

# Reduction of income inequality and subjective well-being in Europe

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## **Abstract**

Using four waves of the European Social Survey (179,273 individuals from 29 countries), we analyze the association of reduction of income inequality by governmental taxes and transfers (redistribution) with subjective well-being. Our results provide evidence that people in Europe are negatively affected by income inequality, whereas reduction of inequality has a positive effect on well-being. Since we simultaneously estimate the effects of income inequality and its reduction, our results might indicate that not only the outcome (inequality), but also the procedure (redistribution) that leads to the outcome influences subjective well-being. We propose four interpretations of the results. It is possible that living in a country where taxes and transfers reduce income inequality to a greater extent, (1) the poor may feel more protected, and (2) the rich may also feel more generous, which may result in an emotional benefit for them. (3) The income inequality reduction variable might capture dimensions of inequality other than income as well. (4) Well-being might be associated not only with actual, but also with perceived inequality that is correlated with income inequality reduction. Our results show that there is some heterogeneity in the effects. The positive effect of redistribution seems to be stronger for less affluent members of the society and left-wing oriented individuals. The effect of post-government inequality seems to be different in Eastern and Western Europe: while income inequality has no significant effect in the West, its impact negative and highly significant in the East.

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# 1. Introduction

Inequality and redistribution are important topics in social sciences. Numerous studies have examined the impact of income inequality on various adverse societal outcomes, and concluded that inequality is positively associated with crime (Choe 2008; Fajnzylber et al. 2002; Scorzafave and Soares 2009) and working hours (Bowles and Park 2005), negatively with health (Kaplan et al. 1996; Wilkinson and Pickett 2006), trust (Gustavsson and Jordahl 2008; Knack and Keefer 1997), political engagement (Horn 2011; Solt 2008, 2010) and mobility (Corak 2013; Wilkinson and Pickett 2009).<sup>1</sup> In the presence of upward social comparison, greater inequality also means greater discrepancy between the aspirations and actual incomes of less wealthy individuals, which imposes substantial psychological cost on these people (Frank 2007).<sup>2</sup>

The relationship between these outcomes and subjective well-being (Dolan et al. 2008; Frey and Stutzer 2002) predicts that income inequality should relate negatively to well-being. Besides, inequality may also shape subjective well-being directly, not only through these channels. Humans are social animals; we can empathize with other people's misery, which means that high inequality may reduce our happiness even without further societal effects. Besides, the negative effect of inequality may result from the envy of the poor.<sup>3</sup>

Starting with Morawetz et al. (1977), inequality has been the topic of several empirical papers. Studies using panel, time-series and within-country data document mostly negative effects in Europe (Alesina et al. 2004; Ferrer-i-Carbonell and Ramos 2010; Grosfeld and Senik 2010; Hagerty 2000; Schwarze and Härpfer 2007; Winkelmann and Winkelmann 2010), and in other non-European countries as well (Oishi et al. 2011; Oshio and Kobayashi 2010).<sup>4</sup> Usually, people living in a more unequal environment seem to feel less happy.<sup>5</sup> Contrary to these results, using information from 85 countries between 1981 and 2008 Røzer and Kraaykamp (2013) found that inequality increases well-being. However, the effect varies with the sample: in Europe income inequality negatively affects well-being.

Determinants of preferences for redistribution are discussed in detail in the literature. There are several factors that have been shown to play an important role: self-interest (income and expected social mobility), risk-aversion (history of misfortune), altruism, culture and ideology, social impact of inequality, acceptable level of inequality, and perception of fairness (Alesina and Giuliano 2011; Alesina and La Ferrara 2005; Corneo and Grüner 2002; Fong 2001; Luttmer and Singhal 2011).

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<sup>1</sup> For a review, see Wilkinson and Pickett (2009, 2010).

<sup>2</sup> In the social comparison literature range-frequency theory also predicts that increasing inequality affects well-being negatively (Hagerty 2000)

<sup>3</sup> However, a recent empirical paper found that the relationship between preference for a more equal society and envy is very weak (Kemp and Bolle 2013).

<sup>4</sup> Cross-sectional cross-country or pooled cross-sectional analyses without controlling for the cultural background of countries are inconclusive. Berg and Veenhoven (2010) and Helliwell and Huang (2008) found a positive association between income inequality and well-being, whereas in an analysis of European countries Fahey and Smyth (2004) reported a negative relationship.

<sup>5</sup> Note however, that the impact of income inequality may be different in some cases. In an unpredictable, volatile environment inequality may be perceived as a signal of increased opportunities and may affect satisfaction positively (Hirschman and Rotschild 1973). For empirical evidence from the Eastern European transition, see Grossfeld and Senik (2010). They show that in the early transition period inequality was positively associated with satisfaction in Poland, but after a couple of years the relationship became negative.

Although societal impacts of inequality, determinants of preferences for redistribution, and the relationship between income inequality and subjective well-being are thoroughly studied, there is little empirical evidence about the impact of inequality reduction (redistribution)<sup>6</sup> on well-being. Only one paper deals explicitly with the question whether the reduction of inequality by taxes and transfers can undo this negative impact. Schwarze and Härpfer (2007) studied how inequality and redistribution (reduction of inequality by the state) is associated with subjective well-being in Germany. Using the German Socio-Economic Panel they found that income inequality calculated on the regional-level has a negative effect on individual life satisfaction, but redistribution is not a significant determinant of well-being. Some redistribution-related issues were analyzed by other papers. Di Tella et al. (2003) and Di Tella and MacCulloch (2008) estimate the effect of unemployment benefits (defined as the income replacement rate) on subjective well-being. Although unemployment benefits are only one component of redistribution, we can take it as a proxy variable of the reduction of inequality. These papers show that a generous welfare state is positively correlated with satisfaction. Oishi et al. (2012) using 54 countries from the Gallup World Poll have found that progressive taxation is positively associated with a global-life-evaluation index.

In this paper we enrich the existing knowledge about the association of inequality reduction by governmental taxes and transfers (redistribution) with subjective well-being. The novelty of our paper is that it is the first to estimate the effect of inequality and the reduction of inequality simultaneously, not limited to an individual country, but using data from several European countries. The analysis is based on the first four waves of the European Social Survey. We simultaneously analyze how inequality and redistribution affect life satisfaction. Our results corroborate the findings of previous literature that – controlling for personal characteristics of the respondents, GDP, unemployment and inflation rate, country fixed effects and year fixed effects – people in Europe are negatively affected by income inequality, whereas provide new evidence that inequality reduction has a positive impact on well-being. Moreover, the simultaneously estimated effects of inequality and its reduction might indicate that it is not only outcome (net income inequality) that influences subjective well-being but also the procedure (redistribution) that leads to the outcome has a relevant impact. We propose four theoretical interpretations of these empirical results. We suggest that the poor may feel more protected, whereas the rich may feel more generous because of higher level of inequality reduction by taxes and transfers, which may result in an emotional benefit for them. It is also possible that not only actual but also perceived inequality is associated with well-being. Another explanation might be that the reduction of income inequality correlates with the generosity of the welfare services provided by the state, and the high level of our redistribution variable might capture a low level of other dimensions of social inequality possibly increasing life satisfaction.

However, according to our findings, there is some heterogeneity in the effects. In line with the previous literature on determinants of preferences for redistribution, we find that the positive effect of redistribution is stronger among less affluent members of the society, and

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<sup>6</sup> In this paper we regard ‘inequality reduction’ and ‘redistribution’ as identical. Unless noted otherwise, ‘redistribution’ and ‘inequality reduction’ refer to the reduction of income inequality by government tax and transfer policies.

left-wingers. Income inequality has no significant effect in Western Europe, but its impact negative and highly significant in Eastern Europe.

Our paper is structured as follows. The next section describes the data and the estimation methods we used. Section 3 shows the estimation of regression models. Section 4 concludes.

## 2. Data and methods

Our main data source is the four waves of the European Social Survey (ESS). ESS is a repeated cross-sectional survey from every other year. The first wave started in 2002, the fourth wave was launched in 2008. We include in our analysis only those 29 countries that participated in more than one round.<sup>7</sup>

Our analysis relies on a self-reported measure of well-being. In the ESS-questionnaire everyone is asked the following single-item question: “All things considered, how satisfied are you with your life as a whole nowadays?” They answer the question on an 11-point scale (0 – extremely dissatisfied, 10 – extremely satisfied). This global life evaluation is our dependent variable.

We estimate a linear relationship between inequality reduction and satisfaction, using the following specification:

$$(1) \quad S_{ict} = \beta_0 + \beta_1 R_{ct} + \beta_2 I_{ct}^N + \beta_3 C_{ct} + \gamma P_{ict} + \mu_c + \lambda_t + \varepsilon_{ict}$$

where  $S_{ict}$  is the life satisfaction of individual  $i$ , who lives in country  $c$  in time (wave)  $t$ .  $R_{ct}$  is the measure of inequality reduction,  $I_{ct}^N$  is post-government (net) income inequality,  $C_{ct}$  is the vector of country-level variables,  $P_{ict}$  is the vector of personal characteristics of individual  $i$ . We also include a country fixed effect  $\mu_i$  and a wave fixed effect  $\lambda_t$ . Finally, the equation includes the usual error term ( $\varepsilon_{ict}$ ).

In line with the literature, this paper measures income inequality by the Gini coefficient. The source of the inequality data is the Standardized World Income Inequality Database (Version 3.0), which provides Gini indices of gross and net income inequality for more than 100 countries (Solt 2009). Data of gross and net income inequality allow us to calculate the effect of government taxes and transfers on income inequality. This index of income inequality reduction by governmental taxes and transfers is computed as the difference between Gini indices based on gross and net incomes divided by gross income inequality:

$$(2) \quad R_{ct} = \frac{I_{ct}^G - I_{ct}^N}{I_{ct}^G} \cdot 100$$

where  $R_{ct}$  is income inequality reduction by governmental taxes and transfers in country  $c$  in time  $t$  (in percent),  $I_{ct}^G$  is the pre-government (gross) income inequality and  $I_{ct}^N$  is the post-government (net) income inequality. The inequality reduction index shows the percentage reduction in inequality by government tax and transfer policies. In other words, it measures the extent of change in income distribution due to governmental taxes and money transfers.

<sup>7</sup> The list of participating countries by ESS rounds is given in Table A1 in the Appendix.

This means that our inequality reduction variable captures policies that affect net income distribution, but set aside redistribution related policies that do not change net income inequality (e.g. in-kind transfers to the poor).

Since Gini indices are calculated on the basis of surveys, measurement error is inevitable. If the variance of Gini indices and inequality reduction is mostly due to measurement errors rather than actual change, then our estimates would be biased. We try to mitigate this bias by calculating the trend values of the time series which capture long-term changes and set aside short-term fluctuation (which is supposed to be primarily the result of the measurement errors). Using inequality reduction and income inequality data for the last two decades, we compute trend components of inequality and its reduction for every country with the Hodrick-Prescott filter (Hodrick and Prescott 1997), and we merge these trend values to the country-wave observations.<sup>8</sup>

The Gini index is highest in Russia, while lowest in Sweden and Denmark. The reduction of inequality (redistribution) is high in the Scandinavian countries, Germany, and Austria and low in Russia, Ukraine, and Bulgaria.<sup>9</sup>

Our other country-level right-hand side variables are the welfare of the states measured by Gross Domestic Product, unemployment rate, and inflation. Data on GDP per capita come from the World Bank (PPP, constant 2005 international \$). In our analysis we use it in logarithmic form because of the presumed declining marginal effect of income. Previous research has highlighted that each doubling of GDP per capita is associated with a constant increase in average well-being (Stevenson and Wolfers 2008, 2013). Data on unemployment and inflation rate come from the World Bank as well.

The control variables in our baseline regression are the following: gender, age, age squared, education (four categories), living with a partner, labor force status (seven categories), subjective health status (five categories), domicile (four categories), household size and equivalent household income. Since income comparison is an important determinant of subjective well-being (Clark et al. 2008) and GDP per capita already captures the effect of the society's average income, we include equivalent household income as the percentage of average equivalent household income in country  $c$  in time  $t$ . With this procedure we can control for the relative income effect.

We exclude some countries from the fourth wave because of missing Gini indices<sup>10</sup>, and individuals with missing life satisfaction. The final sample contains 179,273 individuals and 94 country-time observations.

We estimate OLS regressions using ESS design weights for adjusting the unequal inclusion probabilities within countries combined with another weight whose goal is to transform every sample's  $N$  equal. In this way each cross-sectional sample counts as the same in the analysis. The standard error estimates are robust to heteroskedasticity and clustered at the country-wave level.<sup>11</sup>

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<sup>8</sup> To extract the trend from the time series of inequality and redistribution, we used the Hodrick-Prescott filter with a parameter value of 6.25 as proposed by Ravn and Uhlig (2002) for annual observations.

<sup>9</sup> Table A2 in the Appendix provides descriptive statistics by country.

<sup>10</sup> These countries are Austria, Switzerland and Ukraine.

<sup>11</sup> Table A3 in the Appendix provides descriptive statistics of the main variables.

### 3. Results

Table 1 shows our baseline result. We find that redistribution and post-government income inequality are significant determinants of satisfaction with life. As we expected, the coefficient on inequality is negative: people in Europe dislike inequality. The coefficient on inequality reduction has a positive sign: Inequality reducing governmental policies are correlated positively with satisfaction. The size of the coefficients means that a 1 point increase in inequality reduction is associated with a 0.051 point increase in well-being, while a 1 percentage point increase in the Gini index results in a -0.036 point lower satisfaction. Or in terms of per capita GDP change: a 1 percentage point increase in redistribution is equivalent to a 2.7 percent increase in GDP, whereas a 1 point increase in the Gini index is equivalent to a 3.8 percent decrease in GDP.<sup>12</sup>

*Table 1: Income inequality, inequality reduction and life satisfaction*

	(1)
Inequality reduction	0.036 <sup>***</sup> (0.006)
Post-government income inequality	-0.051 <sup>***</sup> (0.019)
Country-level controls	yes
Individual-level controls	yes
Country dummies	yes
Wave dummies	yes
Adjusted R <sup>2</sup>	0.281
N	179,273

Dependent variable: Life satisfaction. Robust standard errors adjusted for clustering by country-wave are in parentheses. Country-level controls: ln(GDP), unemployment rate, inflation. Individual-level controls: gender, age, age squared, education, marital status, labor force status, health, domicile, household size, equivalent household income (as the % of average income). Dummies are included for missing control variables.

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

It is worth emphasizing that inequality reduction (redistribution) has a significant coefficient even controlling for income inequality. The first explanation for this result might

<sup>12</sup> The estimated coefficient of income inequality in the previous literature is influenced by the well-being measure and the sample as well, thus, most of these findings are not directly comparable with our result. Ferrer-i-Carbonell and Ramos (2010) found that a 1 percentage point increase in the post-government Gini index results a 0.055 decrease in life satisfaction (on an 11-point scale) in Germany (1997-2007). Schwarze and Härpfer (2007) found that a similar increase in the post-government Gini index is associated with a 0.036-0.048 lower life satisfaction (on an 11-point scale) in West-Germany (1985-1998). According to Alesina et al. (2004) a 1 percentage point increase in the Gini index decreases the proportion of “very satisfied” people by 0.55 percentage point and increases the proportion “not very/at all satisfied” people by 0.53 percentage point in Western Europe (1975-1992) (the third middle category was “fairly satisfied”). Oshio and Kobayashi (2011) found that a one-standard-deviation (2.7 percentage points) increase in the Gini coefficient lower the odds of being in the lowest happiness category (on a 3-point measure) by 8.4 percentage points, but does not influence the odds of being in the highest happiness category in Japan (2000-2006).

be that it is not only the level of income inequality that matters, but also the process (the extent of redistribution) may lead to the particular outcome (Frey et al. 2005; Frey and Stutzer 2004).<sup>13</sup> As Frey and Stutzer (2005) state “people get utility from living and acting under particular institutions over and above outcomes” (p. 92.). According to our results not only post-government income inequality influences life satisfaction, but the difference between pre- and post-government inequality (which is measured by our redistribution variable) also matters. This variable might reflect the institutions and attitudes of the society. In accordance with this, individuals (especially the poor) may feel more protected due to higher level of inequality reduction by taxes and transfers; they may get the sense that the community will help them in hardship, irrespective of the actual inequality. It is not necessary to recognize the level of gross income inequality: probably solidarity and helping the poor is common talk in such a society, which may generate these feelings. Moreover, envying the rich may be less strong, thus trust among members of the society might be also higher.

Another possible explanation for the positive coefficient on redistribution is that it is not – or not only – actual but also perceived income inequality is associated with well-being (Oshio and Urakawa 2014). If perceived inequality is correlated negatively with the extent of inequality reduction, then this relationship is reflected in the coefficient on redistribution.

Third, the higher the income inequality reduction the more generous the welfare services provided by the state might be. Thus, high level of our redistribution variable might capture low levels of other dimensions of social inequality or stronger safety net. If not only income inequality but other dimensions of inequality are also associated with well-being, then this effect is reflected by the positive coefficient on the redistribution variable.

Finally, another explanation relies on generosity and altruism. Recent studies demonstrate that spending money on other people and charity is associated with higher well-being (Aknin et al. 2013; Dunn et al. 2008). Even mandatory taxation for a good cause activates reward-related brain regions (Harbaugh et al. 2007). These results suggest that people may feel more generous because of a higher extent of redistribution, which may result in an emotional benefit for them, even if the higher level of solidarity does not depend on their decision.

Coefficients on individual control variables correspond with earlier findings.<sup>14</sup> There is a U-shaped relationship between age and satisfaction. Self-reported satisfaction is higher for those with more education. The better people’s subjective health, the more likely they are to be satisfied. Living in cities has a negative effect on satisfaction. Those who live with a partner tend to feel more satisfied. We find the usual negative relationship between life satisfaction and being unemployed, whereas students are more satisfied than people in paid work. Women tend to report higher levels of well-being. Coefficients on equivalent household income (as the percentage of average household income) and log GDP per capita are positive.

### *3.1. Robustness*

In the next step we examine the robustness of the baseline result. Table 2 summarizes this analysis. Column 1 and Column 2 check whether including less or more control variables

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<sup>13</sup> If the effect of inequality and redistribution is estimated separately, the size of the coefficients is only slightly higher and their significance is unchanged.

<sup>14</sup> The detailed baseline regression result is in Table A4 in the Appendix.

changes the coefficient on inequality reduction and inequality. In Column 1 we control only for country and wave fixed effects. In Column 2 we add controls for disability status, social capital (meeting with friends), feeling about household's income, religiousness, and minority status. In Columns 3 we estimate ordered probit model rather than an OLS specification. In Column 4 we restrict the sample to countries surveyed in at least three waves out of four (21 countries). Maybe redistribution and inequality need some time to have their full effect on subjective well-being, because they do not work only directly but through many channels (crime rate, trust, political engagement, etc.). To address this possibility, in Column 5 satisfaction in time  $t$  is regressed on inequality and its reduction in time  $t-1$ . Finally, we weight the data using only design weights, which corrects for the different inclusion probabilities of individuals, making the samples more representative (Column 6), and combined design and population weights (Column 7). The latter weight ensures that every country is represented in proportion to its population size. Both weights are provided in the ESS dataset.

The overall conclusion of the models is that the association of inequality reduction with life satisfaction is not altered by any of these sensitivity analyses. The coefficient on inequality reduction is always positive and significant at the 1 percent level. On the other hand, the estimated coefficient on income inequality is insignificant in one case and only marginally significant in another one; nevertheless, its sign always remains negative.<sup>15</sup> In summary, robustness checks support the validity of our main results: we can conclude that people in Europe are negatively affected by income inequality, while reduction of inequality is associated with higher subjective well-being.

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<sup>15</sup> A composition effect may explain the insignificance of coefficient on inequality in Column 4: most Eastern European countries are excluded from this sample because of participating in less than three waves. As we show in the next section, inequality has a negative effect in Eastern but no effect in Western European countries.

Table 2: Income inequality, inequality reduction and life satisfaction, robustness analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Only wave and country dummies	More individual controls	Ordered probit	Only countries participating at least in three waves	Lagged inequality and redistribution	Weighted by design weights	Weighted by design weights × population weights
Inequality reduction	0.045*** (0.011)	0.030*** (0.006)	0.018*** (0.003)	0.028*** (0.004)	0.031*** (0.005)	0.036*** (0.006)	0.037*** (0.008)
Post-government income inequality	-0.052** (0.026)	-0.046** (0.020)	-0.023** (0.009)	-0.018 (0.013)	-0.036*** (0.012)	-0.046** (0.018)	-0.029* (0.016)
Adjusted R <sup>2</sup>	0.171	0.339	0.073 <sup>a</sup>	0.252	0.281	0.279	0.248
N	179,273	179,273	179,273	150,549	179,273	179,273	179,273

Dependent variable: Life satisfaction. Robust standard errors adjusted for clustering by country-wave are in parentheses. All regressions include the same control variables (individual- and country-level controls, country dummies and wave dummies) as the baseline regression except Model 1 (only country dummies and wave dummies). More controls: disability status, social capital, feeling about household's income, religiousness, minority status. Dummies are included for missing control variables.

<sup>a</sup> Pseudo R<sup>2</sup>

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

In the next step we examine the sensitivity of our results to the measures of income inequality and income inequality reduction. Table A5 in the Appendix summarizes the results. In Column 1 we use an absolute measure of income inequality reduction (the difference between pre-government Gini index and post-government Gini index) instead of the percentage change. We get the same qualitative results as in Table 1: inequality reduction is associated positively, whereas income inequality is associated negatively with life satisfaction. Column 2 shows the estimation where we use the original income inequality and redistribution variables instead of the smoothed trend. Both variables are significant at the 5 percent level, but their size is somewhat lower than the coefficients in Table 1. This is consistent with our expectations, since the “raw” variables are supposed to be measured with considerable noise, thus, the estimated coefficients of these variables might be biased toward zero. Column 3 includes not only the trend of income inequality and income inequality reduction but the cyclical component (short term fluctuation) as well (computed with Hodrick-Prescott filter). The result clearly shows that the effect of the cyclical component is zero, but the effect of the trend variable remains unchanged. We think this finding indicate that the cyclical component indeed contains the noise caused by the survey measurement of Gini indices. Column 4 shows the result of the analysis where we compute trend component of inequality and its reduction using data for the years 2001-2009 (instead of the years 1990-2009). We can see that the estimated effects are slightly lower, but the main conclusion is not altered. Finally, in Column 5 pre-government income inequality is included instead of post-government income inequality. The coefficient of pre-government Gini index is negative and significant.

In addition to the robustness tests above, we examine the inequality reduction – satisfaction relationship on the country level (where observational units are countries, rather than individuals). In the country-level analysis we are able to examine the relationship between the change in average life satisfaction and the change in redistribution, income inequality, log GDP per capita, unemployment rate, and inflation. We estimate first- and long-differenced equations with OLS regression.<sup>16</sup>

Table 3 provides the regression results, where the effects of redistribution, income inequality, and country-level controls are simultaneously taken into consideration. Column 1 shows the estimation of the first-difference regression without country dummies. Column 2 contains the estimation of the first-difference regression including country fixed effects to allow for country-specific time trends. Column 3 presents the result of the long-difference model. In the first-difference estimations, inequality seems negatively associated with life satisfaction. The size of the coefficients is similar or higher (in absolute term) than the result shown in Table 1, but some are statistically insignificant. Inequality reduction is associated significantly positively with well-being in Column 1. In Column 2 the estimated coefficients lost their significance, but the magnitude of the point estimates are noticeably higher than in Column 1. They are insignificant due to the imprecise estimation (higher standard errors), but it is not a surprise as the number of the estimated parameters are much higher than in Column 1 (because of inclusion of the country dummies).<sup>17</sup> We interpret this result as suggesting that

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<sup>16</sup> In the long-differenced model the changes are calculated as the difference between the last and the first observation of every country.

<sup>17</sup> In this model we have 65 observations and 34 independent variables.

income inequality reduction has a positive and income inequality has a negative but imprecisely estimated effect on life satisfaction. The estimations in Column 2 mean that a 1 percentage point increase in redistribution is equivalent to a 3.8 percent increase in GDP per capita, while a 1 point increase in the Gini index is equivalent to a 6.1 percent decrease in GDP per capita.<sup>18</sup> In the long-difference model, inequality change has no effect on well-being, but change in redistribution has a significant positive impact (Column 3).

Table 3: Income inequality, inequality reduction and life satisfaction, first and long differences

	(1)	(2)	(3)
	First diff.	First diff.	Long diff.
$\Delta$ Inequality reduction	0.040*** (0.010)	0.068* (0.035)	0.035*** (0.008)
$\Delta$ Post-government income inequality	-0.067** (0.032)	-0.108 (0.102)	-0.032 (0.028)
Country-level controls	yes	yes	yes
Country dummies		yes	
Adjusted R <sup>2</sup>	0.472	0.580	0.656
N	65	65	29

Dependent variable:  $\Delta$ Life satisfaction. Robust standard errors are in parentheses. Country-level controls:  $\Delta \ln(\text{GDP})$ ,  $\Delta$ unemployment rate,  $\Delta$ inflation  
\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

### 3.2. Heterogeneity

Previous literature reports considerable heterogeneity in preference for redistribution and inequality aversion. Inspired by these results, we are interested in the effect of inequality reduction and income inequality among different subsamples and different types of individuals. We presume that association between inequality reduction and satisfaction should be stronger in some groups (Eastern Europe vs. other countries, richer vs. poorer individuals, left-wingers vs. right-wingers, the formerly unemployed vs. the never unemployed). After creating binary indicator variables for these groups, we analyze heterogeneity by regressing life satisfaction on redistribution and income inequality interacted with the relevant indicator variables. Each panel in Table 4 (from A to E) represents an OLS regression where the main effects of inequality and inequality reduction are excluded, but their interaction terms with the indicator variables are included.<sup>19</sup> For example, in Panel A (Eastern Europe vs. other countries) one set of interactions measures the effect of inequality and its reduction in post-communist countries, and another set of interactions measures the effect of inequality and its reduction in non-post-communist countries (four interactions altogether). In this way, we can directly see the effect (and the significance) of redistribution and inequality among the

<sup>18</sup> The estimated coefficient on the change of log GDP per capita is 1.809 in this specification (with country dummies).

<sup>19</sup> The regressions also include the baseline control variables and the relevant indicator variables.

examined groups of individuals. We also report the p-value on the test of equal redistribution/inequality coefficients.<sup>20</sup>

Those living in post-communist countries are more likely to support the reduction of income inequality (Alesina and Fuchs-Schündeln 2007; Corneo and Grüner 2002), so we can conjecture that the effect of inequality and its reduction are stronger in former communist countries. The dissimilar historical background might be able to explain these differences (Alesina and Fuchs-Schündeln 2007). The decades of heavy state intervention might have a long-lasting impact on preferences: people in Eastern Europe may consider redistribution as more favorable and prefer a more equal society. An alternative explanation could rely on the different perceptions of opportunities. If individuals in post-communist countries believe that existing income inequalities are not caused by effort and hard work but rather by luck or connections, then they “suffer” more from inequality. Panel A shows that income inequality is not a significant determinant of well-being in Western European countries, whereas its effect is strong in Eastern Europe. The coefficient on inequality reduction in post-communist countries is almost twice as high as in other countries, but this difference just barely fails to be significant at the 10 percent level.

Napier and Jost (2008) present evidence that conservatives are happier than liberals partly because of their greater tolerance of inequality. Alesina et al. (2004) report that inequality has a more negative effect on the happiness of European leftists. In line with these papers, we find that the effect of redistribution is considerably weaker among individuals with right-wing orientation. On the contrary, the estimated coefficient on income inequality is statistically equal among individuals with left-wing and right-wing orientation (Panel B).<sup>21</sup>

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<sup>20</sup> The difference between the two coefficients is identical to the coefficient on the interaction term that would be estimated if the main effect (e.g. inequality reduction) and an interaction term (e.g. inequality reduction interacted with Eastern Europe in Panel A) would be included in the model. The p-value is identical to the p-value on the interaction term in such a model.

<sup>21</sup> We consider as a left-wing oriented individual who on an 11-point left-right scale denotes value 0-4, and as a right-wing oriented individual who denotes value 6-10. Individuals choosing value 5 are coded as central orientation. In the regression beside the reported interactions we also include the interaction of inequality/inequality reduction with this central orientation dummy. It turns out that centrist individuals are affected by inequality and redistribution more than right-wingers, but less than left-wingers.

Table 4: Income inequality, inequality reduction and life satisfaction, heterogeneity

	Inequality reduction	Post-gov. income inequality	Adjusted R <sup>2</sup>	N
A)				
Eastern Europe	0.051 <sup>***</sup> (0.014)	-0.075 <sup>***</sup> (0.024)	0.281	179,273
Western Europe	0.027 <sup>***</sup> (0.006)	-0.020 (0.020)		
p-value on test of equal coefficients	0.101	0.125		
B)				
Left-wing orientation	0.037 <sup>***</sup> (0.006)	-0.060 <sup>***</sup> (0.021)	0.285	179,273
Right-wing orientation	0.030 <sup>***</sup> (0.006)	-0.049 <sup>**</sup> (0.020)		
p-value on test of equal coefficients	0.044	0.254		
C)				
Richer than country average	0.032 <sup>***</sup> (0.007)	-0.052 <sup>**</sup> (0.021)	0.282	179,273
Poorer than country average	0.040 <sup>***</sup> (0.006)	-0.056 <sup>***</sup> (0.018)		
p-value on test of equal coefficients	0.018	0.627		
D)				
Lives comfortably	0.029 <sup>***</sup> (0.007)	-0.049 <sup>**</sup> (0.020)	0.293	179,273
Does not live comfortably	0.037 <sup>***</sup> (0.006)	-0.052 <sup>***</sup> (0.018)		
p-value on test of equal coefficients	0.059	0.751		
E)				
Has experienced unemployment	0.040 <sup>***</sup> (0.007)	-0.053 <sup>***</sup> (0.018)	0.285	179,273
Did not experience unemployment	0.037 <sup>***</sup> (0.007)	-0.053 <sup>***</sup> (0.019)		
p-value on test of equal coefficients	0.287	0.972		

Dependent variable: Life satisfaction. Robust standard errors adjusted for clustering by country-wave are in parentheses. All regressions include the same control variables (individual- and country-level controls, country dummies and wave dummies) as the baseline regression, plus the relevant indicator variables and their interactions with inequality and redistribution.

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Self-interest naturally influences preference for redistribution: wealthier individuals support less redistribution (Alesina and Giuliano 2011; Alesina and La Ferrara 2005; Molnár and Kapitány 2006; Rainer and Siedler 2008) and are more likely to be unaffected by inequality (Alesina et al. 2004; Oishi et al. 2011). In Panel C we see that those with above average household incomes gain smaller satisfaction from inequality reduction than individuals with below average household incomes, whereas the estimated coefficients on inequality are not different statistically between the two groups. On the other hand, it is not only actual income (or income rank) that influences how people react to inequality and redistribution, but perceived income matters as well (Cruces et al. 2013). In Panel D we measure individuals' material welfare with a subjective indicator: Do they feel that their family lives comfortably on their present income? These estimates show that inequality reduction has a weaker effect on respondents who said that they live comfortably on their present income than on those with lower standards of living, whereas we cannot reject the hypothesis of equal income inequality coefficients. The positive coefficients on inequality reduction in Panel C and Panel D are in line with the hypothesis that the poor might feel more protected and the rich might feel more generous when inequality reduction happens to be higher.

There is evidence that people with previous misfortune are more favorable to redistribution (Alesina and Giuliano 2011; Alesina and La Ferrara 2005). As noted by e.g. Alesina and La Ferrara (2005) the experience of unemployment may increase risk aversion or lead to sympathizing with poorer members of society, which means that inequality and redistribution should have a more considerable effect on individuals with such experiences. Panel E shows, however, individuals who have ever been unemployed for a period of more than three months are equally affected by inequality and inequality reduction, compared to those without such unemployment experience.

#### **4. Conclusion**

The objective of this paper has been to examine the association of income inequality and its reduction by government taxes and transfers (redistribution) with individual's subjective well-being. Using 1-4 waves of the European Social Survey (2002-2009), we have estimated the association of inequality and inequality reduction with life satisfaction. Our results are in line with the former evidence that income inequality is negatively related to well-being. The novelty of our analysis is the clear evidence that income inequality reduction has a positive effect on individual life satisfaction. This result contradicts the findings of Schwarze and Härpfer (2007), who found no relationship between regional-level redistribution and individual's well-being in Germany. This discrepancy might be caused by the different samples and the differences of the measurement-level of the Gini index and redistribution.

Previous papers on preference for redistribution and inequality aversion predict that the effect of inequality and its reduction is different in post-communist and in non-post-communist countries. Our results show that income inequality is not a significant determinant of well-being in Western European countries, whereas its effect is strong in Eastern Europe. Political orientation and self-interest seems to moderate the effect the inequality reduction:

poorer members of society and left-wing oriented individuals seem to be more affected by inequality reduction.

Since we have simultaneously estimated the effects of inequality and its reduction, our results suggest that subjective well-being is influenced not only by the outcome (income inequality), but also by the procedure (redistribution) leading to the outcome. Individuals (especially the poor) may feel more protected because of higher level of inequality reduction by taxes and transfers; they may get the sense that the community will help them in hardship, irrespective of the actual inequality. We have listed three other hypotheses to explain this result. It is possible that it is not (or not only) actual but also perceived income inequality is associated with well-being. If perceived inequality is negatively correlated with extent of redistribution, then this relationship might be reflected in the positive coefficient on inequality reduction. A positive correlation between inequality reduction and the generosity of the welfare services provided by the state might mean that high level of our redistribution variable might capture low level of other dimensions of social inequality. This could increase life satisfaction. Finally, people may also feel themselves more generous because of a higher extent of inequality reduction, which may result emotional benefit for them. Further researches are needed to verify or falsify these explanations.

## Appendix

Table A1: Countries in the analysis by ESS round

Country	Round 1	Round 2	Round 3	Round 4
Austria	x	x	x	
Belgium	x	x	x	x
Bulgaria			x	x
Switzerland	x	x	x	
Cyprus			x	x
Czech Republic	x	x		x
Germany	x	x	x	x
Denmark	x	x	x	x
Estonia		x	x	x
Spain	x	x	x	x
Finland	x	x	x	x
France	x	x	x	x
United Kingdom	x	x	x	x
Greece	x	x		x
Hungary	x	x	x	x
Ireland	x	x	x	x
Italy	x	x		
Luxembourg	x	x		
Latvia			x	x
Netherlands	x	x	x	x
Norway	x	x	x	x
Poland	x	x	x	x
Portugal	x	x	x	x
Romania			x	x
Russia			x	x
Sweden	x	x	x	x
Slovenia	x	x	x	x
Slovakia		x	x	x
Ukraine		x	x	

Table A2: Countries in the analysis by ESS round

Country	Number of waves	Mean LSF	Mean GINI	Mean REDIST	Min LSF	Min GINI	Min REDIST	Max LSF	Max GINI	Max REDIST
Austria	3	7.59	26.67	45.44	7.50	26.57	44.97	7.64	26.73	45.71
Belgium	4	7.39	25.92	33.40	7.27	25.52	32.76	7.44	26.56	34.86
Bulgaria	2	4.56	31.12	13.04	4.41	29.30	12.88	4.70	32.95	13.21
Cyprus	2	7.27	29.00	38.38	7.08	28.82	38.38	7.46	29.18	38.38
Czech Republic	3	6.54	25.31	29.18	6.45	25.27	27.04	6.65	25.39	30.68
Denmark	4	8.47	23.66	50.31	8.44	22.62	50.17	8.52	24.95	50.67
Estonia	3	6.15	33.08	31.60	5.89	32.02	30.81	6.38	34.12	32.16
Finland	4	7.96	25.66	47.06	7.91	25.04	46.41	8.00	26.20	47.47
France	4	6.41	27.78	31.33	6.35	27.57	30.29	6.44	28.02	32.44
Germany	4	6.88	28.53	46.53	6.79	27.60	46.33	6.96	29.73	46.68
Greece	3	6.27	33.44	21.55	6.06	33.36	14.54	6.42	33.58	27.09
Hungary	4	5.50	28.03	36.25	5.29	27.52	30.93	5.69	28.30	41.07
Ireland	4	7.45	31.13	22.34	7.12	30.89	21.71	7.72	31.26	22.70
Italy	2	6.71	33.77	24.16	6.51	33.77	24.08	6.91	33.77	24.23
Latvia	2	5.97	37.67	28.41	5.88	37.49	28.04	6.06	37.84	28.78
Luxembourg	2	7.78	27.19	35.99	7.73	27.12	35.78	7.83	27.27	36.20
Netherlands	4	7.63	27.30	36.01	7.55	26.51	35.70	7.69	27.85	36.57
Norway	4	7.77	24.82	46.43	7.66	24.28	46.30	7.89	25.19	46.53
Poland	4	6.41	30.32	30.33	5.85	29.75	27.29	6.87	30.73	31.79
Portugal	4	5.71	36.44	38.55	5.52	36.17	36.76	5.91	36.71	39.92
Romania	2	6.00	31.96	33.44	5.85	30.83	33.28	6.14	33.09	33.60
Russian Federation	2	5.36	45.72	5.57	5.25	45.24	5.03	5.47	46.21	6.11
Slovak Republic	3	6.06	24.24	30.29	5.58	22.95	28.27	6.51	25.49	32.80

Country	Number of waves	Mean LSF	Mean GINI	Mean REDIST	Min LSF	Min GINI	Min REDIST	Max LSF	Max GINI	Max REDIST
Slovenia	4	6.84	24.83	27.65	6.57	24.62	27.38	6.97	25.22	27.94
Spain	4	7.24	31.78	16.42	7.08	31.20	14.06	7.44	32.61	17.90
Sweden	4	7.83	23.46	48.34	7.80	23.30	47.85	7.86	23.62	48.63
Switzerland	3	8.06	28.48	37.02	8.01	27.60	35.59	8.10	29.35	38.17
Ukraine	2	4.41	34.34	11.08	4.39	33.98	10.27	4.44	34.70	11.89
United Kingdom	4	7.12	34.91	27.31	7.07	34.40	25.97	7.23	35.66	28.31

LSF: Life Satisfaction, GINI: Post-government income inequality, REDIST: Inequality reduction

Table A3: Summary statistics

Variable	N	Mean	SD	Min	Max
Life satisfaction	179,273	6.9	2.3	0	10
Inequality reduction	179,273	33.2	10.9	5.0	50.7
Post-government income inequality	179,273	29.3	4.6	22.6	46.2
Ln(GDP)	179,273	10.1	0.4	8.6	11.1
Unemployment rate	179,273	7.26	3.38	2.60	19.90
Inflation	179,273	3.29	2.73	-4.48	14.11
Age	178,208	46.0	18.2	15	100
Female	179,044	0.47	0.50	0	1
Equivalent household income percentage of the average income)	140,725	1.00	0.95	0.01	52.73
Household size	179,099	3.03	1.45	1	8
Education: ISCED 0-1	178,337	0.14	0.34	0	1
Education: ISCED 2	178,337	0.20	0.40	0	1
Education: ISCED 3-4	178,337	0.42	0.49	0	1
Education: ISCED 5-6	178,337	0.24	0.43	0	1
Main activity: paid work	178,094	0.51	0.50	0	1
Main activity: education	178,094	0.10	0.29	0	1
Main activity: unemployed, looking for a job	178,094	0.03	0.18	0	1
Main activity: unemployed, not looking for a job	178,094	0.02	0.13	0	1
Main activity: retired	178,094	0.21	0.41	0	1
Main activity: housework, looking after children	178,094	0.10	0.30	0	1
Main activity: other	178,094	0.04	0.19	0	1
Health: very good	179,079	0.22	0.42	0	1
Health: good	179,079	0.43	0.49	0	1
Health: fair	179,079	0.26	0.44	0	1
Health: bad	179,079	0.07	0.25	0	1
Health: very bad	179,079	0.01	0.12	0	1
Living with a partner	177,873	0.63	0.48	0	1
Big city	178,689	0.19	0.40	0	1
Suburbs or outskirts of big city	178,689	0.12	0.32	0	1
Town or small city	178,689	0.30	0.46	0	1
Village	178,689	0.39	0.49	0	1

Table A4: Income inequality, inequality reduction and life satisfaction, detailed results

	Coefficient	SE
Inequality reduction	0.036 <sup>***</sup>	(0.006)
Post-government income inequality	-0.051 <sup>***</sup>	(0.019)
Ln(GDP per capita)	1.385 <sup>***</sup>	(0.362)
Unemployment rate	-0.020 <sup>*</sup>	(0.010)
Inflation	-0.011	(0.008)
Age	-0.066 <sup>***</sup>	(0.004)
Age squared/100	0.072 <sup>***</sup>	(0.004)
Female	-0.136 <sup>***</sup>	(0.013)
Education: ISCED 2	0.075 <sup>**</sup>	(0.034)
Education: ISCED 3-4	0.116 <sup>***</sup>	(0.036)
Education: ISCED 5-6	0.269 <sup>***</sup>	(0.046)
Main activity: education	0.312 <sup>***</sup>	(0.035)
Main activity: unemployed, looking for job	-1.075 <sup>***</sup>	(0.051)
Main activity: unemployed, not looking for job	-0.778 <sup>***</sup>	(0.066)
Main activity: retired	0.124 <sup>***</sup>	(0.024)
Main activity: housework, looking after children	-0.003	(0.025)
Main activity: other	-0.190 <sup>***</sup>	(0.034)
Living with partner	0.499 <sup>***</sup>	(0.019)
Health: very good	3.172 <sup>***</sup>	(0.078)
Health: good	2.681 <sup>***</sup>	(0.072)
Health: fair	2.006 <sup>***</sup>	(0.067)
Health: bad	1.034 <sup>***</sup>	(0.070)
Big city	-0.134 <sup>***</sup>	(0.026)
Suburbs or outskirts of big city	-0.151 <sup>***</sup>	(0.022)
Town or small city	-0.093 <sup>***</sup>	(0.017)
Equivalent household income (% of the average income)	0.170 <sup>***</sup>	(0.019)
Household size	0.027 <sup>***</sup>	(0.007)
Country dummies	Yes	
Wave dummies	Yes	
Adjusted R <sup>2</sup>	0.281	
N	179,273	

Dependent variable: Life satisfaction. Robust standard errors adjusted for clustering by country-wave are in parentheses. Dummies are included for missing control variables. Reference categories: Education level: ISCED 0-1, Main activity: paid work, Health: very bad, Domicile: village/farm or home in countryside.

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Table A5: Income inequality reduction, income inequality and life satisfaction, robustness analysis

	(1)	(2)	(3)	(4)	(5)
Inequality reduction (trend component; HP filter)			0.036 <sup>***</sup> (0.006)		0.055 <sup>***</sup> (0.009)
Inequality reduction (cyclical component; HP filter)			0.003 (0.009)		
Inequality reduction (absolute measure)	0.057 <sup>***</sup> (0.010)				
Inequality reduction (original)		0.030 <sup>***</sup> (0.006)			
Inequality reduction (HP trend based on years 2001-2009)				0.034 <sup>***</sup> (0.006)	
Post-government income inequality (trend component; HP filter)	-0.080 <sup>***</sup> (0.017)		-0.051 <sup>***</sup> (0.019)		
Post-government income inequality (cyclical component; HP filter)			0.003 (0.017)		
Post-government income inequality (original)		-0.027 <sup>**</sup> (0.013)			
Post-government income inequality (HP trend based on years 2001-2009)				-0.046 <sup>**</sup> (0.019)	
Pre-government income inequality (trend component; HP filter)					-0.031 <sup>***</sup> (0.012)
Adjusted R <sup>2</sup>	0.281	0.280	0.281	0.281	0.281
N	179273	179273	179273	179273	179273

Dependent variable: Life satisfaction. All regressions include the same control variables (individual- and country-level controls, country dummies and wave dummies) as the baseline regression (Table 1). Robust standard errors adjusted for clustering by country-wave are in parentheses. Inequality reduction (trend component; HP filter) and Post-government income inequality (trend component; HP filter) are the same inequality and inequality reduction variables used throughout the paper.

Inequality reduction (absolute measure) = Pre-government Gini index – Post-government Gini index.

Post-government income inequality (original) and Inequality reduction (original) = Original values from SWID (not HP trends)

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

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