002	-0.003	0.124
LU	0.585	0.061	-0.018	0.064	0.019	0.152	0.000	0.004	0.004	0.128
NL	0.558	-0.041	0.173	-0.001	0.026	0.221	-0.007	0.011	0.007	0.053
NO*	0.459	-0.218	0.385	0.004	0.019	0.252	-0.047	0.041	0.064	0.042
PL	0.603	-0.249	0.358	0.048	0.008	0.147	0.000	-0.003	-0.002	0.089
SE	0.552	0.349	-0.189	0.003	0.021	0.211	-0.031	0.011	0.043	0.030
SI	0.436	-0.384	0.537	0.016	0.001	0.308	-0.006	0.006	0.024	0.061
SK	0.550	-0.096	0.145	0.007	0.012	0.321	-0.000	0.005	0.012	0.045
UK	0.640	0.056	0.026	-0.002	0.030	0.143	0.006	0.015	0.008	0.077

Table 11: Inequality Contribution of Society Characteristics

6 Conclusion

The descriptive evidence suggests that there are sizeable differences across European member states in the levels of within country income inequality. 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. Throughout the paper, we therefore answer the question to which extent the differences in income inequality are driven by country specific factors. By means of an integrated regression-based decomposition approach and a set of three income-generating functions, we evaluate the inequality contribution of the welfare state, different income components and individual characteristics to overall inequality.

Our regression 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.

Also, in most countries capital incomes explain substantially more inequality than their economic weight would suggest, therefore indicating their more unequal distribution compared to other earnings. The estimation of the earning-generating-function on the third stage then reveals, that especially the presence of tertiary education, the number of earners (part-time and full-time) and housing costs have the highest contribution on the inequality of household earnings. Though there a considerable variations in the size of the effects across countries, in all countries the largest part of inequality accounting is left in the unobserved characteristics of the household. 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.

Appendix

	Residual	Market	Taxes	Benefits	Pensions
EU	0.013	1.256	-0.329	0.032	0.028
AT	0.003	1.257	-0.361	0.061	0.040
BE	0.006	1.594	-0.588	0.014	-0.026
CY	0.004	1.097	-0.170	0.040	0.028
CZ	0.002	1.431	-0.396	-0.014	-0.023
DE	0.005	1.189	-0.219	0.063	-0.037
DK	0.001	1.613	-0.542	-0.014	-0.058
EE	0.001	1.297	-0.294	0.026	-0.030
ES	0.002	1.184	-0.234	0.029	0.019
FI	0.001	1.397	-0.385	0.014	-0.027
HU	0.006	1.243	-0.254	0.002	0.003
IE	0.002	1.196	-0.197	-0.007	0.006
IS	0.002	1.346	-0.371	0.016	0.007
LT	0.003	1.272	-0.291	0.025	-0.009
LU	0.009	1.368	-0.394	0.017	0.000
NL	0.006	1.705	-0.692	-0.012	-0.008
NO*	0.056	1.003	-0.052	0.001	-0.007
PL	0.003	1.344	-0.395	-0.008	0.055
SE	0.017	1.611	-0.603	0.032	-0.057
SI	0.029	1.259	-0.310	0.018	0.004
SK	0.000	1.158	-0.311	0.009	0.144
UK	0.002	1.441	-0.492	-0.022	0.070

Table 12: Inequality Contribution of Public Pensions

	Residual	Market	Taxes	Unempl	Family	Social	Other	Pensions
EU	0.013	1.257	-0.330	0.005	0.017	0.001	0.009	0.028
AT	0.003	1.256	-0.361	-0.003	0.031	0.008	0.025	0.041
BE	0.006	1.592	-0.587	0.002	0.018	-0.001	-0.004	-0.026
CY	0.004	1.097	-0.169	0.026	0.003	-0.001	0.011	0.028
CZ	0.002	1.431	-0.396	-0.002	-0.005	-0.008	-0.000	-0.023
DE	0.005	1.188	-0.219	0.015	0.028	0.003	0.018	-0.037
DK	0.001	1.613	-0.542	-0.022	0.017	0.000	-0.009	-0.058
EE	0.001	1.297	-0.295	0.001	0.022	-0.000	0.003	-0.030
ES	0.002	1.184	-0.234	0.003	0.005	-0.000	0.022	0.019
FI	0.001	1.396	-0.384	-0.009	0.021	-0.002	0.004	-0.027
HU	0.006	1.243	-0.254	-0.002	0.003	-0.000	0.001	0.003
IE	0.002	1.196	-0.197	0.007	-0.006	-0.000	-0.008	0.006
IS	0.002	1.346	-0.371	-0.001	0.008	-0.001	0.011	0.007
LT	0.003	1.272	-0.291	-0.000	0.021	-0.001	0.005	-0.009
LU	0.009	1.366	-0.394	-0.004	0.032	-0.005	-0.005	0.000
NL	0.006	1.703	-0.691	-0.001	0.009	-0.008	-0.012	-0.008
NO*	0.056	1.003	-0.052	-0.000	0.003	-0.000	-0.001	-0.007
PL	0.003	1.344	-0.394	0.001	-0.003	-0.002	-0.003	0.055
SE	0.017	1.613	-0.605	-0.004	0.037	-0.005	0.003	-0.057
SI	0.029	1.259	-0.309	-0.000	0.012	-0.006	0.012	0.004
SK	0.000	1.158	-0.311	0.001	0.009	-0.002	0.002	0.144
UK	0.002	1.442	-0.492	-0.001	-0.000	-0.009	-0.011	0.070

Table 13: 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
NO*	1.069	-0.334	0.011	0.052	0.004	0.106	0.091
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 14: Factor Shares of Tax Benefit System

	Resid	Age	Age2	Educ	Sex	Married	Self	Occup	Industry	Hours	Earners	Child	> 64	HH Size	Tertiary	Owner	H_ Cost
EU	0.639	0.076	-0.054	0.004	0.021	-0.001	0.009	0.054	0.001	0.019	0.081	-0.001	0.005	-0.002	0.057	0.01	0.081
AT	0.639	0.023	-0.015	0.007	0.016	0.024	-0.004	0.035	0	0.034	0.142	0.005	0	0.018	0.027	0.034	0.015
BE	0.591	0.048	-0.032	0.007	0.009	0.007	0.031	0.045	0.001	0.029	0.179	0.004	0.002	-0.007	0.056	0.023	0.004
CY	0.449	0.099	-0.058	0.027	0.004	0.039	-0.001	0.063	0.012	0.005	0.164	-0.004	0.018	0.04	0.084	0.031	0.029
CZ	0.47	0.031	-0.02	0.014	0.024	0.012	0	0.062	-0.001	0.03	0.318	0	0.002	-0.006	0.052	0.003	0.011
DE	0.533	0.13	-0.075	0.001	0.021	0.027	-0.004	0.037	0.004	0.178	0.092	-0.002	0	0.001	0.028	0.024	0.005
DK	0.503	0.221	-0.164	-0.003	0.019	0.009	-0.004	0.027	0.001	0.041	0.119	-0.092	0.002	0.18	0.04	0.06	0.042
EE	0.513	-0.079	0.124	0.008	0.063	0.009	0.011	0.057	0.002	0.019	0.186	-0.001	0.005	-0.009	0.038	0.004	0.05
ES	0.555	0.067	-0.053	0.02	0.01	0.014	0.017	0.069	-0.002	0.001	0.187	-0.001	0	-0.004	0.079	0.019	0.022
FI	0.49	0.145	-0.1	0	0.024	0.01	0.013	0.041	0.007	0.056	0.136	-0.041	0.002	0.069	0.077	0.059	0.011
HU	0.54	0.037	-0.029	0.019	0.01	0.01	0.002	0.085	-0.003	0.043	0.196	0.001	0	-0.004	0.079	0.001	0.014
IE	0.458	0.083	-0.068	0.022	0.011	0.036	-0.002	0.02	0.001	0.079	0.156	0.018	0.003	0.002	0.088	0.071	0.023
IS	0.435	0.161	-0.101	0.01	0.034	0.025	0.033	0.028	-0.001	0.06	0.124	-0.031	0.006	0.109	0.079	0.014	0.013
LT	0.527	-0.018	0.027	0.018	0.014	0.024	0.01	0.106	0	0.017	0.139	0.002	0	-0.007	0.059	0.012	0.07
LU	0.46	0.049	-0.009	0.047	0.018	0.002	0.003	0.117	0.008	0.041	0.102	0.003	0	0.002	0.085	0.057	0.016
NL	0.521	0.076	-0.054	-0.002	0.029	0.013	0.006	0.026	0	0.112	0.07	-0.007	0.001	0.027	0.05	0.081	0.052
NO*	0.526	0.248	-0.182	0.003	0.026	0.021	-0.001	0.031	0.01	0.073	0.107	-0.052	0.003	0.096	0.046	0.041	0.004
PL	0.555	-0.006	0.05	0.027	0.006	0.012	0.031	0.086	0.002	0.009	0.093	0.002	0	0	0.062	0.002	0.069
SE	0.556	0.302	-0.219	-0.001	0.028	0.011	0.003	0.029	0.015	0.027	0.076	-0.065	0	0.105	0.033	0.096	0.004
SI	0.457	0.128	-0.11	0.025	0.001	0.018	0.01	0.103	0.001	0.003	0.232	0.004	0.001	0.017	0.104	0.004	0.001
SK	0.58	0.033	-0.033	0.004	0.014	0.009	0	0.048	-0.001	0.009	0.274	0.002	0.002	0.015	0.038	0.001	0.005
UK	0.446	0.067	-0.037	-0.002	0.013	0.026	0.006	0.05	0.005	0.159	0.114	0.01	0.009	0.006	0.043	0.046	0.041

Table 15: Additional Control Variables

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