European Commission

JRC SCIENTIFIC AND POLICY REPORTS

Income Inequality and Social Outcomes: Bivariate Correlations at NUTS1 Level

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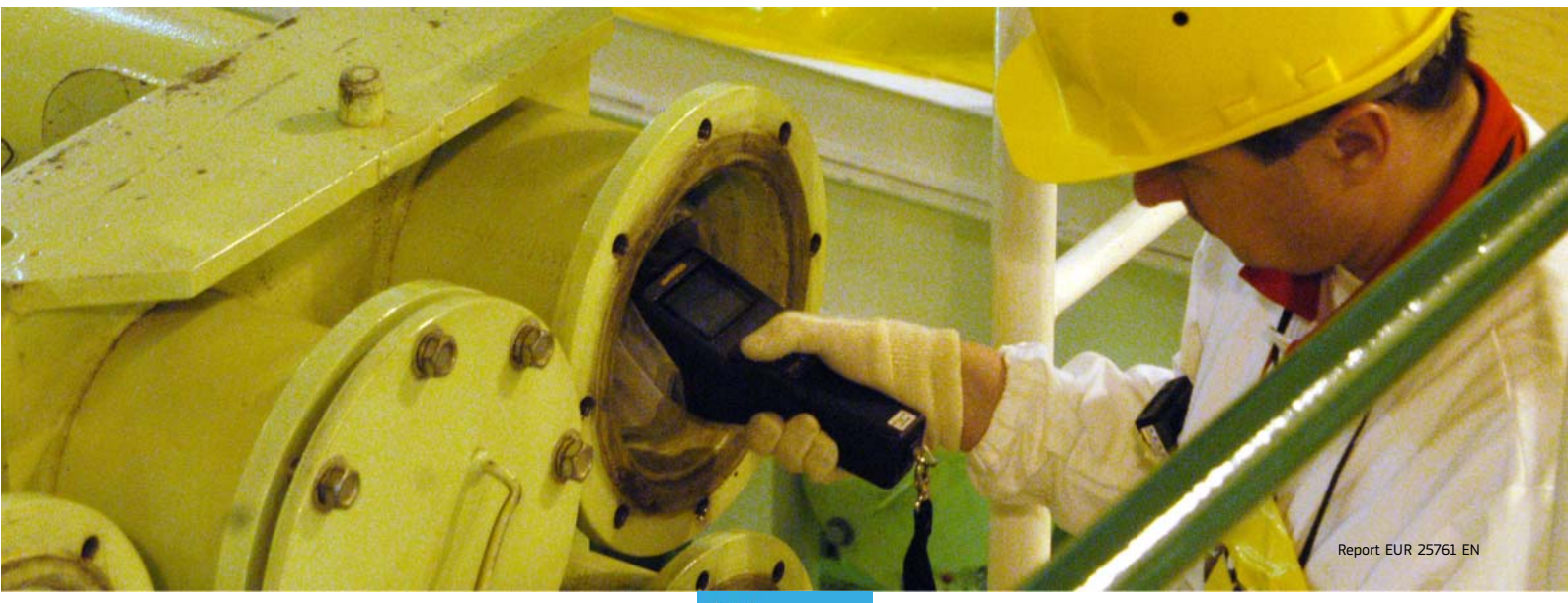
2013



Report EUR 25761 EN

Joint Research Centre

European Commission
Joint Research Centre
Institute for the Protection and Security of the Citizen

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JRC78630

EUR 25761 EN

ISBN 978-92-79-28229-4

ISSN 1831-9424

doi:10.2788/80746

Luxembourg: Publications Office of the European Union, 2013

Printed in Italy

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1 Introduction

The last two decades have been marked by a growing concern about rising inequality. In a recent book (2012), Joseph Stiglitz, a former Nobel prize winner in Economics argues that rising income inequality is one of the main factors underlying the economic and financial crisis in the United States. In its 13th-19th October 2012, the Economist, a magazine, has devoted a special report on income inequality in the world.

Media interest has surrounded the emergence of the inequality debate in public arenas and square. Protesters in the United States (the Occupy Wall Street movement) and in Spain (the *indignados*) have denounced the present system as fundamentally flawed and unfair. A rally cry of these movement is that bankers benefiting from large bonuses have been bailed out while the victims of the crisis brought by the very same bankers are stuck in unemployment. The We are the 99% slogan and the associated web blog "We are the 99 percent" (see http://wearethe99percent.tumblr.com/) also refer to this growing unequal distribution of wealth.

On a broader perspective the issue about the benefits (or otherwise) of redistributive policies is at the heart of the presidential election debate Kerry versus Obama in the US at the time of writing the present report. Nobel prize economist and polemist Paul Krugmann in his blog (http://krugman.blogs.nytimes.com/) denounces the anti-Keynesian stance and policies of his adversaries. In this debate all is up for discussion, from the interpretation of the Great Depression and the New Deal to the economic success of Latvia in fighting the present crisis, with the issue of inequality squarely at the centre-stage.

The development of income inequality in the EU Member States has been the subject of a recent publication by the OECD (2011). The report highlights a general trend of widening income disparities. While in the 1980s the Gini coefficient was equal to around 0.29 in OECD countries it markedly rose to 0.32 in the late 2000s. Particularly striking is the increase in income inequality of former equal societies, such as the Nordic countries and Germany. The causes of this rising income inequality in the past decades have also attracted much political and scholarly attention. The OECDs (2011) report provides a wealth of explanatory mechanisms, ranging from rising wage inequality to different taxation policies and household structures.

A different perspective is to look at the social and economic challenges associated with rising income inequalities in the EU, i.e. to ask whether and why we should pay attention to the growing polarization between the 1% and the 99% of the population? These questions gained prominence through a widely cited

book by Richard Wilkinson and Kate Pickett entitled "The Spirit Level, Why More Equal Societies Almost Always Do Better" (2009). Although the authors main tenet that more equal societies perform better on a wide range of social outcomes is intuitive and straightforward, the authors do not provide convincing empirical evidence for their propositions and the lack of a causal link between inequality and the many social outcomes analyzed in the book has been the subject of a heated debate, see e.g. the authors own blog for a list of refutations and counter-refutations http://www.equalitytrust.org.uk/resources/response-to-questions.

The book of Wilkinson and Pickett has been instrumental in promoting a cooperation between the Directorate General Joint Research Centre (DG JRC) and the Directorate General for Employment, Social Affairs and Inclusion (DG EMPL) on the social and economic challenges associated with the rising income inequality in Europe.

The cooperation aims at analyzing the socio-consequences of rising income inequalities in Europe. The present report is the second outcome of this project, the first being a literature review (EUR No. pending) on the relationship between income inequality and social outcome variables in the area of happiness, criminality, health, social capital, education, voting behavior and female labor participation. [1]. In the present report, we complement the literature review by examining the bivariate correlations existing between income inequality and some of the social outcomes mentioned above.

The present analysis is carried out at the sub-national level (NUTS1 level) and focuses on bivariate correlations. In a next report, a multivariate analysis will be performed for a reduced number of social outcomes. In this last report we shall attempt to establish a clear direction of causality. The chosen social outcomes are political participation and crime.

This present report is organized as follows. Section 2 addresses a number of data and methodological issues. In particular, we tackle (i) the regional dimension of the analysis, (ii) the measures employed for income inequality, and (iii) the data sources used for income and the social outcomes. In addition, we provide information on the empirical methods used for the analysis as well as the robustness checks. Section 3 constitutes the main part of this work and starts by presenting an overview over the income inequality observed on NUTS1 level in Europe. The following subsections discuss then the regional distribution of social outcomes over Europe and presents the bivariate correlations between the income inequality measures and the social outcomes as well as the associated ordinary least squares coefficients.

[1] Report delivered by JRC to DG EMPL in May 2012

As already noted in the literature review, the correlations presented in this report confirm the negative relationship between income inequality and some social outcomes. More precisely, we find that higher income inequality is significantly related to lower recorded voter turnout, lower participation in voluntary organizations, higher crime rates and higher early school leaver rates. Results remain valid, irrespective of the estimator or the income disparity index employed. Trust and self-reported voting behaviors are also negatively and significantly associated with income inequality, though the findings are found to be sensitive to the estimation method or the inequality index used for the computation of the bivariate statistics. Finally, the social outcomes related to well-being and health are not found to be significantly associated with income disparities.

As the empirical analysis below is only based on bivariate statistics, the results should be taken with a pinch of salt as none of the statistical associations discussed in this paper can be regarded as evidence of a causal relationship, which will be the subject of our next effort.

2 Methodological and data issues

2.1 Sub national level of analysis

The empirical analysis is carried out at the sub-national level.[2] To that end, we have used the regional classification developed by Eurostat in the 1970s, i.e., the Nomenclature of Territorial Units for Statistics (NUTS), which provides a single and uniform geographical division of the European Union into a hierarchical set of regions. The NUTS classification subdivides the economic territory of the Member States into three levels: NUTS1, NUTS2 and NUTS3. NUTS3 are subdivisions of NUTS2 which are themselves sub-divisions of NUTS1.[3] NUTS1 represents major socioeconomic regions, NUTS2 captures basic regions used for the implementation of regional policies while NUTS3 relates to smaller areas.[4] While the NUTS Regulation has defined minimum and maximum population thresholds for the average size of the NUTS1-3 regions as shown in Table 1, the NUTS classification is also related to administrative subdivisions already existing in Member States.

[2]This is an explicit requirement of the technical annex describing this cooperation AA-JRC N.32376-2011 NFP

[3]Note that two lower levels of Local Administrative Units (LAU) have also been defined: the upper LAU level (LAU level 1, formerly NUTS level 4) and the lower LAU level (formerly NUTS level 5).

[4]The NUTS classification has acquired a legal status relatively recently, after the adoption of a Regulation in May 2003. Previously, the use and update of the NUTS classification was done under "gentlemen's agreements" between the Member States and Eurostat.

Table 1: NUTS classification: population thresholds.

	Min Population	Max Population
NUTS 1	3 000 000	7 000 000
NUTS 2	800 000	3 000 000
NUTS 3	150 000	800 000

Source: *Regions in the European Union Nomenclature of territorial units for statistics* (2010).

For instance, NUTS2 and 3 respectively correspond to the *regions* and *departments* in France and to *Comunidades autónomas* and *provincias* in Spain. Similarly, NUTS1 and NUT3 are the *Länder* and *Kreise* in Germany. Table 2 reports the number of NUTS1-3 regions for each EU Member States.[5] The current NUTS classification valid since the first January 2012 divides the 27 EU countries into 97 regions at NUTS 1, 271 regions at NUTS 2 and 1303 regions at NUTS 3 level.[6]

The compilation of regional statistics raises specific issues, particularly when regional indicators are derived from micro surveys nationally representative. Whilst, an analysis of the correlation between income inequality and several social outcomes would be finer at the NUTS3 level than at the NUTS1 level, analysis on the NUTS3 level are not very reliable due to low number of observations per NUTS3 region. This is particularly true in the present report as most of the social outcomes are drawn from cross-country surveys with limited sample sizes. For this reason, the empirical analysis reported in this report has been conducted at the NUTS1 level.

2.2 Income inequality indices

The two main indicators of income inequality used for the analysis are (i) the ratio of the income received by the richest 20% households to the income held by the 20% poorest households (S80/S20 ratio) and (ii) the Gini coefficient. The sections below briefly introduce these two inequality measures.

2.2.1 The S80/S20 Ratio

The S80/S20 ratio can be expressed as follows :

[5]Since 2003, the NUTS regulation has been amended several times to reflect the introduction of the regions of the 10 new Member States in 2004 and of the regions of Bulgaria and Romania in 2007.

[6]In this document, we shall consider the NUTS classification that had been used in the previous period (2006 NUTS classification), given that all the data used for the computation of bivariate statistics refer to the period between 2005 and 2010. The number of NUTS1 remains unchanged.

Table 2: Number of NUTS1, NUTS2 and NUTS3 by country.

Country	NUTS 1	NUTS 2	NUTS 3
AT	3	9	35
BE	3	11	44
BG	2	6	28
CZ	1	8	14
DK	1	5	11
DE	16	39	429
EE	1	1	4
IE	1	2	8
GR	4	13	51
ES	7	19	59
FR	9	26	100
IT	5	21	107
CY	1	1	1
LV	1	1	6
LT	1	1	10
LU	1	1	1
HU	3	7	20
MT	1	1	2
NL	4	12	40
PL	6	16	66
PT	3	7	30
RO	4	8	42
SI	1	2	12
SK	1	4	8
FI	2	5	20
SE	3	8	21
UK	12	37	133
EU-27	97	271	1303

Source: *Regions in the European Union Nomenclature of territorial units for statistics* (2010). If the number of individuals living in a Member State is below the minimum threshold for a given NUTS level, the Member State itself constitutes a NUTS territorial unit of that level. There are 11 countries (CZ, DK, EE, IE, CY, LV, LT, LU, MT, SI, SK) for which NUTS0 and NUTS1 coincide.

$$\frac{S_{80}}{S_{20}} = \frac{\sum_{i|y_i \geq Q_{80}} y_i}{\sum_{i|y_i \leq Q_{20}} y_i} \tag{1}$$

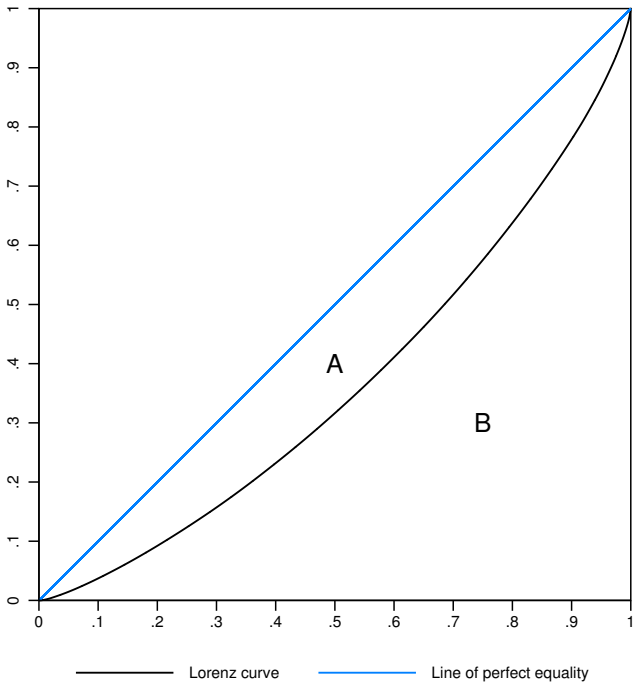
where Q_{80} and Q_{20} represent the 80th and the 20th percentile respectively. The $\frac{S80}{S20}$ ratio allows for a crude perception of a society's degree of polarization. If S80/S20 is equal to x, it implies that the income of the richest 20% of the population is higher by a factor of x than the income of the poorest 20%. The $\frac{S80}{S20}$ ratio is an appealing measure of disparity as it is both easily understandable and represents an effective way to measure the distance between the extremes of a distribution. However, by its very nature, the $\frac{S80}{S20}$ ratio ignores information on income and income dispersion between the 20th and the 80th percentiles, which constitutes the majority of the population under consideration. The presence of extreme income values, belonging to either the upper tail or the lower tail of the income distribution, could produce high value of $\frac{S80}{S20}$ ratio, even if the

interquantile range 80/20 is fairly equitable.[7]

2.2.2 The Gini coefficient

The Gini coefficient has been the most popular method for operationalizing income inequality in literature. The Gini coefficient is defined on the basis of the Lorenz curve. The Lorenz curve maps the cumulative income share on the y-axis against the cumulative population share ordered from the lowest income to the highest one on the x-axis as seen below:

Figure 1: Lorenz curve.



Source: Authors' calculations on 2009 EU-SILC data.

In case of perfect equality in the distribution of education, the Lorenz curve and the diagonal coincide. The larger the distance of the curve from the diagonal line, the larger the inequality. When for two countries, x and y, the Lorenz curve of country x lies in any point above the Lorenz curve of country y, income disparities

[7]Note that this indicator satisfies few of the statistical desirable qualities (i.e., symmetry, scale invariance, Pigou-Dalton transfer and decomposability properties (see Cowell (2009) for additional information) of inequality indices. In particular, this statistic does not satisfy the Pigou-Dalton transfer principle, i.e, a transfer of income from a rich household to a poor one in the interquantile range 80/20 does not result in a more equal income distribution as measured by the $\frac{S80}{S20}$ ratio.

in country y are higher than in country x.[8]

The Gini coefficient summarizes the whole income distribution and corresponds to the ratio of the area between the diagonal and the Lorenz Curve (A) and the total area under the diagonal (A+B). The coefficient ranges from 0 (perfect equality) to 1 which represents the case in which all income is owned by one individual (perfect inequality).

The Gini coefficient can also be expressed as a function of all inter-household income differences taken in absolute value, normalized around the mean income. More precisely, the Gini coefficient can be computed using the following formula:

$$GINI = \frac{1}{2n(n-1)\mu} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j| \tag{2}$$

with y_i defined as the income level of an household i, n the number of households and μ the average income. The *Gini* coefficient ranges between 0 and 1. When each household has an income equal to μ, then the *Gini* coefficient is 0. Similarly, if one recipient receives an income amounting to $n * \mu$, while the rest of the population has no income, the *Gini* coefficient takes the value 1. As n increases, the computation of (1) can be cumbersome. However, as shown by Deaton (1997), insofar as we can rank the n units from the richest ($r_i = 1$) to the poorest ($r_i = n$), the Gini coefficient can be computed as follows:

$$Gini = \frac{n+1}{n-1} - \frac{2}{n(n-1)\mu} \sum_{i=1}^{n} r_i y_i \tag{3}$$

In contrast to the S80/S20 ratio, the Gini is a synthetic measure of income inequality which describes the overall inequality across all the income distribution. This inequality metric is bounded between 0 and 1 and satisfies the Pigou-Dalton transfer principle, i.e., a transfer of income from a rich household to a poor one results in a more equal income distribution. Indeed as shown by the formula above, the Gini coefficient gives more weight to poorer households in the income distribution than to richer ones.[9]

The Gini is also relatively insensitive to the tails of the distribution and thus

[8] If the two Lorenz curves cross each other, then we cannot conclude which distribution is more equitable using only the information given by the shape of the 2 Lorenz curves.

[9] The Gini coefficient satisfies most of the desirable statistical properties. In particular, this income inequality measure is independent of the population size, scale invariant and satisfies Pigou-Dalton's Principle of Transfers (Dalton, 1920). It can be used to compare income inequality across different countries as it is independent of the unit of measurement. Inequality is often decomposed by population groups to measure the contribution of the within country and between country effects to the total income inequality. However the Gini coefficient cannot be easily decomposed into between and within-country groups or to be added across groups to show the sources of inequality.

relatively robust to problems associated with reliability of extreme values, its value being more sensitive to changes around the mode than to variations in the extremes of the income distribution. However, the interpretation of the Gini coefficient is not as straightforward as for the S80/S20 ratio. Indeed, although the level of inequality is given by the value of the coefficient, its interpretation can only be done in comparative terms.

2.3 Income data

2.3.1 Income definition

One of the first steps in calculating income inequality is to decide about which income measure to use. An appropriate income measure should reflect the net financial means available to an individual. Most commonly used is the concept of *total disposable household income* (OECD, 2011; Eurostat, 2010). This is the aggregate income that we employ in this analysis.

Total disposable household income includes all income accruing to the household, e.g. gross employee income, income (also losses) from self-employment, income from rental of property etc., plus benefits received by the state, such as unemployment benefits, housing allowances, pensions, and subtracts taxes and social insurance contributions paid (Eurostat, 2010). Thereby, this measure reflects the financial means available to the household for consumption.

The next step in the calculation of an income inequality measure is to distribute the household income to all individuals living in the household. To satisfy the consumption of an additional household member additional income is needed, albeit income needs only to increase at a decreasing rate. To illustrate this, adding another person to a one-person household is likely not to double energy consumption. To reflect these economies of scale the total household income is divided by an equivalence scale. The equivalence scale used in this report is the modified OECD scale and has the following weights: The first adult, i.e. person age 14 or older, in the household weights 1, all following adults are assigned a weight of 0.5, and children weight 0.3 (Eurostat, 2012). For example for a two adult family with three children aged 10, 12, and 15, the equivalence scale would be: $1 + 0.5 + 0.5 + 0.3 + 0.3 = 2.6$. Hence, the total disposable household income would be divided by 2.6 and the value of the equivalised income would then be artificially assigned to all household members.

While there seems to be a consensus that disposable income is an adequate measure of economic well-being it should be noted that it is not clear whether to include other benefits accruing to households in the income measure. In particular there is an ongoing debate whether and how to include the so-called “imputed

rents" in the income measure. The argument is that households, who either own their apartment or house and thus do not pay rent, or households, who pay rents which are substantially below the market value, need to spend less income for housing costs and thus have more income available for other consumption. According to Eurostat (2010, chapter 7) including imputed rent in the income increases the mean income and decreases income inequality in almost all countries (exceptions are the Netherlands and Norway). However, the ranking of countries remain unchanged when imputed rent is included (see Frick *et al.*, 2008).[10]

In addition to imputed rent, it is also noteworthy that own consumption, i.e. consumption of goods that are produced by oneself is not included in income and this might understate the actual income of households in certain regions (Eurostat, 2010, p.180). However, so far, there is no comparable and reliable information of own consumption to be included in the disposable income measure. Given the limited data availability and conceptual problems of imputed rent and own consumption, the total disposable household income used in the current analysis does not include imputed rents and own consumption.

2.3.2 Data sources

For most countries information on disposable income is drawn from the 2005-2009 waves of the European Union Statistics on Income and Living Conditions (henceforth EU-SILC). The EU-SILC is an annual household survey aiming at collecting comparable cross-sectional and longitudinal micro-data on income, poverty, social exclusion and other living conditions. This is the main source of information about living standard and poverty in the Member States of the European Union.[11] EU-SILC was launched in 2004 as a replacement of the European Household Panel Survey. The first release of data (relating to the year 2004) included data for 13 Member States (Austria, Belgium, Denmark, Estonia, Finland, France, Greece, Ireland, Italy, Luxembourg, Portugal, Spain, Sweden), plus Norway and Iceland. From 2005, Germany, Netherlands and the UK joined, along with the rest of the new Member States (Cyprus, Czech Republic, Hungary, Latvia, Lithuania, Poland, Slovenia, Slovakia). Finally, from 2007 onwards, the EU-SILC represents all 27 Member States, and includes Turkey and Switzerland as non-members alongside Norway and Iceland.[12] Also, very important in the context of this

[10] There are also a number of methodological and data related issues when estimating imputed rent. In particular, rents could be imputed by relying on the capital market or on self-estimation. Depending on which method is used, values for imputed rents differ substantially and they might not be comparable across countries (see Eurostat, 2010).

[11] See http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/eu_silc for further information.

[12] As EU-SILC is a harmonised data framework involving ex ante standardisation (in contrast to the European Community Household Panel, ECHP, survey), data from all countries are not collected via a single standard survey instrument. Instead, Member States are given a list of

work, the data includes for the majority of countries information on the region of residence of households allowing us to construct regional indices of income inequality. This is true for all countries, but UK, the Netherlands, Germany and Portugal; for these 4 countries, the region of residence is not reported.

We have been unable to find surveys on living conditions for Portugal and the Netherlands with information on the region of residence. For the Netherlands, income inequality indices will thus be measured at the country level, whereas for Portugal they will be calculated by using income data pertaining to the mainland region PT1. Note that for Portugal we exclude the regions of the archipelago of the Azores and Madeira, which represent less than 5% of the total population. Lastly, we excluded from our sample the French overseas regions (Guadeloupe, Martinique, Guyane, Reunion) because of lack on information on the social outcome variables.

For Germany and the UK, we have respectively employed the 2004-2009 waves of the German Socio-Economic Panel (GSOEP) and the version 2009/2010 of the Household Below Average Income Survey (HBAI). GSOEP is the German representative panel household survey (see Wagner et al. (2007) for additional information concerning the survey) which collects yearly data on socio-economic conditions since 1984. The data contains information on the *Länder* of residence of the interviewed households. The HBAI data is drawn from the Family Resources Survey (FRS), which is a continuous cross-sectional survey across Great Britain running since 1994. The HBAI dataset provides a rich set of information about income, household composition and, crucial for our aim, Government Office Regions, which essentially correspond to the NUTS1 regions.

The three surveys - EUSILC, GSOEP and HBAI - are large nationally representative surveys with a number of sampled households amounting to respectively around 137,000 (2009 figures including Norway and Iceland), 12,000 and 25,000. EU-SILC and GSOEP data record information on total disposable household income as of the previous calendar year, whilst the income reference period for the HBAI dataset is the financial year (April to March). EUSILC and GSOEP document *annual* household income (aggregate income in a calendar year)while HBAI provides information on current income (income in the period of the survey interview) on a *weekly* basis.[13] Though we might think that these differences in the reference could affect the shape of the income distribution and undermine com-

variables which must be present in the data, thus giving some flexibility to how the required information must be collected.

[13]For Germany, information on income comes from the Cross-National Equivalent File, a dataset created by Cornell University in cooperation with DIW-Berlin, ISER-Essex and StatsCan-Ottawa, consisting of variables from the GSOEP, American PSID, Canadian SLID and British BHPS. In this file the income variables are annualized, meaning that the typical GSOEP variables asking about monthly income components have been transformed.

parability of the inequality measures across surveys, Böheim and Jenkins (2006), using the British Household Panel Survey, have shown that current income and annual income definitions lead to very similar estimates of income distribution statistics. Accordingly, we decided not to apply any transformation to the income data.

Furthermore, information on household disposable income is recorded in current prices, meaning that the monetary value of the income is expressed according to the prices in the survey year. In order to remove the effect of general prices level, the income variables are set to the 2009 prices by using the Harmonised Consumer Price Index provided by Eurostat before calculating the inequality measures. Note that for the UK, the HBAI dataset provides already harmonized weekly household income within the survey year, and hence takes into account the different time period in which it is collected.

2.4 Social Outcomes

2.4.1 Indicators of social outcomes

We examine the effect of income inequality on 6 categories of social outcomes: (i) well-being, (ii) criminality, (iii) health, (iv) social capital, (v) education, and (vi) political participation. We measure each social outcome with 2 indicators. When possible, we have selected one *objective* and one *subjective* measure based on self-reported information. Table 9 provides additional information regarding the definition of each of the selected indicators, while Table 3 presents some summary statistics.

Table 3: Summary statistics of the sample.

	Inequality Index		Social outcomes											
	Gini	S80/S20	Happiness (score)	Life Satisfaction (score)	Criminality & Vandalism (%)	Domestic burglary ('000 inhab.)	Self-reported health (score)	Chronic disease (%)	Membership (%)	Trust in people (score)	Tertiary education (%)	Early leavers (%)	Voting (%)	Turnout (%)
Austria														
AT1	0.27	4.06	3.12	7.38	0.18	6.00	2.03	0.26	0.20	5.10	21.33	10.50	0.80	75.36
AT2	0.24	3.40	3.22	7.80	0.06	2.00	2.07	0.24	0.25	5.05	16.20	7.42	0.71	73.42
AT3	0.25	3.47	3.20	7.54	0.06	2.33	1.97	0.24	0.31	5.07	17.27	9.45	0.78	72.25
Belgium														
BE1	0.41	7.46	3.15	6.63	0.36	9.00	2.07	0.24	0.34	4.91	41.63	18.80	0.65	85.90
BE2	0.25	3.54	3.49	7.65	0.12	5.67	2.00	0.21	0.56	5.35	33.70	9.47	0.83	91.74
BE3	0.27	3.84	3.28	7.05	0.20	11.00	2.17	0.30	0.34	4.50	30.77	14.42	0.80	88.80
Bulgaria														
BG3	0.36	6.54	2.63	4.43	0.24	2.00	2.51	0.30	0.07	3.22	18.97	20.42	0.72	59.10
BG4	0.33	5.62	2.70	4.71	0.23	5.00	2.43	0.25	0.07	3.65	27.13	11.62	0.67	56.31
Cyprus														
CY0	0.29	4.27	3.04	7.21	0.11		1.93	0.29	0.11	4.35	32.77	13.93	0.87	89.00
Czech Republic														
CZ0	0.25	3.51	2.96	6.30	0.13	1.14	2.42	0.31	0.26	4.51	15.60	5.40	0.59	63.51
Germany														
DE1	0.28	4.25	3.07	7.26	0.06	1.33	2.30	0.32	0.36	5.14	28.60	10.75	0.70	78.68
DE2	0.32	5.01	3.13	7.22	0.06	1.00	2.33	0.34	0.47	5.01	27.43	10.35	0.75	77.87
DE3	0.30	4.75	2.79	6.68	0.16	2.00	2.37	0.41	0.09	4.92	34.97	15.82	0.73	77.39
DE4	0.25	3.52	2.70	6.45	0.10	1.00	2.41	0.40	0.22	4.26	30.47	10.77	0.72	74.94
DE5	0.28	3.47	3.00	6.62	0.19	4.00	2.42	0.36	0.08	4.56	24.47		0.79	75.50
DE6	0.28	3.81	3.10	6.84	0.17	4.00	2.29	0.34	0.20	4.86	29.10	17.27	0.69	77.53
DE7	0.33	5.23	3.00	7.09	0.08	1.67	2.36	0.39	0.31	4.94	27.17	12.80	0.75	78.71
DE8	0.26	3.64	2.75	6.34	0.08	1.00	2.43	0.37	0.08	4.37	26.70	12.50	0.70	79.38
DE9	0.29	4.31	2.99	7.38	0.06	1.50	2.35	0.37	0.29	5.07	21.67	13.67	0.78	71.25
DEA	0.31	4.75	3.02	7.11	0.12	2.60	2.33	0.37	0.21	4.66	22.63	14.88	0.74	78.34
DEB	0.28	4.16	3.03	7.10	0.06	1.67	2.36	0.30	0.50	4.86	23.40	14.77	0.76	78.72
DEC	0.29	4.38	2.58	6.72	0.08	3.00	2.48	0.40	0.45	4.47	19.80		0.71	79.43
DED	0.24	3.44	2.79	6.37	0.09	1.50	2.41	0.38	0.16	4.69	32.40	7.68	0.77	75.69
DEE	0.24	3.37	2.75	6.40	0.10	1.00	2.51	0.40	0.25	4.00	24.60	11.55	0.68	70.96
DEF	0.30	4.59	2.91	7.11	0.06	3.00	2.37	0.36	0.47	4.97	22.63	13.65	0.75	79.09
DEG	0.22	3.05	2.70	6.32	0.06	1.00	2.51	0.38	0.25	4.36	28.03		0.75	75.49

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	Inequality Index		Social outcomes											
	Gini	S80/S20	Happiness (score)	Life Satisfaction (score)	Criminality & Vandalism (%)	Domestic burglary ('000 inhab.)	Self-reported health (score)	Chronic disease (%)	Membership (%)	Trust in people (score)	Tertiary education (%)	Early leavers (%)	Voting (%)	Turnout (%)
Denmark														
DK0	0.25	3.78	3.44	8.45	0.13		1.90	0.25	0.54	6.93	33.53	10.48	0.86	85.56
Estonia														
EE0	0.33	5.38	2.86	6.37	0.17	2.50	2.55	0.39	0.21	5.48		13.47	0.56	61.91
Spain														
ES1	0.29	4.67	3.15	7.17	0.09	0.17	2.47	0.32	0.12	4.99	30.93	23.45	0.67	71.37
ES2	0.28	4.54	3.04	7.39	0.12	0.20	2.25	0.26	0.07	5.28	38.47	19.35	0.67	69.60
ES3	0.32	5.36	3.29	7.10	0.30	2.00	2.21	0.22	0.05	5.29	39.17	25.55	0.74	79.08
ES4	0.32	5.65	3.14	7.53	0.11	1.00	2.34	0.28	0.06	5.11	26.67	31.20	0.77	78.61
ES5	0.30	4.88	3.17	7.47	0.22	1.00	2.26	0.26	0.12	5.15	28.23	32.15	0.69	73.24
ES6	0.32	5.91	3.16	7.17	0.19	1.25	2.30	0.28	0.09	5.11	24.77	37.58	0.70	73.53
ES7	0.33	6.06	3.12	7.61	0.18	1.00	2.39	0.28	0.06	4.56	23.40	32.85	0.71	65.87
Finland														
FI1	0.26	3.68	3.00	7.95	0.12	1.00	2.09	0.41	0.32	6.51	37.37	9.85	0.73	65.13
France														
FR1	0.30	4.70	3.31	6.35	0.23		2.08	0.29	0.25	4.65	39.27	11.62	0.60	
FR2	0.26	3.61	3.31	6.16	0.16		2.22	0.35	0.24	4.23	22.10	13.70	0.67	
FR3	0.27	3.72	3.24	6.05	0.21		2.21	0.33	0.27	4.07	24.60	15.53	0.67	
FR4	0.25	3.57	3.23	6.28	0.17		2.23	0.35	0.20	4.30	24.97	11.52	0.66	
FR5	0.25	3.49	3.25	6.33	0.11		2.15	0.34	0.26	4.54	25.37	9.08	0.72	
FR6	0.29	4.22	3.20	6.28	0.12		2.23	0.37	0.26	4.34	29.33	10.57	0.71	
FR7	0.27	3.84	3.27	6.39	0.14		2.14	0.32	0.28	4.39	28.27	11.93	0.64	
FR8	0.29	4.30	3.15	6.13	0.20		2.23	0.34	0.21	4.57	26.00	16.10	0.65	
Greece														
GR1	0.32	5.51	3.13	5.61	0.07		1.91	0.25	0.14	3.91	22.60	14.23	0.81	74.26
GR2	0.35	6.04	2.92	5.96	0.02		1.93	0.22	0.06	3.41	16.93	17.73	0.81	70.14
GR3	0.33	5.48	2.91	5.74	0.17		1.80	0.20	0.13	4.35	28.57	11.13	0.71	73.62
GR4	0.32	5.19	2.87	6.49	0.03		1.97	0.26	0.05	4.04	17.30	20.58	0.79	70.10
Hungary														
HU1	0.27	4.00	2.93	5.64	0.18	3.00	2.56	0.38	0.07	4.53	29.27	9.20	0.73	70.33
HU2	0.25	3.64	2.98	5.52	0.08	1.67	2.64	0.38	0.11	4.28	15.43	11.67	0.73	65.74
HU3	0.27	3.95	2.90	5.36	0.10	2.00	2.70	0.41	0.09	4.20	15.80	13.15	0.72	63.47

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	Inequality Index		Social outcomes											
	Gini	S80/S20	Happiness (score)	Life Satisfaction (score)	Criminality & Vandalism (%)	Domestic burglary ('000 inhab.)	Self-reported health (score)	Chronic disease (%)	Membership (%)	Trust in people (score)	Tertiary education (%)	Early leavers (%)	Voting (%)	Turnout (%)
Ireland														
IE0	0.31	4.64	3.41	7.31	0.14		1.84	0.31	0.23	5.39	35.87	11.55	0.72	67.03
Iceland														
IS0	0.27	3.84	3.49		0.03		1.80	0.24	0.47			23.67		
Italy														
ITC	0.30	4.69	3.00		0.12	3.20	2.39	0.22	0.22		15.33	18.90		
ITD	0.28	4.29	3.05		0.10	2.71	2.37	0.24	0.23		14.37	16.25		
ITE	0.30	4.85	3.02		0.12	3.00	2.41	0.22	0.21		17.20	14.47		
ITF	0.32	5.54	3.02		0.16	1.75	2.38	0.20	0.14		12.77	23.28		
ITG	0.33	5.83	2.87		0.10	1.50	2.43	0.22	0.20		12.10	26.68		
Lithuania														
LT0	0.35	6.22	2.72	5.02	0.07	2.33	2.78	0.35	0.12	4.41	29.33	7.98	0.45	48.59
Luxembourg														
LU0	0.28	4.03	3.32		0.11	1.00	1.98	0.21	0.47		29.17	11.33		
Latvia														
LV0	0.37	7.08	2.84	5.88	0.25	1.50	2.87	0.38	0.11	4.12	23.73	14.50	0.58	62.85
Netherland														
NL0	0.27	3.95	3.50	7.54	0.17		2.06	0.32	0.70	5.81	32.30	11.70	0.85	78.09
Norway														
NO0	0.26	3.91		7.86	0.04	1.50	2.01	0.30		6.71	36.10	15.47	0.77	76.90
Poland														
PL1	0.37	6.66	2.97	6.74	0.08	0.75	2.51	0.33	0.07	4.32	26.27	4.98	0.68	51.06
PL2	0.31	4.99	3.03	6.92	0.10	1.20	2.51	0.34	0.05	3.99	20.73	4.03	0.65	48.42
PL3	0.30	4.93	3.17	6.73	0.04	1.00	2.55	0.34	0.03	4.04	20.67	4.47	0.63	44.91
PL4	0.31	4.99	3.15	6.93	0.06	0.71	2.45	0.33	0.06	4.24	18.60	6.03	0.62	46.11
PL5	0.33	5.61	3.07	7.07	0.09	1.00	2.43	0.33	0.11	4.66	19.30	5.45	0.61	44.30
PL6	0.32	5.20	3.00	6.84	0.09	0.75	2.43	0.31	0.05	4.25	18.67	7.03	0.64	45.63
Portugal														
PT1	0.37	6.43	2.91	5.47	0.11	4.00	2.78	0.35	0.08	3.84	14.80	35.02	0.74	61.64

Continued on next page

	Inequality Index		Social outcomes											
	Gini	S80/S20	Happiness (score)	Life Satisfaction (score)	Criminality & Vandalism (%)	Domestic burglary ('000 inhab.)	Self-reported health (score)	Chronic disease (%)	Membership (%)	Trust in people (score)	Tertiary education (%)	Early leavers (%)	Voting (%)	Turnout (%)
Romania														
RO1	0.31	5.37	2.94	6.25			2.48		0.11	4.16	12.07	15.10	0.67	38.88
RO2	0.38	8.21	2.68	5.94			2.58		0.07	3.65	10.67	19.97	0.69	40.17
RO3	0.35	6.34	2.82	5.63			2.48		0.05	3.44	17.30	16.92	0.56	37.18
RO4	0.34	6.36	2.83	6.39			2.31		0.06	4.05	13.40	14.87	0.67	40.46
Sweden														
SE1	0.26	3.97	3.17	7.82	0.13	1.80	1.93	0.33	0.29	6.38	36.83	11.70	0.85	83.87
SE2	0.23	3.37	3.20	7.90	0.14	2.33	1.92	0.33	0.30	6.23	31.87	10.68	0.84	83.14
SE3	0.22	3.21	3.19	7.88	0.08	1.00	2.01	0.34	0.36	6.41	27.67	11.63	0.82	82.60
Slovenia														
SI0	0.23	3.35	3.03	6.96	0.09	1.00	2.45	0.36	0.29	4.11	23.20	5.00	0.68	63.10
Slovakia														
SK0	0.25	3.66	2.85	6.23	0.09	3.38	2.43	0.27	0.12	4.14	15.97	5.83	0.70	56.75
United Kingdom														
UKC	0.30	4.60	3.22	7.05	0.54	6.00	2.22	0.38	0.20	5.00	26.90	14.97	0.66	59.15
UKD	0.32	5.12	3.34	7.11	0.49	9.00	2.12	0.37	0.22	5.46	30.63	15.90	0.66	59.95
UKE	0.32	5.01	3.41	6.89	0.51	9.50	2.20	0.38	0.25	5.11	29.47	16.40	0.65	61.15
UKF	0.33	5.43	3.38	7.01	0.50	10.00	2.14	0.38	0.23	5.31	29.47	16.62	0.66	64.60
UKG	0.33	5.27	3.32	6.93	0.50	6.40	2.11	0.35	0.26	5.15	28.60	16.63	0.67	62.75
UKH	0.36	6.20	3.40	7.12	0.46	7.00	2.08	0.35	0.36	5.44	30.37	16.08	0.70	65.65
UKI	0.43	9.05	3.30	6.95	0.59	8.00	1.96	0.29	0.27	5.17	43.70	11.13	0.65	61.20
UKJ	0.37	6.47	3.39	7.08	0.50	6.00	1.99	0.34	0.30	5.34	36.60	13.88	0.72	66.35
UKK	0.33	5.34	3.34	7.23	0.45	8.00	2.07	0.37	0.33	5.52	33.53	12.48	0.74	67.80
UKL	0.34	5.43	3.23	7.14	0.48	5.00	2.06	0.38	0.11	5.38	32.10	16.55	0.70	63.75
UKM	0.34	5.43	3.30	7.29	0.46	4.33	2.05	0.36	0.10	5.60	36.67	11.63	0.69	62.30
UKN	0.32	5.13	3.35	7.31	0.44	6.50	2.27	0.35	0.24	5.45	30.10	13.88	0.53	60.25

Source: Authors' calculations using data on European NUTS1 region over the period 2005-2009.

2.4.2 Data on social outcomes

The social outcomes are drawn from the following surveys:

- The European Social Survey - ESS
- The European Values Study - EVS
- The European Election database - EED
- The European Survey on Living Conditions EU-SILC, as well as the GSOEP for Germany and the BHPS for the UK
- The Labor Force Survey - LFS
- The Urban Audit data - UAD

The **European Social Survey** (ESS) is a biennial study conducted in the majority of European countries since 2002.[14] The ESS contains questions on the socio-economic characteristics of the respondents and their households but also includes detailed information on trust in institutions, values, identity, health, well-being and various aspects of civic and political participation, ranging from voting turnout to signing a petition, from membership in political parties and action groups to boycotting certain products. ESS contains a nationally representative sample of persons 15 years or older who are resident within private households, regardless of nationality and citizenship or language. The minimum effective sample size in participating countries is 1500 if the population is above than 2 million inhabitants and 850 otherwise. Note that some large countries like Germany, the UK, or France have large numbers of NUTS 1 regions due to a large population size. However, the total ESS sample size is about the same for each country, regardless of the population size and the number of NUTS 1 regions. This means that the number of respondents in a given region may be relatively small in big countries. The ESS has been used to build 2 regional indicators related to **political participation** and **social capital**, i.e self-reported voting behaviors and generalized trust.

The **European Values Study** (EVS) started in 1981 and has been repeated every 9 years since then.[15] The fourth wave - the one employed in the empirical analysis - which took place between 2008 and 2010 covered 47 countries/regions, from Iceland to Azerbaijan and from Portugal to Norway. All EU countries participated to the fourth edition of the survey. As the ESS, the EVS provides insights into the ideas, beliefs, preferences, attitudes, values and opinions of citizens along

[14] For additional information, see http://ess.nsd.uib.no/ess/.
[15] See http://www.europeanvaluesstudy.eu/ for detailed information.

additional information of the socio-economic characteristics of the person interviewed. In each country the sample is representative of the adult population of 18 years and older who are resident within private households, regardless of nationality and citizenship or language.[16] The average country sample size is 1500. The EVS has been used to measure **subjective well-being** and **social capital**. The indicator for well being is a self-reported measure of general happiness while the one on social capital is about participation in charitable organizations.

The **European Election database** covers 35 countries over the period 1990-2011 and contains information on parliamentary elections, European Parliament elections, presidential elections, as well as EU-related referendums in European countries.[17] For each election, the dataset includes information on the number of persons entitled to vote, numbers of votes cast for each contesting party or candidate, number of valid votes or the number of invalid votes. Data are mainly provided by national election authorities, national statistical agencies and other official sources. The EED provides us with a regional and objective measure of **voter turnout**.

The **Urban Audit data** (UAD) designed by Eurostat, DG REGIO and the National Statistical Offices covers both medium-sized and large towns/cities. As defined by Eurostat, medium-sized town/city has a population of between 50,000 and 250,000 inhabitants and large town/city has a population of over 250,000. Data cover the following period: 1989-1993, 1994-1998, 1999-2002, 2003-2006 and 2007 - 2009. [18] The cities included in the dataset are such that they cover about "20 % of the country population and reflect a good geographical distribution within the country" (Eurostat, website). The UAD contains data for over 250 indicators on a various range of issues (demography, social and economic dimensions, criminality, civic participation, education, environment, culture etc). This data source will be used for constructing an objective indicator of **criminality**.

The **European Union Labour Force Survey** (EU-LFS) is a quarterly large household sample survey conducted in EU Member States (as well as in the three European Free Trade Association, EFTA, countries and three EU-candidate countries) which covers all people aged 15 and older. The sampling rate of the EU-LFS ranges between 0.2% and 3.3% of the population. The database includes observations on labour market participation as well as several variables related to the individuals characteristics of the interviewed persons. We have relied on regional indicators published by Eurostat and drawn from this survey in order to measure the social outcome related to **educational attainment**.

[16] In Finland the sample is representative of the 18-74 years old population.

[17] see http://www.nsd.uib.no/european_election_database/ for additional information

[18] See http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/city_urban for additional information.

Finally, the **EU-SILC** survey (and the **SOEP** and **BHPS** surveys respectively for Germany and the UK) described in section 2 have been employed to derive regional indicators on **health conditions** and a subjective measure of **criminality**.

2.5 Statistical methods

In the empirical analysis, we examine the relationship between the social outcomes and income inequality while relying on correlations and regression coefficients.

The CORRELATION COEFFICIENT is given by

$$corr = \frac{cov(O_{rt}, I_{rt-1})}{\sigma_{I_{rt-1}} \sigma_{O_{rt}}} \tag{4}$$

with $cov(O_{rt}, I_{rt-1})$ being the covariance between income inequality I_{rt-1} at time $t-1$ and the social outcome O_{rt} at time t while $\sigma_{I_{rt-1}}$ and $\sigma_{O_{rt}}$ are the standard deviations of the corresponding two variables. The correlation coefficient is comprised between 0 and 1 with 1 indicating a perfect linear association while -1 correspond to a perfect negative linear association. The sign of the correlation coefficient indicates whether the correlation is positive or negative and the magnitude of the correlation coefficient determines the strength of the association. Though there are no fixed thresholds to determine what is a strong correlation, it is usually admitted that if $|corr| < 0.3$, the correlation is weak while if $|corr| > 0.7$ the correlation is strong. Otherwise the correlation is moderate.

The ORDINARY LEAST SQUARES REGRESSION COEFFICIENT (OLS) is equal to:

$$r_{OLS} = \frac{cov(O_{rt}, I_{rt-1})}{\sigma_{I_{rt-1}} \sigma_{Ir_{t-1}}} \tag{5}$$

The OLS regression coefficient can be obtained by estimating the following equation:

$$O_{rt} = a + r_{OLS} * I_{rt-1} + \varepsilon_{rt} \tag{6}$$

where O_{rt} is the social outcome of region r at time t and ε_r is the residual term of the equation. The estimated coefficient, $\widehat{r_{OLS}}$, describes the change in the mean of the social outcome associated with a variation of one unit of I_{rt-1}.

It is very important to keep in mind that both measures assume a linear relationship between the social outcomes and income disparity. In addition, the fact that two variables are significantly correlated does not indicate that one causes the other, no matter how strong is the correlation. The reader should always re-

member that correlation does not imply causality while reading the entire report (for additional information, see the discussion in the literature review, section 2).

2.6 Robustness checks

In the appendix, we test the robustness of the results presented in the main part of the document when (i) alternative income inequality indices, i.e. various Atkinson indices, are employed (ii) we control for the potential influence of outliers.

2.6.1 Atkinson index

Besides the Gini index and the $\frac{S80}{S20}$ ratio, a number of alternative inequality indices have been used in the literature. In particular, income inequality measures such as the generalised entropy index and the Atkinson index offer the possibility to look at the inequality in different areas of the income distribution. The Gini coefficient is highly sensitive to inequalities in the middle of the income spectrum and, instead, the $\frac{S80}{S20}$ ratio put more attention to the two extremes of the income distribution. We have checked the robustness of the correlations between the social outcomes and income inequality when we use as alternative measure of income disparity, the Atkinson index.

The Atkinson index is measured as follows:

$$A_\epsilon = 1 - \frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i^{1-\epsilon}}{\mu}\right)^{\frac{1}{1-\epsilon}} \tag{7}$$

where y_i defines the income level of an individual/household i, μ is the mean income, n is the number of individuals/households and ϵ is a parameter of sensitiveness to transfers at different levels of the distribution. ϵ can also be understood as a measure of the degree of "aversion to inequality". The theoretical range of Atkinson values is 0 to 1, with 0 being a state of equal distribution. If $\epsilon > 0$, there is a preference for equality. Larger values of ϵ correspond to a higher concern for income redistribution (transfers) on the bottom part of the distribution. When ϵ approaches zero, on the other hand, a higher weight is given to redistribution at the top. In appendix, we report the correlation and regression coefficients when we use two different values of ϵ (0.5 and 1).[19] An advantage of the Atkinson index is that it offers a welfare interpretation. More precisely, the Atkinson values can be used to calculate the proportion of total income that would be required

[19]The Aktinson index becomes very sensitive to abnormal low incomes when the risk averion parameter ε is above 1. Note also that the Atkinson index does not consider the individuals/households which have zero values. In case there is a high proportion of them, this limitation causes a rigid sample selection, undermining the correct measurement of income inequality (Atkinson and Marlier, 2010).

to achieve the current level of social welfare if incomes were perfectly distributed. For example, an Atkinson index value of 0.20 suggests that we could achieve the same level of social welfare with $(1 - 0.30) = 70\%$ of income.

2.6.2 Measurement errors and outliers

For some NUTS1 regions the income variable might be recorded with error or have outliers, i.e. negative and very high income values. Reported negative values are due to the presence of income losses from self-employment. This might pose issues for the calculation of the inequality measures. In order to deal with it, we have adopted a twofold strategy. First, we have adjusted the income for the outliers by applying a winsorization procedure, which consists of replacing outliers with selected percentiles. In the present study we have imputed zero to all negative income data and assigned the 99.9^{th} percentile of the regional income distribution to the incomes greater than this value. We performed a zeroing imputation to all negative values mainly to comply with the HBAI and GSOEP dataset, wherein income has already adjusted for negative values. With the winsorization we preserve the median of the income distributions and the number of observations by NUTS1 regions, even tough the mean will not be necessarily equals to the non-winsorized data.[20]

Second, estimate equation (6) has been estimated using least absolute deviation models (LAV). While the OLS estimates consists of minimizing the sum of squares of residuals, i.e., $\sum_{r=1}^{R} \left[O_{rt} - a - \widehat{r_{OLS}} * I_{rt-1}, \right]^2$, LAV estimates minimizes the sum of the absolute residuals, i.e. $\sum_{r=1}^{R} \left|O_{rt} - a - \widehat{r_{LAV}} * I_{rt-1}, \right|$. This implies that LAV estimators are less sensitive to the presence of outliers. All these robustness checks are reported in appendix, in Tables A.1-A.4.

[20]Note that we could also have proceeded by *trimming* the extreme values, but we refrained from doing so in order to avoid inflating too much the mean of the income distribution. Furthermore, Van Kerm (2007) has shown that winsorizing income data, instead of removing them from the sample, produces more robust and stable results in the EU-SILC dataset.

Table 9: Social Outcomes: indicators, definition and data source

Dimension	Type of indicator	Indicator	Definition	Data source
Political Participation	*Self-reported*	Voting Behavior	Proportion of individuals having voted at the last national election	ESS
	Objective	Turnout	Recorded turnout at the last national parliamentary election	EDD
Criminality	*Self-reported*	Crime	Proportion of respondents that feel that crime, violence or vandalism in the area is a problem for the household	EU-SILC, SOEP, BHPS
	Objective	Burglary	Number of domestic burglary per 1000 inhabitants	UAD
Health	*Self-reported*	Health	Health score ranging from 1 (very good health) to 5 (very bad health)	EU-SILC, ESS
		Chronic diseases	Proportion of individuals having a longstanding illness or longstanding health problem	EU-SILC, SOEP, BHPS
Education	*Objective*	Early school leavers	Share of 18-24 years old having completed at most ISCED3b and not in education or training	EU-LFS
		Tertiary education	Share of individuals aged 30-34 having completed a tertiary education (ISCED 5-6)	EU-LFS
Social Capital	Self-reported	Trust	Trust score ranging from 0 (cannot be too careful) to 10 (most people can be trusted)	ESS
		Member	Proportion of individuals belonging to one of the following organization: human rights, conservation, environment, ecology, animal rights, youth work, sports or recreation, women's group, peace movement, or organizations concerned with health	EVS
Subjective Well-Being	*Self-reported*	Life Satisfaction	Life satisfaction score ranging from 0 (extremely dissatisfied) to 10 (extremely satisfied)	ESS
		Happiness	Happiness score on a scale from 1 (not at all happy) to 4 (very happy)	EVS

3 Bivariate Correlations

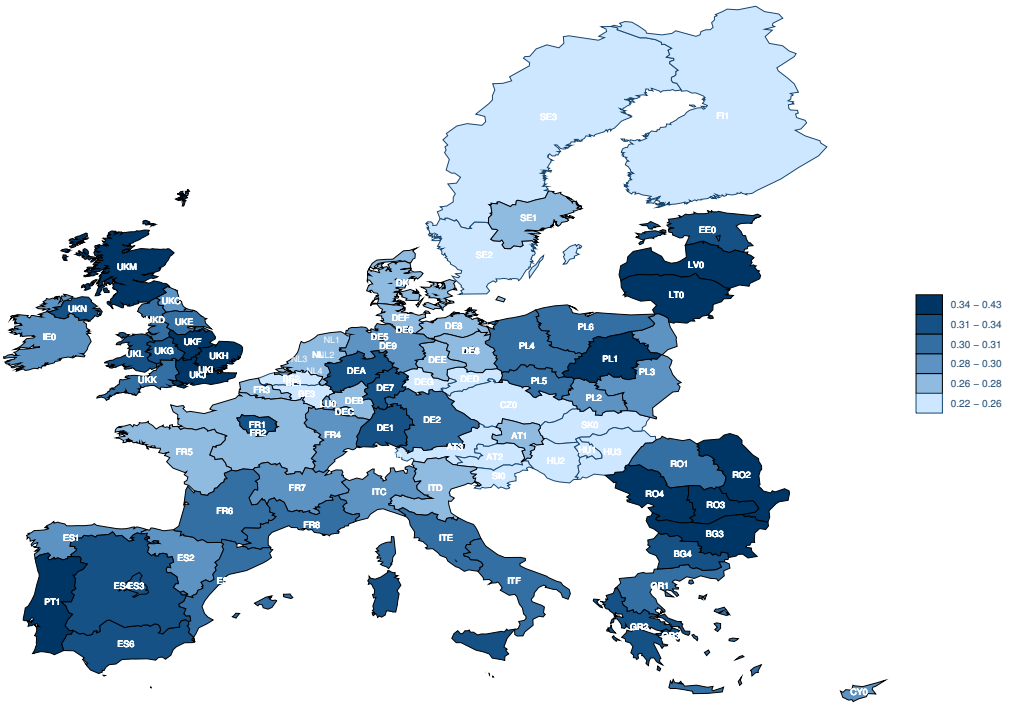
3.1 Inequality across NUTS1 regions

Figures 2 and 3 display the regional distribution of income inequality over the EU member states using respectively the Gini coefficient and the S80/S20 ratio. As we discussed in section 2.2, the Gini coefficient is a measure for inequality and varies from 0, i.e. perfect equality to 1, i.e. perfect inequality. In our dataset, the range of the Gini is somewhat small, with lowest values ranging around 0.22 and highest values of the Gini being at 0.43. Darker blue areas in Figures 2 and 3 refer to NUTS 1 regions with higher income inequality and the light blue areas refer to areas with less inequality. Regions with particularly high levels of income inequality can be found in some Eastern-European countries, such as Latvia, Lithuania, Central Poland (PL1), Romania, parts of Bulgaria (BG3), as well as in Portugal and various regions in the UK. In addition to the variation of income inequality across European countries, we also observe substantial within-country variations for example for Spain, Italy, the UK, France and Germany. The latter country's variation of income inequality is particularly striking, as the Gini coefficient varies from 0.22-0.24 for Eastern German regions to a maximum value of 0.33 in DE7.

On the other hand, regions with particularly low levels of income inequality can be found in Finland, Sweden, parts of Germany (DED, DEG), Hungary, Slovakia, Slovenia, Czech Republic, Austria, and in Belgium.

Now turning to the second income inequality measure, we can confirm the pattern seen for the Gini coefficient. The values for the S80/S20 measure vary from 2.9 to 9. As discussed in section II, the S80/S20 has a straightforward interpretation. For example, if the value of the S80/S20 equals to 2.95 then this implies that the income of the richest 20% of the population is higher by a factor of 2.95 than the income of the poorest 20%. In this respect, higher values of the S80/S20 measure point to more unequal distribution of income in a NUTS region. As already seen for the Gini coefficient, the most unequal regions can be found in Latvia, Lithuania, Central Poland (PL1), Romania, parts of Bulgaria (BG3), as well as in South and Central Spain, Portugal and various regions in the UK. The regions with the most equal income distribution are similar to those noted for the Gini coefficient. Again, we observe very high within-country differences in the value of the s80/s20 ratio, with the highest variations displayed for Germany.

Figure 2: Gini coefficient across NUTS 1 regions.



Source: Authors' calculations on EU-SILC, GSOEP and HBAI 2009 data.
Darker blue corresponds to higher values of the Gini index.

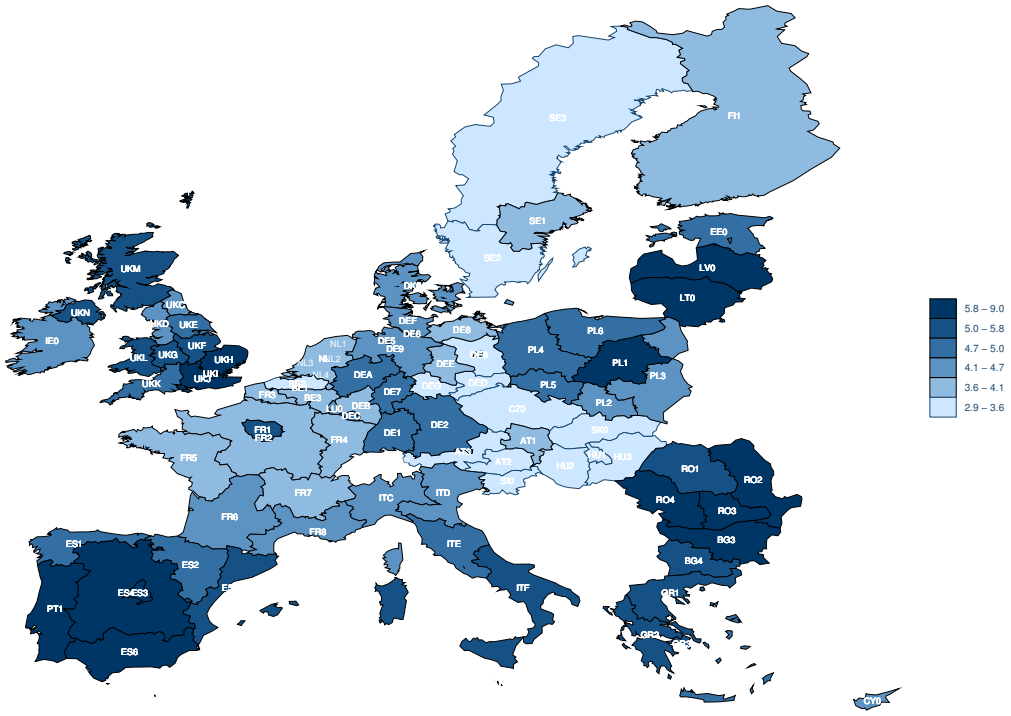
3.2 Happiness and income inequality

3.2.1 Rationale

The discussion on whether income inequality affects an individual's happiness dates back to theoretical considerations on relative deprivation and relative utility and refers to the idea that people's utility depends not only on their own income but also on their relative position in the society (van de Stadt, Kapteyn and van de Geer, 1985). In addition, some scholars suggest that individuals can have a "taste for equality". In particular, Thurow (1971, p.327) proposes that "the individual is simply exercising an aesthetic taste for equality or inequality similar in nature to a taste for paintings".

An intuitive and comprehensive explanation of the impact of income inequality on individuals' well-being is provided by Hirschman and Rothschild (1973). These authors use the analogy of a traffic jam on a two-lane motorway to explain the effect of income inequality on happiness and call this the "tunnel effect" (Hirschman and Rothschild (1973), p.545): "Suppose that I drive through a two-lane tunnel, both lanes going the same direction, and run into a serious traffic jam. No car

Figure 3: S80/S20 ratio across NUTS 1 regions



Source: Authors' calculations on EU-SILC, GSOEP and HBAI 2009 data.
Darker blue corresponds to higher values of the S80/S20 ratio.

is moving in either lane as far as I can see (which is not very far). I am in the left lane and feel dejected. After a while the cars in the right lane begin to move. Naturally, my spirits lift considerably, for I know that the jam has been broken and that my lane's turn to move will surely come any moment now. But suppose that the expectation is disappointed and only the right lane keeps moving: in that case I will at some point become quite furious".

This analogy nicely illustrates several important aspects in the relationship between income inequality and happiness. First, inequality may convey information about future prospects. This means that if I observe that the people around me are moving, then I expect to be able to move upward soon too. This suggests that income inequality might have a positive effect on individuals's wellbeing. Second, the positive impact of inequality might turn negative if these expectations are not fulfilled, i.e. if my lane is still not moving. This has important consequences for countries in different development stages and there is empirical evidence on transition countries supporting this notion (as discussed below). Last, the question arises at what point people do get "upset" about their lane not moving. This refers to people's beliefs on whether mobility is possible in their country and how difficult it is for people to move upwards.

In conclusion, income inequality might affect positively the individual's level of happiness if people perceive that in their society upward mobility is possible. However, if individuals think that it is very unlikely to reach a higher income, then income inequality will probably impact negatively on happiness.

3.2.2 Bivariate correlations

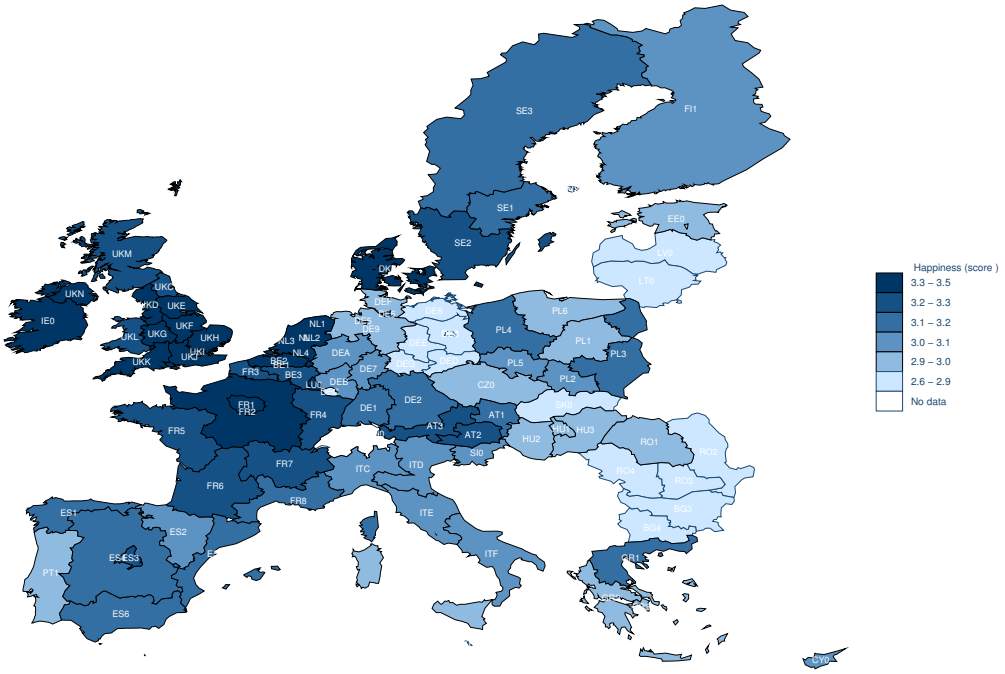
We investigate the effect of income inequality on happiness by relying on two indicators. The first indicator is taken from the European Value Survey (EVS), 2008 and is drawn from the following question: *"Taking all things together, would you say you are: very happy, quite happy, not very happy, or not at all happy"*. The indicator ranges from 4, i.e. very happy, to 0, i.e. not at all happy. Happiness scores in our dataset on EU Member States vary from 2.6 to 3.5. The second indicator measures life satisfaction in the population and is drawn from the European Social Survey. In particular, the indicator is derived from the responses to the following question *"All things considered, how satisfied are you with your life as a whole nowadays?"*. Values might range from 0 meaning extremely dissatisfied to 10 meaning extremely satisfied, however in our sample the lowest values correspond to 4.3 and the maximum value equals to 8.5. For most countries, data is drawn for the year 2008; but due to missing data the year 2006 is used for Austria and Luxembourg, and 2010 is used for the Czech Republic and Spain. Unfortunately, in the European Social Survey, no information is available for Italy. The two indicators constitute the main measure of happiness employed in the literature (see literature review, 3.1.2).

Figure 4 displays the regional distribution of life satisfaction over the NUTS 1 regions in Europe. Life satisfaction is particularly high in the Nordic countries, Sweden, Denmark and Finland, as well as in the Netherlands, UK, Ireland, and Austria. Comparably low life satisfaction on the other hand can be found in Estonia, Latvia, Lithuania, Romania, Bulgaria, Hungary, as well as Portugal, parts of eastern Germany, parts of France (i.e. Méditerranée, Bassin Parisien, and Nord-Pas-de-Calais).

In addition, Figure 5 shows how the second measure of happiness taken from the European Social Survey varies over Europe. The main pattern observed from the graph on life satisfaction remains robust. In addition, we observe a stark within-country variation on perceived happiness, such as in Germany (here happiness scores ranging from lowest (2.6) to higher (3.2)).

Using this regional information we correlate the life satisfaction outcomes with our two income inequality measures. In particular Figure 6 depicts the pairwise correlations between life satisfaction and the Gini index (top panel of Fig. 6) and life satisfaction and the S80/S20 ratio (bottom panel of Fig. 6). For both

Figure 4: Happiness across NUTS1 regions.



Source: Authors' calculations, based on the EVS. Darker blue corresponds to higher happiness scores.

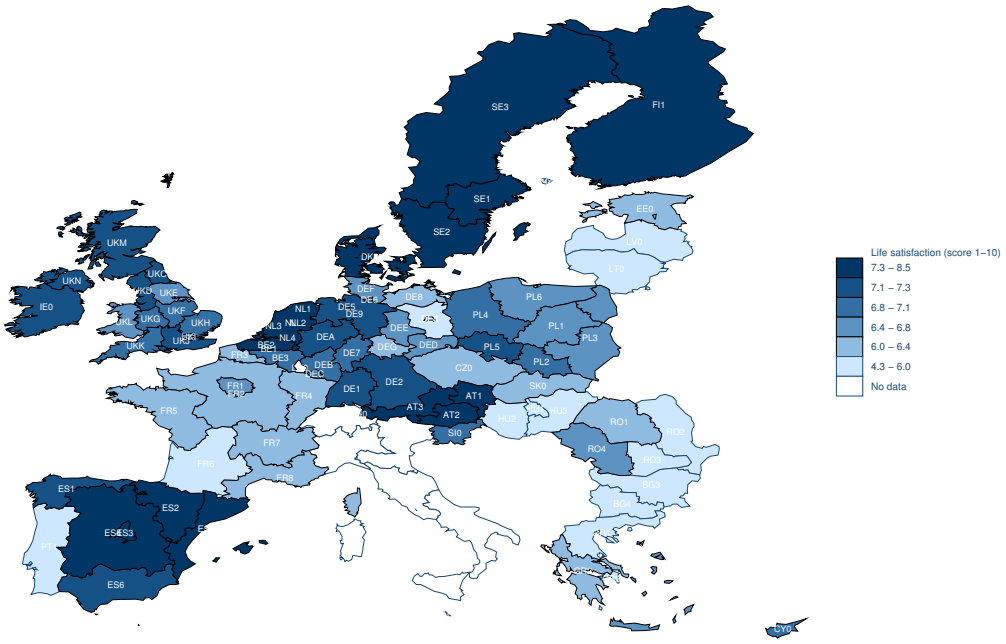
inequality indices, we cannot identify a relationship between higher inequality and lower life satisfaction statistically significant at 5 percent level. This is true for both indicators and irrespectively of the income inequality index used. When, as presented in the Appendix Tables A1-A3, we use alternative specifications concerning the inequality measure, i.e. Atkinson index, as well as different estimation method, i.e. LAV estimator and winsorized income data, we confirm the absence of a significant relationship between income inequality and self-reported well-being.

3.3 Voting behaviors and income inequality

3.3.1 Rationale

According to the *class-bias hypothesis*, economic inequality should lower the political participation of the poorer citizens. The idea is that concentrations of wealth and power are related to each other. Rich individuals will have more power than the poorer ones on the political scene, preventing discussions about issues that are important for the poor fringe of the population. As the opinion of the low-income group is are not taken into account for designing policies, the

Figure 5: Life Satisfaction across NUTS1 regions.

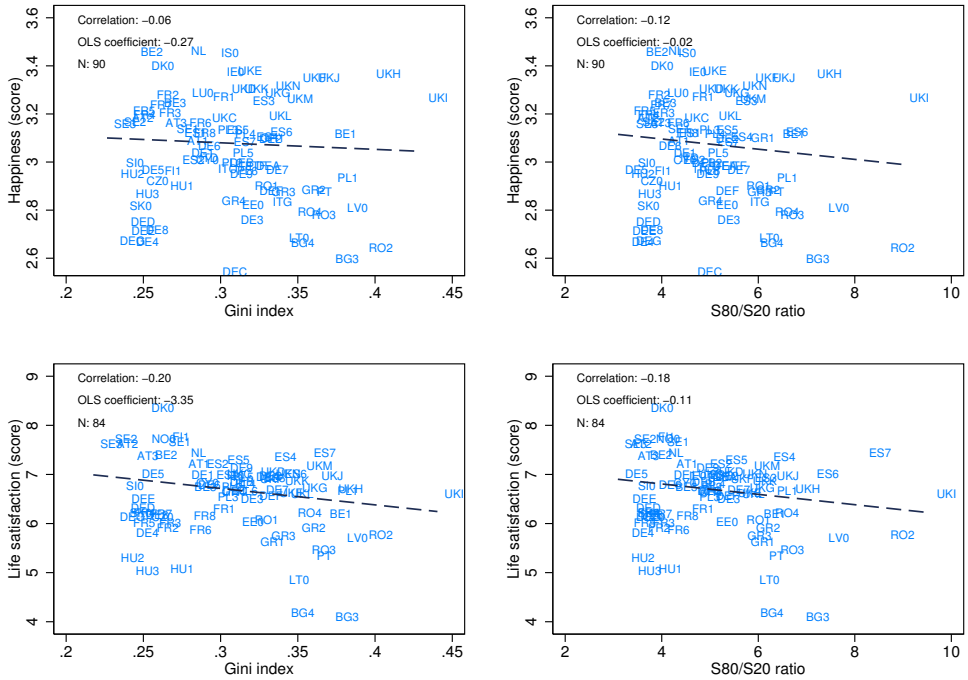


Source: Authors' calculations based on the ESS. Darker blue corresponds to higher life satisfaction scores.

expected benefits from voting are lower for this group than for the high-income group leading the former to opt out of civic engagement (see Horn, 2011). The implication of the class bias hypothesis is that voter turnout and economic inequality should be negatively related to each other (Solt, 2010, and Mueller and Stratmann, 2003).

Under the assumption that (i) government policies are directly responsive to the preferences of the citizens expressed in elections and (ii) government policies affect the distribution of income, through taxation and transfers, a reduced engagement of the low-income group means that elected political leaders will put into place policies that will only reflect the preferences of high-income groups. As put by Lijphart (1997, p.1) and reported in Mueller and Stratmann (2003) low participation in elections will lead to"inequality of representation and influence that are not randomly distributed but systematically biased in favor of more privileged citizens, those with higher income, greater wealth and better education and against the less advantaged citizen". This argument fits with the median voter hypothesis (see Meltzer and Richard, 1981). If turnout is skewed by income, the income of the median voter will be higher than the mean income of the country, and this will lead to a lower demand for taxes and transfers which will induce

Figure 6: Bivariate correlations between subjective well-being indicators and income inequality.



Source: Authors' calculations. ** significant at 5% percent level.

an increase of inequality (see Milanovic, 2000, Malher, 2008 for empirical tests of median voter hypothesis).[21]

The relationship between turnout and inequality is thus likely to be mutually reinforcing. A low political participation leads to economic inequality if this participation is lower among the low-income groups than for the rest of the population. In turn, rising economic inequality risks discouraging participation among low-income groups, and so on.

The *conflict theory*, on the other hand, predicts the opposite. Rising income inequality should result in more political engagement. Indeed, greater level of inequality causes disagreements in political preferences that spurs discussions about the suitable policies. These discussions are then seen to cause higher rates of political mobilizations and to stimulate more interest and participation in the political interest. As explained in Horn (2011), under the premise of the rational

[21]Horn (2011) argues that the effect of increasing inequality on turnout might depend on whether this increase is driven by the growth of top income or, on contrary, by a relative deterioration of the situation of the low-income group. In the first case, low and medium income group could unite together to promote redistributive policies that favor the medium income group and which are more favorable for the low-income group than policies that would be designed for the most advantaged groups. Under such circumstances, the low-income group might have an additional incentive to vote. The opposite will happen if rising income inequality is due to a decrease of the income of the low-income group relatively to the rest of the population.

voter hypothesis, if inequality is low, both low and high-income groups might have a low incentive to vote if one consider that redistributive policies are the main issues decided by governments as none of the two groups has a lot to lose. The opposite will be observed if inequality is high.

3.3.2 Bivariate correlations

We investigate the effect of income inequality on political participation using 2 variables related to voting behaviors.[22] Information on voter turnout has been widely employed in the literature to compare political participation across countries and examine its determinants (Dee 2004; Milligan et al. 2004; Siedler 2007).

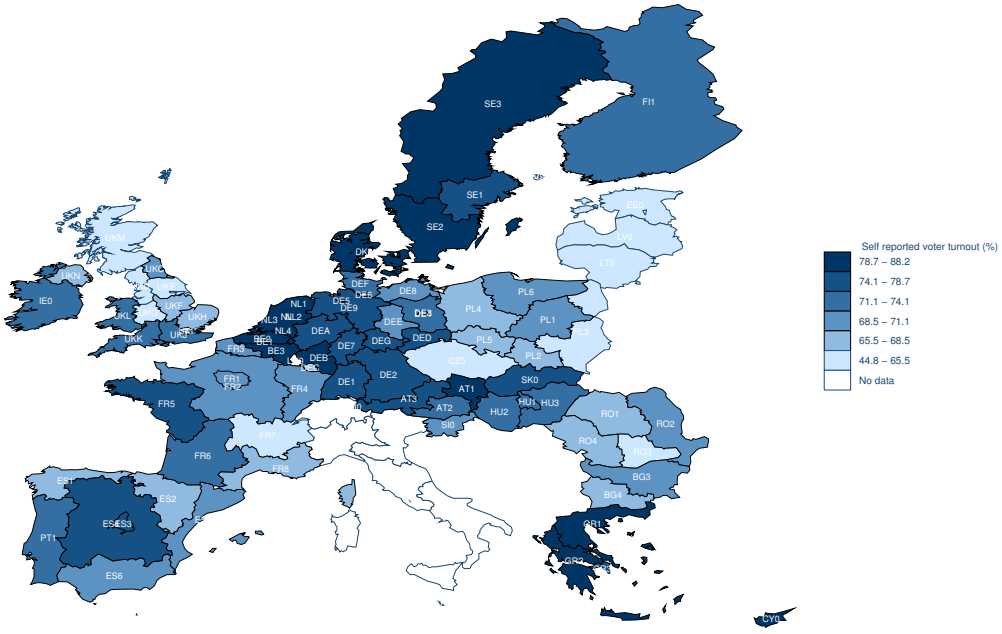
The first variable is the *proportion of individuals in each region reporting to have voted at the last national election.* This information, based on self-reported information, is drawn from the 2010 and 2008 waves of the European Social Survey, except for Austria for which we have used the 2006 wave of the same survey. Information is missing for Luxembourg and Italy. As shown, in Figure 7, the highest self-reported turnout are found in Sweden, Denmark, Belgium, and Greece. The voter turnout percentage amounts to 88% in Denmark and more to 80% in Greece, Sweden or the Netherlands. Low voter turnouts are observed in Baltic countries. Less than one interviewed individuals out of two report to have voted at the last national election in Lithuania. The voting participation rate is equal to 0.56 and 0.57 respectively in Latvia and Estonia. Within-country variation in voting participation are substantial: in the West of France (FR5), the voter turnout rate is equal to 0.76 against 0.64 in the East of France (FR7). Similarly, this figure ranges between 0.58 and 0.73 in the UK.

The overall voting rates emerging from survey data are usually higher than voting rates registered in general elections. Respondents tend to intentionally misreport that they voted because they feel that there is a social stigma associated with failing to cast ballots. We thus also rely on a second measure based on official records and which will not suffer from the limitations associated with self-reported information. This variable is taken from the European Election database and measures the actual turnout at the last country parliamentary election over the period 2005-2010. Unfortunately, information is missing for Italy and France.[23]

[22]Note that, the dataset we have compiled contains several additional variables related to political involvement. In particular, the ESS collects data on political interest, party preferences and participation to activities such as political parties (see in appendix for additional information on these variables we have to prepare an appendix with variables/codebook). The bivariate analysis for these variables is not reported here. However should the reader be interested in these particular outcomes, it would be possible to carry out the same analysis as the one done for voting behavior.

[23]It is not possible to compare directly these objective and subjective indicators as they potentially refer to different national elections.

Figure 7: Self-reported voting behaviour across NUTS1 regions.

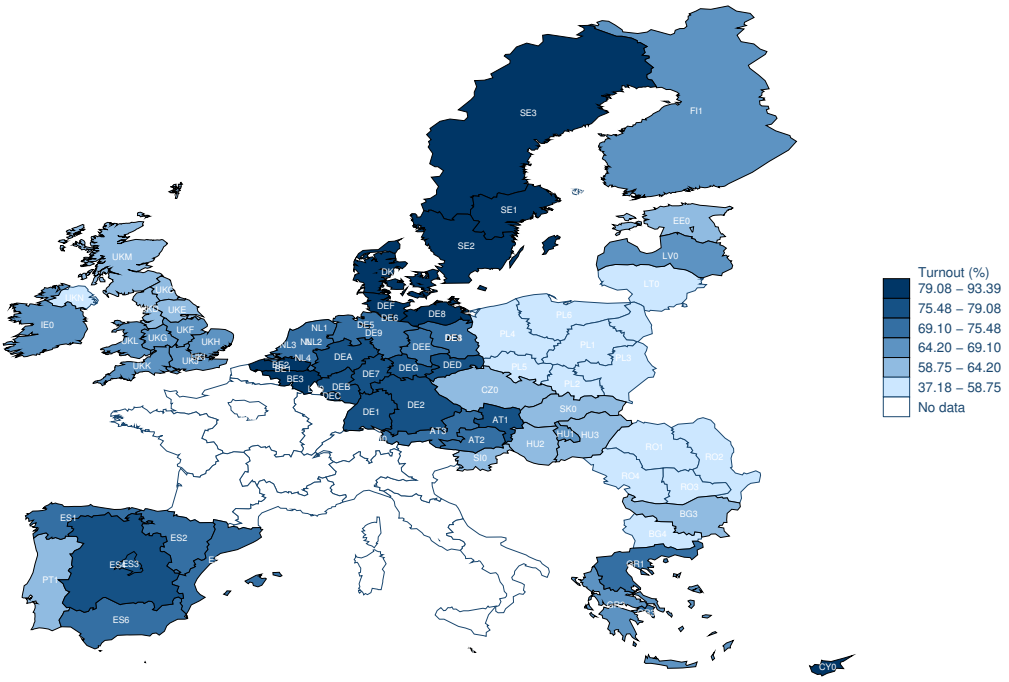


Source: Authors' calculations based on ESS data.
Darker blue corresponds to higher percentages of self-reported turnout.

As shown, in Figure 8, voter turnouts above 80% are recorded in Sweden, Denmark, Belgium and Luxembourg. In comparison, in some Eastern and Baltic countries such as Poland, Romania, or Lithuania, voting participation oscillates between 37% and 50%. There is a third group of countries, composed in particular of the UK, Germany, Spain, Greece, Slovenia, or Slovakia whose voting participation rates lay between 50% and 70%. Though, on average, regional disparities within countries seem to be less important than with the previous indicator, still some countries display substantial heterogeneity in voting participation. There is, for instance, a 17 percentage points difference between the central and south regions of Poland in the share of individuals having participated at the last parliamentary election.

Figure 9 reports the bivariate correlations between the voting behavior indicators and the inequality indexes. These correlations indicate that there is a negative and significantly different from zero association between income inequality and voting behaviors at the regional level. The correlation between self-reported voting behaviors and the Gini coefficient amounts to -0.38 and to -0.36 when the inequality index is the S80/S20 ratio. From the OLS estimates, we see that an increase of 0.1 in the value of the Gini coefficient is associated with a 6.3

Figure 8: Voter turnout across NUTS1 regions.



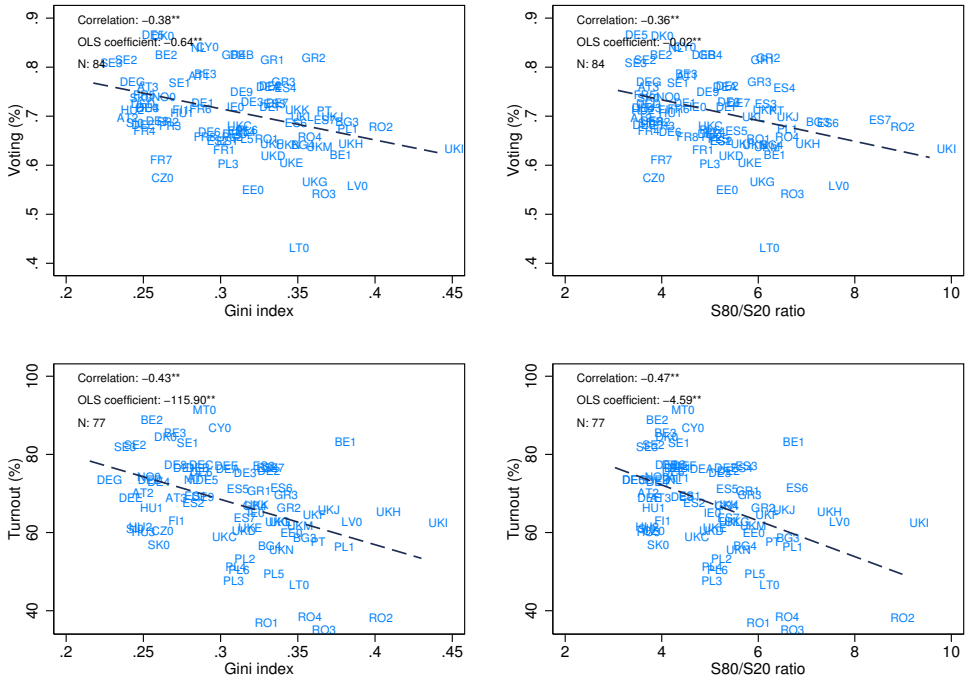
Source: Authors' calculations based on EDD data.
Darker blue corresponds to higher percentages of voter turnout.

percentage points decrease in the percentage of individuals reporting to have voted at the last national election. The regression coefficient when the inequality index is the S80/S20 ratio is equal to -0.02. i.e. an increase of S80/S20 by one is equivalent to a reduction of the self reported voter turnout percentage rate by 2.1 percentage points.

This negative relationship between income disparities and political involvement is confirmed with the objective measure of voter turnout. In this case the magnitude of the correlation is even (if slightly) higher, with the correlation coefficient lying between -0.44 and -0.47 according the selected inequality index. More precisely, the estimated regression coefficients indicate that a 0.1 rise in the Gini index corresponds to a 11.7 percentage points drop in the subjective indicator of voter turnout while an increase of the S80/S20 ratio accounts for a 4.7 percentage points decrease in the value of the objective measure of voting turnout.

Results reported in Tables A.1-A.4 shows that the correlation between income inequality and recorded turnout is negative and significantly different from zero, irrespective of the inequality index or estimation method employed. The self-reported indicator on voting behavior displays also negative and significantly different from zero association with income inequality in most of case, though the

Figure 9: Bivariate correlations between voting behavior indicators and income inequality.



Source: Authors' calculations. ** significant at 5% percent level.

strength of the association tends to be lower when we rely on methods robust to outliers.

3.4 Social capital and income inequality

3.4.1 Rationale

The term social capital is often traced back to the work of the sociologist Bourdieu (1977), but it gained popularity with the seminal work of Coleman (1990) and Putnam (1993). Recently, Guiso et al. (2008) define social capital as "good" culture, i.e., a set of beliefs and values that facilitate cooperation among the members. The authors show that social capital can be measured by both direct indicators (such as generalized trust) and indirect indicators (such as blood donations, or membership in charitable organizations).

There is a large consensus that heterogeneity is one important factor reducing the formation of social capital. Usually, community heterogeneity refers to income inequality but also ethnicity, and racial heterogeneity, though here, we concentrate our attention on economic inequality. Several mechanisms could explain the association between economic inequality and social capital.

First, individuals might be adverse to heterogeneity. In other words, they prefer having contacts with individuals that are similar to themselves, i.e. that belong to the same socioeconomic group. The genetic bases for ethnical preferences in mate selection are discussed in Richard Dawkins (The selfish Gene) and Jared Diamond (The Third Chimpanzee) works. We focus here on socio-economic status. In heterogeneous societies contacts between dissimilar individuals will be at a lower rate than in more homogeneous societies. Repeated interactions being conducive of social capital and trust, heterogeneous societies are thus characterized by fewer contacts and, in consequence, by lower levels of cooperation and trust (see the seminal work by Colman, 1990, and Alesina et al, 2002 for instance).[24] This aversion to heterogeneity can be driven by the fact that individuals from different socioeconomic groups are less likely to share common values and norms which makes it more difficult for them to predict the attitudes of others. This creates an environment not favorable to the development of social capital (Knack and Keefer, 1997).

Second, when resources are not evenly distributed, poor individuals might perceive that they are living in an unfair society where the rich tend to exploit the poor. This will lead individuals at the bottom end of the income distribution to develop distrust against richer individuals (Rothstein and Uslaner, 2004). Uslaner and Brown (2005) argue that when income inequality is high, individuals from different socioeconomic groups will have the sensation that they are not sharing the same fate, and this will hamper trust.

Third, inequality should relate to the level of optimism. A higher level of inequality is likely to reduce the level of optimism for the future and thereby trust (Uslaner and Brown, 2005, Rothstein and Uslaner, 2005).

Finally, economic inequality increases the incentives for dishonest comportments directed against the rich, by the poor people. This implies that poor people will be less trustworthy, which will, thereby, reduce the level of social capital of richer individuals.

3.4.2 Bivariate correlations

We rely on 2 indicators to operationalize social capital: one is about **trust** while the other refers to **participation in voluntary organizations**.

The use of trust to proxy cognitive social capital is motivated by several academic papers. Guiso et al. (2008, 2010) consider that direct indicators such as general-

[24] It is also possible that in more heterogeneous societies, contacts with dissimilar individuals are more frequent than in homogeneous societies, and because, on average people distrust those that are dissimilar from themselves, then, the level of trust tends to be lower in more heterogeneous societies.

ized trust fit well with the definition of social capital as an individual belief about the willingness of other members of the community to cooperate. [25].

Information on trust is available in various cross-country surveys. Here, we rely on the European Social Survey in which respondents are asked if *they believe that people can be trusted, or if, on contrary, we cannot be too careful in dealing with others*. This variable ranges from 0 to 10 with 10 meaning that most people can be trusted while the value 0 means that we cannot be too careful. The information is drawn from the 2008 or 2010 surveys for all countries but for Austria for which we had to use the 2006 wave. Data on trust are missing for Italt and Luxembourg.

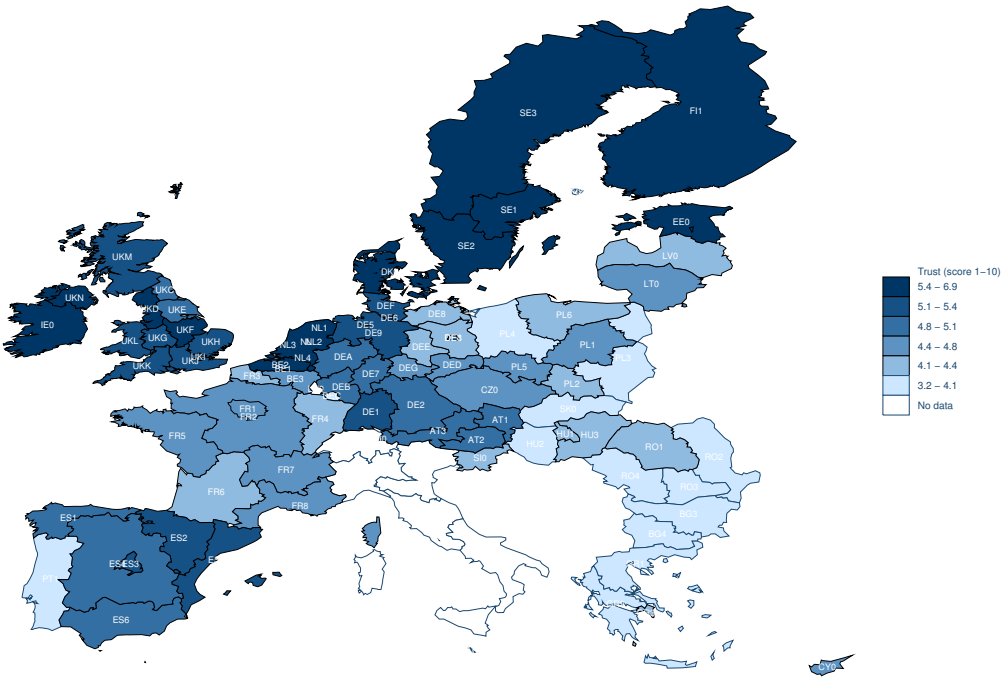
Figure 10 maps the average level of trust across European NUTS1 regions. The highest level of trust is reported in Nordic countries such as Denmark, Finland, Sweden or the Netherlands while, on contrary, Eastern and South European countries such as Poland,Romania, Bulgaria or Portugal tend to display lower levels of trust. In Denmark, the trust indicator scores on average at 7 whereas in Portugal, the same indicator is equal to 3.8. Disparities within countries are noticeable in Spain and Germany. Between the region Sachsen-Anhalt (DEE) and Baden-Wurttemberg (DE1), there is a 1.1 point difference in the average level of trust (4.0 and 5.1 respectively). In Spain, the level of trust ranges between 4.6 and 5.3.

Next, we use an indicator of individual participation in local organisations denoted by membership. We focus on "Putnamesque" networks involving "horizontal egalitarian relationship" rather than on networks based on "vertical hierarchical relationships". The variable membership is based on individual responses taken from the 2008-2010 European Values Study and measures *the proportion of individuals in each region* which are a member of one of the following organisations: *human rights, conservation, environment, ecology, animal rights, youth work, sports or recreation, women's group, peace movement, or organizations concerned with health*. This type of indicator has been largely used in the literature either in this form or in a closely related formulation and is intended to measure "structural" social capital, i.e social networks that entails mutual beneficial actions. Note however that though being member of an organization might be desirable *per se*, it does not convey automatically benefits expected from structural social capital as the actual benefices will depend on the type of relationship within the organization.

Figure 11 shows that participation in Putnamesque organizations greatly varies across Europe. Countries, such as Sweden, the Netherlands, Luxembourg, Belgium and Germany report the highest figures whilst Poland, Romania or Spain display low levels of participation. In Denmark and Luxembourg, respectively more than 70% and 50% of interviewed individuals are member of one of the

[25]See Uphoff and Wijayaratna (2000) for a discussion on the distinction between structural and cognitive social capital.

Figure 10: Trust across NUTS1 regions.



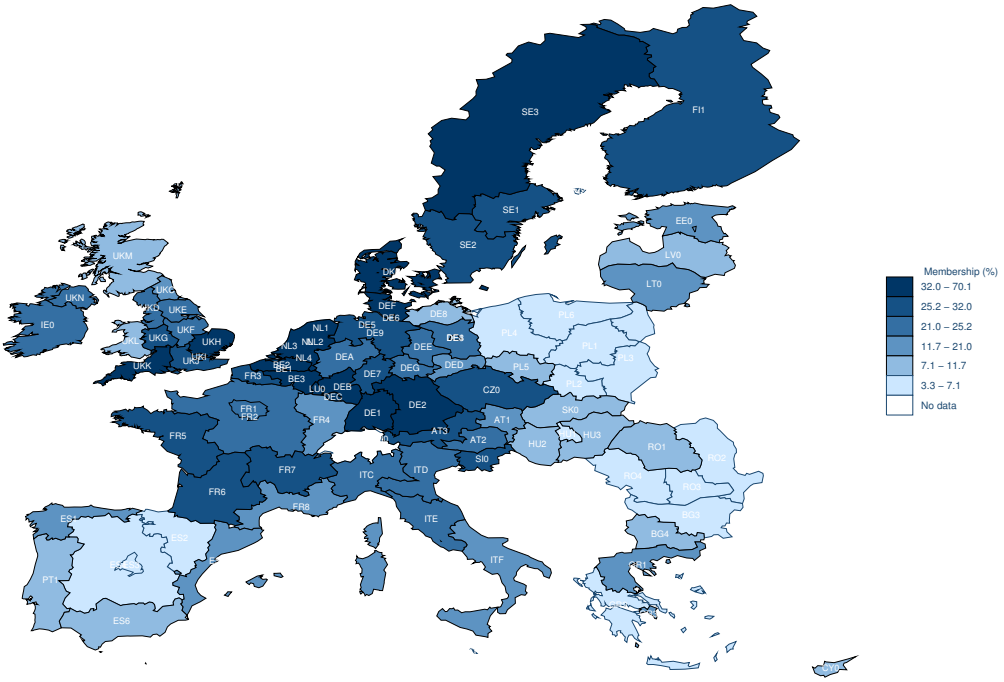
Source: Authors' calculations based on ESS data. Darker blue corresponds to higher percentages.

organizations described above. In comparison, in Poland and Romania this indicator scores below 10%. Regional variations within countries are substantial. For instance, in South-West and East of England, participation rates are about 20% higher than the national average.

In general, the two indicators of social capital show that Nordic countries display high level of social capital while, in comparison, Eastern and Southern countries are embodied with lower levels of social capital.

After having shown the distribution of our 2 proxies for social capital across Europe, we now turn to inspect whether income inequality might have an effect on this social outcome variable. Figure 12 displays the pairwise correlations between the two social capital indicators and the two measures of income inequality. The bivariate correlations are negative and significantly different from zero for both social capital indicators, though of relatively limited magnitude. The bivariate correlations range between -0.18 and -0.26. The regression coefficients do not suggest any significantly different from zero relationship between trust and both inequality measures.. Findings for the proxy of structural capital (membership) show that a 0.1 increase in the Gini coefficient corresponds with a 6.8 percentage points reduction in the proportion of individuals participating in Putnamesque

Figure 11: Membership across NUTS1 regions.



Source: Authors' calculations based on EVS data. Darker blue corresponds to higher percentages.

organizations. The estimated regression coefficient associated with the S80/S20 ratio is equal to -0.031.

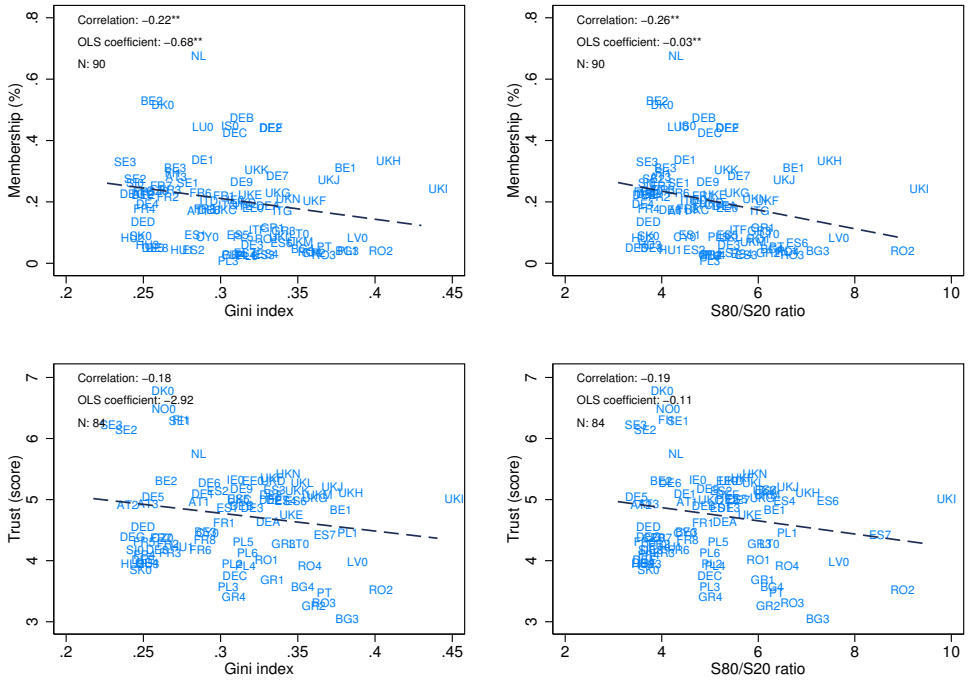
Results reported in Tables A.1-A.4 shows that the correlation between income inequality and social capital is negative and significantly different from zero, irrespective of the inequality index or the estimation method employed when the indicator is a proxy for structural social capital. However, the relationship between generalized trust and income disparity is sensitive to the income disparity index and estimation method employed.

3.5 Health and income inequality

3.5.1 Rationale

In the past 20 years more than hundred published articles have been trying to disentangle the relationship between income inequality and health (Lynch et al., 2004). This amount of research already indicates that it is far from easy to clearly link income inequality to health outcomes. Part of the problem is the lack of a widely accepted rationale on why wider income distribution should affect an individual's health status. A part of the empirical evidence even suggests that

Figure 12: Bivariate correlations between social capital indicators and income inequality.



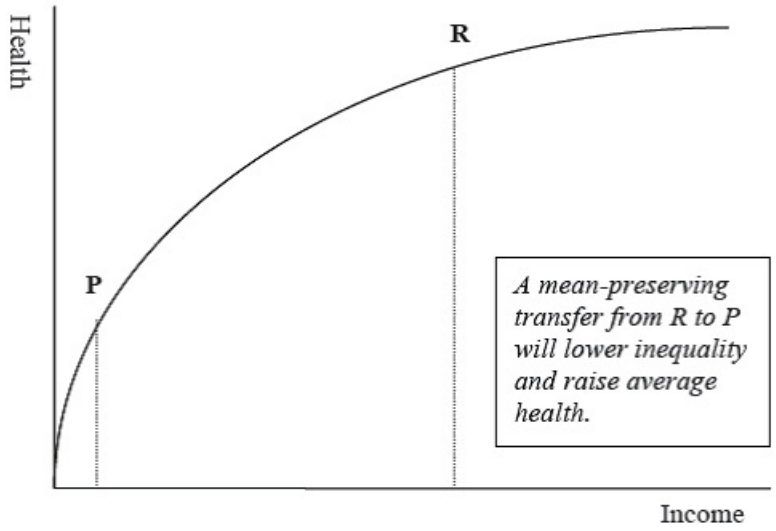
Source: Authors' calculations. ** significant at 5% percent level.

the causality runs in the other way, i.e. from health to inequality. In the following paragraphs, the three most widely mechanisms to connect income inequality and health are discussed (Leigh et al., 2009, Deaton, 2003, and Gravelle, 1998).

The *absolute income hypothesis* postulates that an individual's health status increases with individual income but at a decreasing rate (see Figure 13). This means that one extra Euro given to a deprived person increases his/her health status more than the same Euro spent on a rich person. Hence, there exists a non-linear relationship between income and health status. Figure 14 illustrates this argument by displaying at the country level the bivariate relationship between life expectancy and GDP per capita. This non-linear relationship was found between countries when comparing richer and poorer countries but also within countries (Leigh et al., 2009). As Deaton (2003) argues, this supports the idea that within a country a redistribution of income from richer to poorer individuals will increase the overall health status. In other words, under the absolute income hypothesis an effect of income inequality on health would be caused by the non-linear relationship of income and health.

The second mechanism proposed in the literature is the *relative income hypothesis*. The relative income hypothesis postulates that an individual's relative income position within a country affects the individual's health status. The rationale for

Figure 13: Non-linear relationship of income and health.



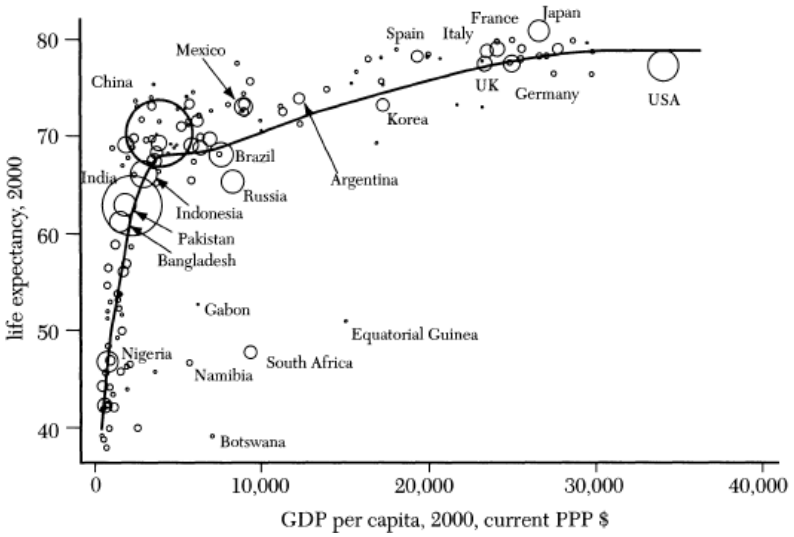
Source: Leigh et al., 2009, p. 6.

this hypothesis is not clearly spelled out in the literature. Most scholars, however, propose the following mechanism: lower relative income increases chronic stress of individuals, due to an increased feeling of deprivation. This chronic stress is then seen to translate into an unhealthier life (Leigh et al., 2009).

The last mechanism to explain why income inequality might affect health is the idea of *societal effects* and, in particular, the effect of increased violence due to higher income inequality. Higher violence and crime rates might lead to higher death rates (i.e. homicides) but also to increased levels of stress, which then translate into worse health outcomes. The effect of income inequality on crime is discussed more extensively in section 3.6. Other societal effects mentioned in the literature are related to societal heterogeneity. In particular, greater heterogeneity is seen to hinder societies to agree on investments in public goods (Alesina et al., 1999). This implies, that higher income inequality might lead to lower investments in the health sector, e.g. in hospitals, and this then might translate into lower health status of the surrounding population (Leigh et al., 2009). Moreover, higher income inequality is also related to lower levels of trust which in turn might increase anxiety and stress levels.

Note, as we already mentioned above, researchers not only propose a causal relationship between income inequality and health, but also support the reciprocal relationship, i.e. the effect of increased health status on income. In particular, scholars propose that health can affect income via labor market effects, educational effects and marriage market effects (Leigh et al., 2009). Leigh et al. (2009) argue that unhealthier individuals have more difficulties in finding and retaining

Figure 14: Cross-country evidence of life expectancy and income.



Source: Deaton, 2003, p. 116.

a job and in obtaining a promotion, thereby having lower levels of income (some evidence on this link can be found in Gertler and Gruber, 2002). Second, improved health of students is positively related to educational attainment and to lower dropout rates of students, causing an increased income later in life. Last, Leigh et al. (2009) argue that healthier people are more likely to marry and build stable relationships, which additionally affects income levels.

3.5.2 Bivariate correlations

We have chosen two different measures of health status for the bivariate correlations. The first measure relates to the *self assessed health status*, and thereby refers to a subjective measure of health. More precisely, this indicator is measures the average score from 1 (very good) to 5 (very bad) of the self-defined health status on the NUTS 1 level of the European countries. Data are drawn from the 2008 EU-SILC survey, or from the 2008 ESS when the information is missing. Figure 15 displays the spatial distribution of values for self-assessed health, with darker blue areas referring to worse self-assessed health and lighter blue areas to better levels of subjective health status on the NUTS 1 level. People in the Nordic countries, i.e. Denmark, Sweden and Finland, as well as in several western European countries, such as UK, the Netherlands, parts of Belgium, Austria, and Ireland perceive that they have a particularly good health status. Noteworthy is the particularly high perceived health status in Greece in contrast to neighboring countries, which report, comparatively, a low health status. In general, self-reported health is low in Eastern-European countries (including Eastern Germany), as well as in Italy, Portugal, and in the Northern parts of Spain.

While this first indicator on health refers to subjective evaluations of health status, we employ additionally a somewhat more objective indicator of health status, namely an indicator on chronic diseases in the population. More precisely, this indicator constitutes the proportion of people in a NUTS 1 region who replied yes to following question: *"Do you have any longstanding illness or longstanding health problem?"*. Data are drawn EU-SILC for most countries, and from SOEP and USS for respectively Germany and the UK. Data employed on chronic diseases refers to the year 2006, and missing values in Germany, Sweden, UK and Bulgaria are replaced by data belonging to the 2008-2010. No data on chronic health was available for Romania.

Figure 16 shows the spatial distribution of the percentage of the population with chronic disease across NUTS 1 regions. Darker blue areas in Figure 16 refers to higher percentages of people with a chronic disease. From Figure 16, it is difficult to establish a clear pattern. Especially high levels of chronic disease appear in Finland, Germany, UK, Estonia, Latvia, and Hungary. On the opposite side are Italy, Greece, Austria as well as the Flemish part of Belgium and the eastern part of Spain with comparably low percentages of the population indicating a chronic disease. The map on chronic diseases across NUTS1 regions produces surprising findings. One underlying reason might be that chronic disease are more easily detected in societies with otherwise good health care provision and thus high levels of health in the population.

After having displayed the regional distribution of the two health indicators, the next step is to investigate the interrelation of the health indicators with income inequality. Figure 17 provides the pairwise correlations between the two health indicators, i.e. self-assessed health and chronic diseases, and the two income inequality measures, i.e. the Gini index and the S80/S20 ratio. The correlations are very low (i.e., range between 0.08 and 0.14) and not significantly different from zero. This is true for both health indicators, irrespective of the income disparity index employed. Results reported in Tables A.1-A.4 confirm the absence of a clear correlation between health and income inequality.

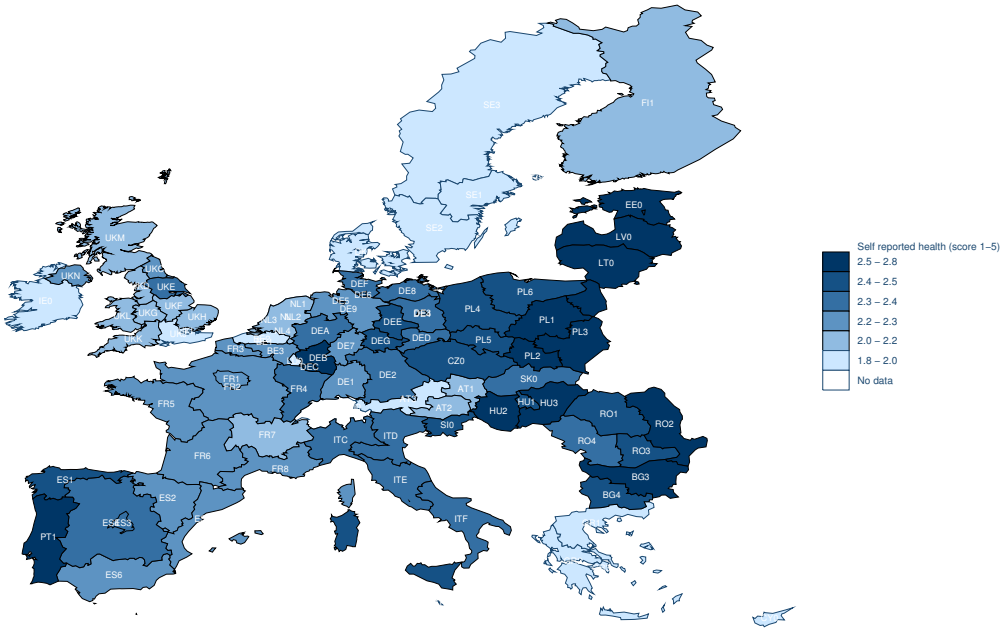
3.6 Criminality and income inequality

3.6.1 Rationale

The determinants of criminality, and in particular the role played by income inequality, has attracted the attention of scientists from various disciplines.

Economic theories for criminal activities date back to Becker (1968) and stress that a criminal act is the result of a rational decision based on a cost-benefit analysis. Individuals decide to participate or not in criminal activities by comparing

Figure 15: Self-reported health across NUTS1 regions.



Source: Authors' calculations based on EU-SILC and ESS data. Darker blue corresponds to higher scores.

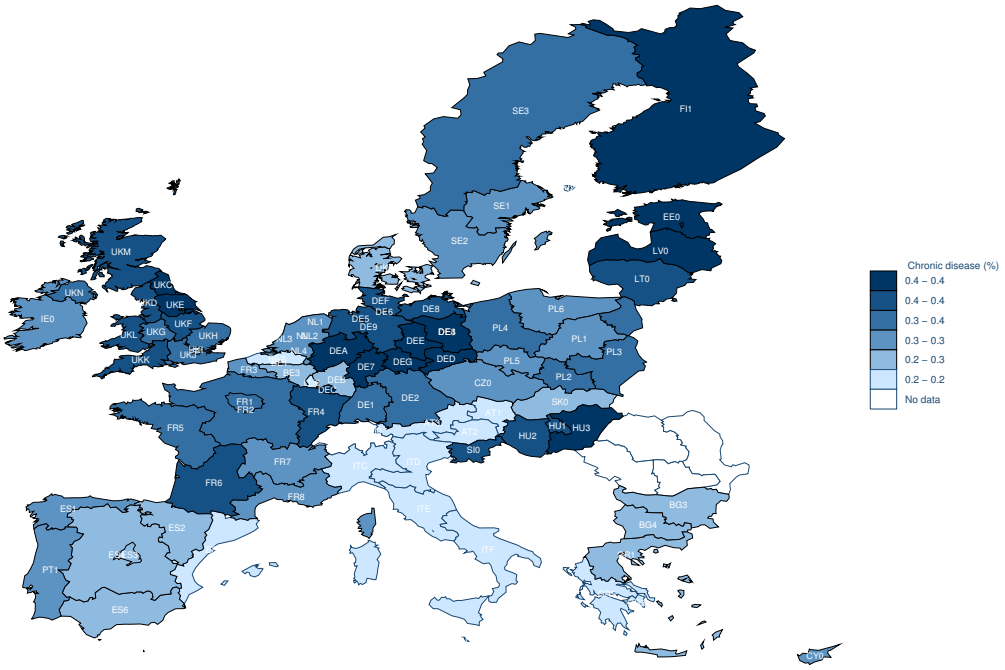
the returns of criminal and legal activities. The net return of a criminal act is the difference between the loot and the associated costs such as the opportunity cost and the severity of punishment if the individual is caught while committing the crime. Income inequality should increase the potential gain derived from a criminal act for individuals situated at the bottom end of the income distribution because the gap between their income and the country mean income is larger, relatively to a situation in which the resources would be more evenly distributed.

Sociological theories sustain that criminal activities result from a feeling of frustration of the less well-off people when they compare their situation with respect to the one of wealthier individuals. The higher is income inequality, the greater is the sentiment of unfairness of disadvantaged individuals. Economic deprivation and the associated feeling of resentment might spur criminal behaviors (Morgan, 2000, citing, in particular, Merton's work, 1938).

3.6.2 Bivariate correlations

Typically, crime statistics used in empirical studies refers to homicide, robbery and property crime rates. In the following, we have also relied on one similar **objective measure of crime**. We complement it with **one indicator of crime**

Figure 16: Chronic Diseases across NUTS1 regions.



Source: Authors' calculations.
Darker blue corresponds to higher percentages based on EU-SILC, USS and SOEP data.

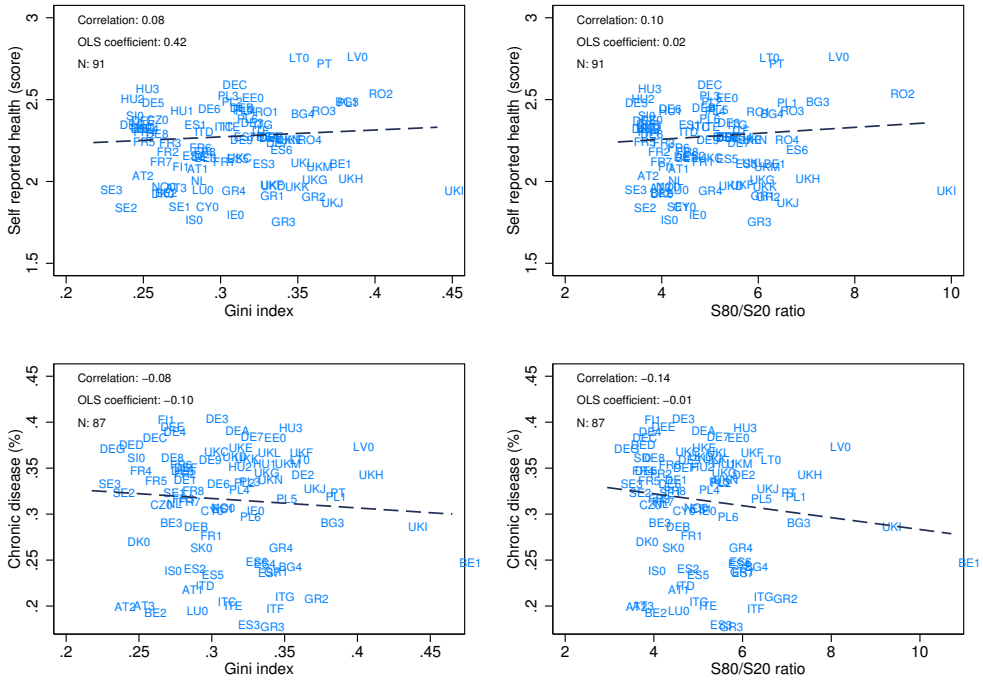
based on individual perceptions.

The first indicator is drawn from the Urban Audit Data (UAD). As explained in section 2.4, this dataset covers both medium-sized and large towns/cities in EU countries. Around 337 cities covering 28 countries are included in the database, i.e, an average of 12 cities per country. In order to make possible the analysis at the regional level, these cities have been matched with the corresponding NUTS1 level. This limitation has to be taken into account while looking at the bivariate association. In what follows we have selected as indicator of criminality *the number of burglary per 1000 inhabitants*. All countries and NUTS1 regions are covered except for Greece and Romania. Most of the data come from the 2007-2009 period, though for France, Denmark, Cyprus, and the Netherlands we had to rely on the previous period, i.e 2003-2006.

Figure 18 indicates that the number of burglary per 1000 inhabitants is the highest in the UK, Netherlands and Belgium. Relatively high numbers of burglary are also reported in Ireland, Denmark and Ireland. Within countries, a higher burglary rate is usually registered in the NUTS1 regions hosting the country's capital.

The subjective indicator of crime aims at measuring, at the regional level, the

Figure 17: Bivariate correlations between health indicators and income inequality.



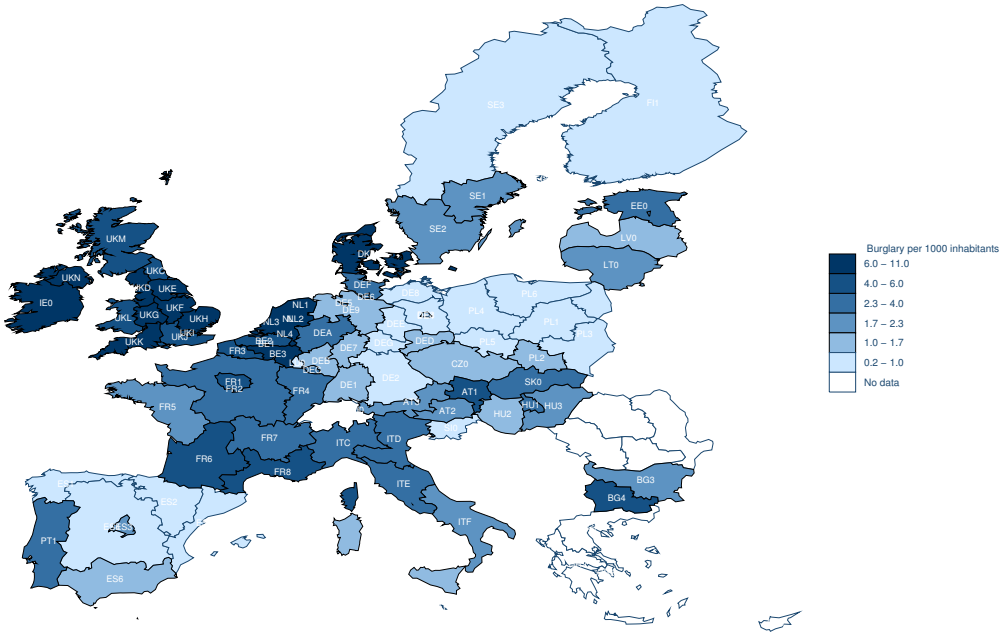
Source: Authors' calculations. ** significant at 5% percent level.

proportion of individuals that *feels crime, violence or vandalism to be a problem for the household*. Data are drawn from the EU-SILC survey for all countries but Germany and UK. For these two countries, we have respectively employed the SOEP and BHPS surveys. The data period is 2007 for most of countries, though for Germany and Denmark, the indicator respectively corresponds to the year 2009 and 2006 while for Sweden and Bulgaria we use information from the 2008 year.

As shown in Figure 19, the perception of crime is the highest in the UK with around 50% of the respondents reporting that crime, violence or vandalism to be a problem in their living area. Latvia and Bulgaria also display high values for this indicator. In contrast, individuals living in Germany as well as in Eastern countries such as Poland, Slovakia, Slovenia report low levels of crime perception. Within countries, the NUTS1 regions with the highest proportion of individuals worried about crime, vandalism or violence are those hosting the country's capital such as Ilê-de-France (FR1) in France, the Community of Madrid (ES2) in Spain or Brussels Capital region (BE1) in Belgium.

The bivariate correlations in Figure 20 show that the perceived crime and income inequality are correlated to each other with correlation coefficient equals to 0.52 when the income inequality index is the Gini coefficient and to 0.49 if instead

Figure 18: Domestic burglary across NUTS1 regions.



Source: Authors' calculations based on UAD data. Darker blue corresponds to higher figures.

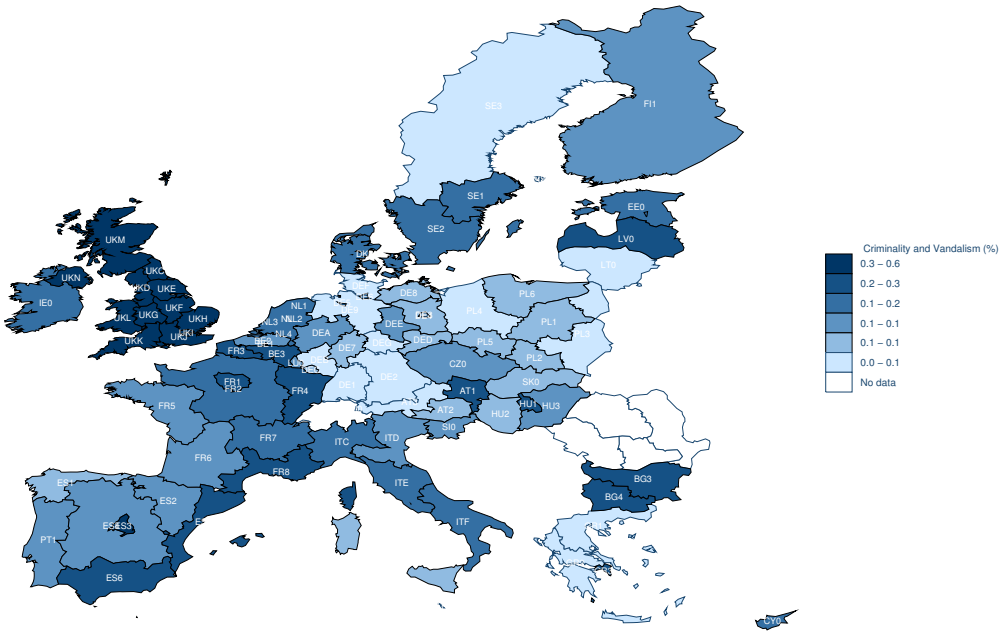
the S80/S20 ratio is the index used. In quantitative terms, a 0.1 rise in the Gini coefficient is associated with a 16.9 percentage points increase in the percentage of individuals reporting that crime, violence or vandalism is a problem. Additionally an increase of the S80/S20 ratio implies a 6.3 percentage points rise in the value of the subjective indicator of crime.

3.7 Education and income inequality

3.7.1 Rationale

The high and positive correlation between education and income is a well-established fact. In the theory of the human capital, Gary Becker (1964) showed that acquiring education increases the skills and competencies of individuals and their productivity. Since in a competitive labor market wages equal workers's productivity, higher productivity leads to higher wage. This means that a more educated society holds greater welfare. Supporting as well as opposing views have encouraged the production of countless empirical and theoretical studies. Nowadays, the acknowledgment of a causal relationship between education and earning is a well-established result and it is one of the most important achievements in

Figure 19: Self-Perception of Crime across NUTS1 regions.



Source: Authors' calculations based on EU-SILC, SOEP and BHPS data.
Darker blue corresponds to higher percentage.

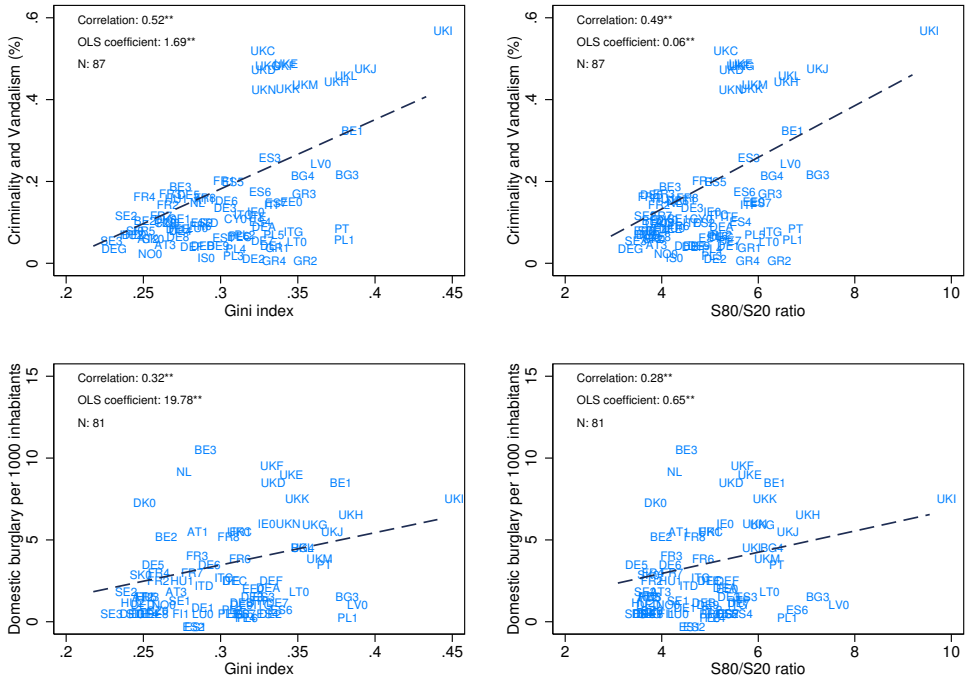
economics.

Conversely things are less clear-cut when analyzing the link between income inequality and educational attainments.

On the one hand, rising wage inequality should encourage investments in education mainly because it raises the return to education. Topel (1997) observes a faster skill accumulation as a result of rising returns. This increase in the supply of skills should eventually mitigate the increase in inequality.

On the other hand, increasing income inequality affects also the resources that households have available to finance education. The intergenerational theory claims that there exists a strong correlation between income and education distributions. This entails that barriers, e.g. liquidity constraints, family background, might prevent the investment in education for the fraction of the population belonging to the bottom of the income distribution. If the intergenerational mechanism is persistent then the same part of population are trapped at low levels of education and income for more than one generation.

Figure 20: Bivariate correlations between crime indicators and income inequality.



Source: Authors' calculations. ** significant at 5% percent level.

3.7.2 Bivariate correlations

The relationship between income inequality and educational outcomes is investigated by relying on the two EU2020 headline indicators in education and training. The first indicator refers to the share of the population aged 30-34 years who have successfully completed university or university-like (tertiary-level) education with an education level ISCED of 5-6.[26] Data are drawn from the 2009 EU-LFS survey. Estonia is missing. The second indicator employed here, describes a negative development in the education sector, namely the share of students which leave the education system prematurely and with only a low level of education. This indicator is drawn from the 2009 EU LFS and measures the proportion of persons aged 18 to 24 whose highest level of education or training attained is ISCED 0, 1, 2 or 3c short and who declared not having received any education or training in the four weeks preceding the survey.[27]. Data is available for all countries for 2009 except for the regions in Germany, for which available data comes from 2004-2008.

[26] See Eurostat, http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=0&language=en&pcode=t2020_41&tableSelection=1

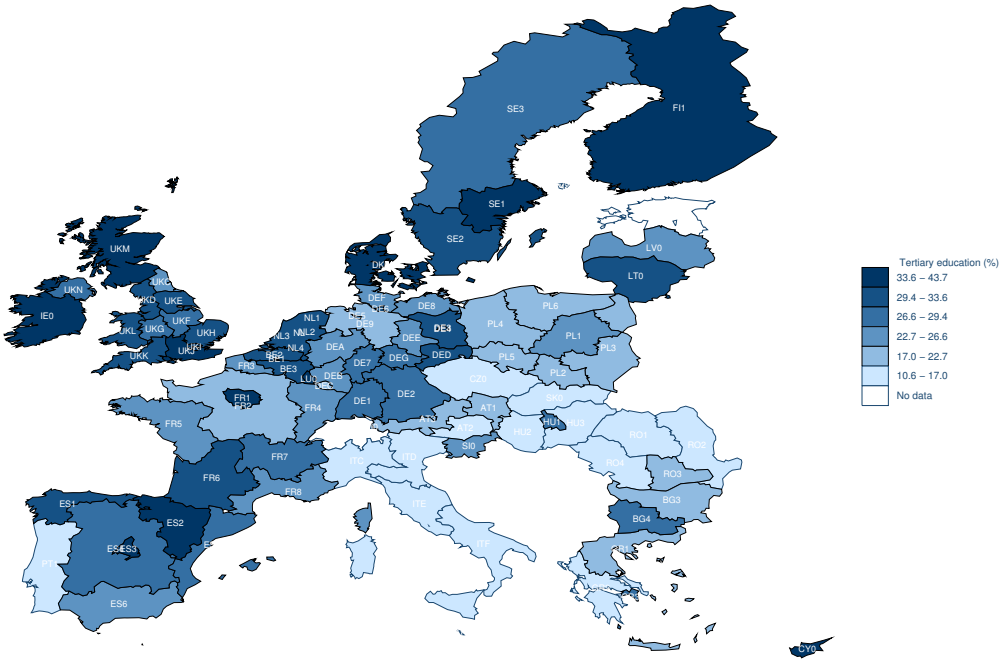
[27] See Eurostat, http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=0&language=en&pcode=t2020_40&tableSelection=1

Figures 21-22 display the regional distribution of the two education indicators in the EU member states. High shares of the population aged 30-34 with completed tertiary education can be found in parts of Sweden, Denmark, Ireland, and the UK, as well as in central France (Ilê de France) and northern and central Spain (ES2, ES3) and Luxembourg. On the other side, very low levels of tertiary education completion can be found in Portugal, Italy, Czech Republic, parts of Austria (AT2), Hungary, Slovakia, Czech Republic, Romania and Greece. In addition to the variation of income inequality across European countries, we also observe substantial within country variation for Spain, UK, Germany and France. In France, moving from the regions which comprises Paris (FR1) to the surrounding region (FR2) is accompanied with a drop in tertiary education completion rates of 17 percentage points (i.e. from 39.27% to 22.10%).

From Figure 22, we observe a huge variation in the share of early school leavers. For example, some Eastern-European countries perform very well and have only very low levels of early school leavers, such as for Poland, Lithuania, Czech Republic, Slovenia and Slovakia. However, neighboring countries, such as Hungary, Romania and Greece have comparably very high levels of early school leavers. In addition, high shares of early school leavers can be found in Spain, Portugal, Italy, and the UK. In addition, we again observe very high within-country variations especially for the UK, France, Italy and Germany. For France, early school leaver rates vary from as low as 9% (FR5) to a maximum of 16.10% (FR8).

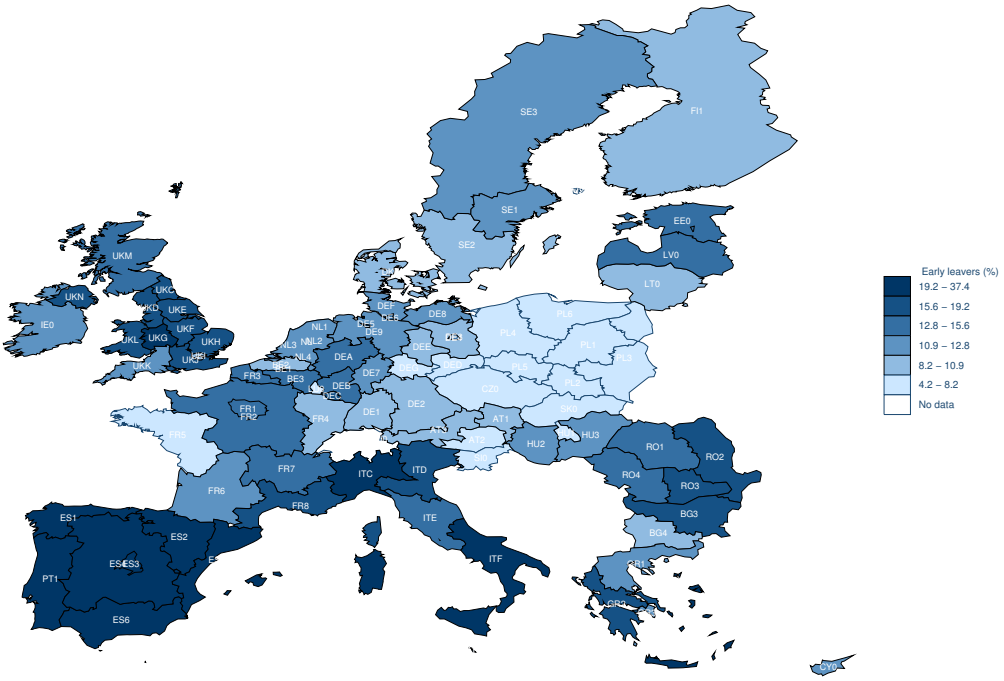
After this first glance at the regional distribution of educational achievement over the EU countries, we now ask the question whether we can detect empirically any relationship between educational attainment and income inequality. Here, Figure 23 displays the pairwise correlation between the two educational indicators and income disparity indices. Taken together the results from the pairwise correlations of the two education indicators provide a mixed picture. On the one hand, the tertiary education completion rate is not significantly related to income inequality Both the correlation and regression coefficients are not statistically different from zero. This lack of correlation is confirmed by the results reported in Appendix. On the other hand, the share of early school leavers is positively associated with income inequality. The pairwise correlation amounts to 0.35 if income disparity is proxied by the gini index and to 0.42 when the S80/S20 ratio is employed. The robustness checks provided in Appendix Tables A1-A3 confirm the negative association between income inequality and the share of early school leavers.

Figure 21: Tertiary Education completion across NUTS1 regions.



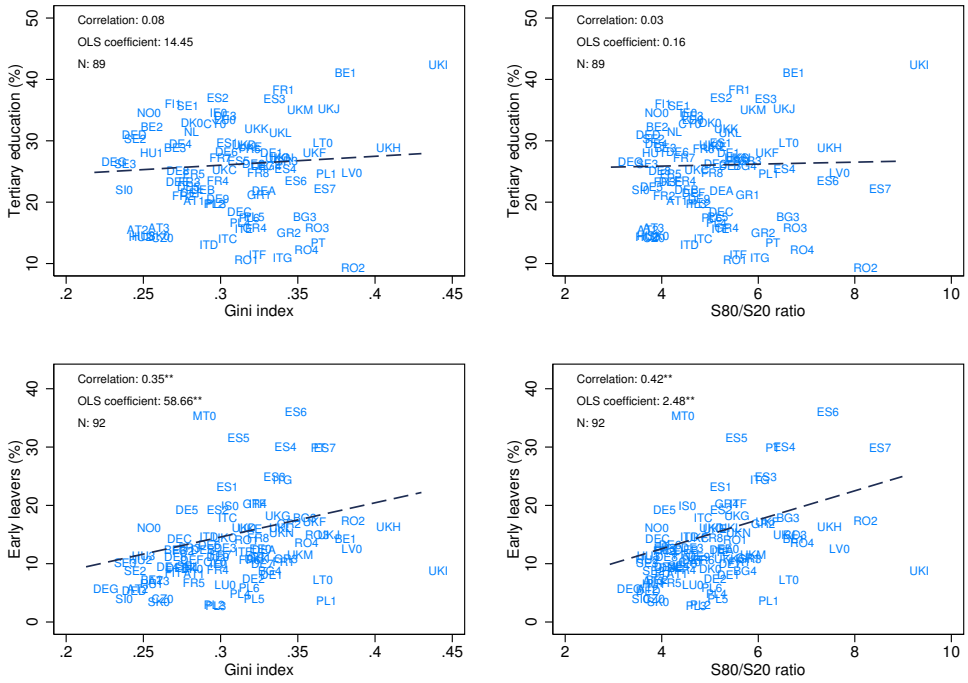
Source: LFS data. Darker blue corresponds to higher tertiary completion rates.

Figure 22: Early School Leavers across NUTS1 regions.



Source: LFS data. Darker blue corresponds to higher shares of Early school leavers.

Figure 23: Bivariate correlations between education indicators and income inequality.



Source: Authors' calculations. ** significant at 5% percent level.

4 Conclusion

Findings reported in this document need to be interpreted with caution as they are based on simple bivariate correlations. In other words, the associations between income inequality and the socio-outcomes discussed in this document should not be interpreted as causal relationships.

The present report complements the earlier literature review (D'Hombres *et al.*, 2012) and aims to focus our target for a subsequent causality quest.

Based on the finding of the present studies it would seem that the most promising avenues for a research on the social outcomes of wage inequality should focus on:

- The negative relationship between income inequality and recorded voter turnout;
- The negative relationship between income inequality and participation in voluntary organizations;
- The positive correlation between income inequality and crime rates;
- The positive correlation between income inequality and early school leaver rates.

Results one to four above remain valid, irrespectively of the estimator or the income disparity index employed.

The following results are less promising in that the findings are found sensitive to the estimation method or the inequality index used for the computation of the bivariate statistics:

- The negative relationship between income inequality and reported voter turnout;
- The negative relationship between income inequality and trust.

Finally, little scope for a causality analysis seems to exist for the social outcomes related to well-being and health.

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Appendix

Table A.1: Social outcomes and Gini coefficient: some robusteness checks.

	Happiness	*Life Satisfaction*	*Crime*	*Burglary*	*Health Status*	*Chronic Disease*	*MembershipTrust*		*Tertiary Education*	*Early School Leavers*	*Voting Behaviour*	*Recorded Turnout*
						OLS estimates						
Gini	-0.274	-3.352	1.694	19.781	0.420	-0.103	-0.677	-2.916	14.454	58.660	-0.637	-115.90
	(0.52)	(-1.87)	(5.58)	(3.05)	(0.77)	(-0.71)	(-2.07)	(-1.64)	(0.73)	(3.52)	(-3.73)	(-4.10)
Obs	90	84	87	81	91	87	90	84	89	92	84	78
						OLS estimates - winsorized income						
Gini	1.555	-0.852	0.898	20.041	0.152	-0.091	-1.231	2.739	4.748	51.573	-0.469	-99.326
	(2.08)	(-0.33)	(2.32)	(2.45)	(0.19)	(-0.42)	(-3.21)	(1.08)	(0.16)	(3.26)	(-2.19)	(-2.88)
Obs	90	84	87	81	91	87	90	84	89	92	84	78
						LAV - winsorized income						
Gini	-1.555	-0.852	0.898	20.041	0.152	-0.091	-1.231	2.739	4.748	51.573	-0.469	-101.036
	(-2.35)	(-0.43)	(3.80)	(2.87)	(0.15)	(-0.48)	(-3.47)	(0.91)	(0.19)	(3.02)	(-1.83)	(-2.44)
Obs	90	84	87	81	91	87	90	84	89	92	84	77

Source: Authors' calculations. t-stat (in brackets).

Table A.2: Social Outcomes and S80/S20 ratio: some robustness checks.

	Happiness	*Life Satisfaction*	*Crime*	*Burglary*	*Health Status*	*Chronic Disease*	*MembershipTrust*		*Tertiary Education*	*Early School Leavers*	*Voting Behaviour*	*Recorded Turnout*
						OLS estimates						
Ratio $\frac{S80}{S20}$	-0.021	-0.105	0.063	0.648	0.018	-0.006	-0.031	-0.108	0.161	2.485	-0.021	-4.590
	(-1.09)	(-1.66)	(5.22)	(2.56)	(0.91)	(-1.27)	(-2.57)	(-1.72)	(0.23)	(4.39)	(-3.47)	(-4.57)
Obs	90	84	87	81	91	87	90	84	89	92	84	78
						OLS estimates - winsorized income						
Ratio $\frac{S80}{S20}$	-0.024	-0.136	0.063	0.659	0.024	-0.006	-0.032	-0.127	0.040	2.314	-0.024	-5.053
	(-1.25)	(-2.06)	(5.22)	(2.56)	(1.16)	(-1.12)	(-2.61)	(-1.95)	(0.06)	(3.84)	(-3.82)	(-4.98)
Obs	90	84	87	81	91	87	90	84	89	92	84	78
						LAV - winsorized income						
Ratio $\frac{S80}{S20}$	-0.087	-0.038	0.040	0.827	0.006	-0.006	-0.037	0.077	-0.170	1.993	-0.014	-5.021
	(-3.88)	(-0.52)	(4.83)	(2.62)	(0.18)	(-0.76)	(-2.91)	(0.64)	(-0.18)	(3.96)	(-1.48)	(-3.65)
Obs	90	84	87	81	91	87	90	84	89	92	84	77

Source: Authors' calculations. t-stat (in brackets).

Table A.3: Social Outcomes and the Atkinson index, $\epsilon = 0.5$: some robustness checks.

	Happiness	*Life Satisfaction*	*Crime*	*Burglary*	*Health Status*	*Chronic Disease*	*MembershipTrust*		*Tertiary Education*	*Early School Leavers*	*Voting Behaviour*	*Recorded Turnout*
						OLS estimates						
Atkinson $\epsilon = 0.5$	-0.450	-6.341	3.412	41.201	0.541	-0.113	-1.028	-4.588	34.703	89.082	-1.189	-214.865
	(-0.44)	(-1.80)	(5.76)	(3.31)	(0.51)	(-0.44)	(-1.60)	(-1.31)	(0.91)	(2.67)	(-3.53)	(-3.85)
Obs	90	84	87	81	91	87	90	84	89	92	84	78
						OLS estimates - winsorized income						
Atkinson $\epsilon = 0.5$	-1.660	-0.903	1.060	21.658	0.180	-0.173	-1.173	2.578	4.479	60.551	-0.376	-138.065
	(-1.82)	(-0.44)	(4.41)	(2.60)	(0.17)	(-0.84)	(-2.78)	(0.77)	(0.16)	(3.21)	(-1.26)	(-3.22)
Obs	90	84	87	81	91	87	90	84	89	92	84	78
						LAV estimates - winsorized income						
Atkinson $\epsilon = 0.5$	-2.839	-1.581	2.146	45.653	0.136	-0.120	-2.294	4.065	58.778	99.584	-0.732	-206.655
	(-1.97)	(-0.41)	(5.85)	(3.59)	(0.07)	(-0.37)	(-3.44)	(0.67)	(1.43)	(3.09)	(-1.51)	(-2.57)
Obs	90	84	87	81	91	87	90	84	89	92	84	77

Source: Authors' calculations. t-stat (in brackets).

Table A.4: Social Outcomes and the Atkinson index, $\epsilon = 1$: some robustness checks.

	Happiness	*Life Satisfaction*	*Crime*	*Burglary*	*Health Status*	*Chronic Disease*	*MembershipTrust*		*Tertiary Education*	*Early School Leavers*	*Voting Behaviour*	*Recorded Turnout*
						OLS estimates						
Atkinson $\epsilon = 1$	-0.551	-3.472	1.840	20.546	0.567	-0.140	-0.825	-3.039	8.019	68.836	-0.686	-139.668
	(-0.95)	(-1.76)	(5.22)	(2.79)	(0.94)	(-0.87)	(-2.29)	(-1.56)	(0.37)	(3.77)	(-3.65)	(-4.46)
Obs	90	84	87	81	91	87	90	84	89	92	84	78
						OLS estimates - winsorized income						
Atkinson $\epsilon = 1$	-2.658	-1.516	2.097	47.360	0.157	-0.206	-2.002	4.086	58.765	103.560	-0.733	-200.073
	(-1.72)	(-0.40)	(5.19)	(3.78)	(0.08)	(-0.64)	(-2.74)	(0.68)	(1.30)	(3.04)	(-1.50)	(-2.90)
Obs	90	84	87	81	91	87	90	84	89	92	84	78
						LAV estimates - winsorized income						
Atkinson $\epsilon = 1$	-2.502	-0.929	1.120	22.060	0.159	-0.117	-1.166	2.570	4.522	60.468	-0.467	-136.993
	(-3.61)	(-0.45)	(4.53)	(2.79)	(0.15)	(-0.55)	(-2.88)	(0.76)	(0.16)	(3.34)	(-1.59)	(-3.16)
Obs	90	84	87	81	91	87	90	84	89	92	84	77

Source: Authors' calculations. t-stat (in brackets).

Table A.5: Full name of NUTS 1 regions.

	Acronym	**Full name**
Austria	AT1	East Austria
”	AT2	Southern Austria
”	AT3	West Austria
Belgium	BE1	Brussels Capital Region
”	BE2	Flemish Region
”	BE3	Walloon region
Bulgaria	BG3	Severna I Iztochna
”	BG4	Yugozapadna I Yuzhna Tsentralna
Cyprus	CY0	Cyprus
Czech Republic	CZ0	Czech Republic
Germany	DE1	Baden-Württemberg
”	DE2	Bavaria
”	DE3	Berlin
”	DE4	Brandenburg
”	DE5	Bremen
”	DE6	Hamburg
”	DE7	Hessen
”	DE8	Mecklenburg-Vorpommern
”	DE9	Lower Saxony
”	DEA	North Rhine-Westphalia
”	DEB	Rhineland-Palatinate
”	DEC	Saarland
”	DED	Saxony
”	DEE	Saxony-Anhalt
”	DEF	Schleswig-Holstein
”	DEG	Thuringia
Denmark	DK0	Denmark
Estonia	EE0	Estonia
Spain	ES1	North West
”	ES2	North East
”	ES3	Community of Madrid
”	ES4	Centre
”	ES5	East
”	ES6	South
”	ES7	Canary Islands
Finland	FI1	Mainland Finland
”	FI2	Aland
France	FR1	Île-de-France
”	FR2	Parisian basin
”	FR3	Nord-Pas-de-Calais
”	FR4	East
”	FR5	West
”	FR6	South West
”	FR7	Centre East
”	FR8	Mediterranean
”	FR9	Overseas departments
Greece	GR1	Voreia Ellada
”	GR2	Kentriki Ellada
”	GR3	Attica
”	GR4	Nisia Aigaiou, Kriti
Hungary	HU1	Central Hungary
”	HU2	Transdanubia
”	HU3	Great Plain and North

Continued on next page

	Acronym	**Full name**
Ireland	IE0	Ireland
Iceland	IS0	Iceland
Italy	ITC	North West
”	ITD	North East
”	ITE	Centre
”	ITF	South
”	ITG	Islands
Lithuania	LT0	Lithuania
Luxembourg	LU0	Luxembourg
Latvia	LV0	Latvia
Netherland	NL1	North Netherlands
”	NL2	East Netherlands
”	NL3	West Netherlands
”	NL4	South Netherlands
Norway	NO0	Norway
Poland	PL1	Central Region
”	PL2	South Region
”	PL3	East Region
”	PL4	Northwest Region
”	PL5	Southwest Region
”	PL6	North Region
Portugal	PT1	Mainland Portugal
”	PT2	Azores
”	PT3	Madeira
Romania	RO1	One
”	RO2	Two
”	RO3	Three
”	RO4	Four
Sweden	SE1	East Sweden
”	SE2	South Sweden
”	SE3	North Sweden
Slovenia	SI0	Slovenia
Slovakia	SK0	Slovakia
United Kingdom	UKC	North East England
”	UKD	North West England
”	UKE	Yorkshire and the Humber
”	UKF	East Midlands
”	UKG	West Midlands
”	UKH	East of England
”	UKI	Greater London
”	UKJ	South East England
”	UKK	South West England
”	UKL	Wales
”	UKM	Scotland
”	UKN	Northern Ireland

European Commission
EUR 25761 EN – Joint Research Centre – Institute for the Protection and Security of the Citizen

Title: **Income Inequality and Social Outcomes: Bivariate Correlations at NUTS1 Level**

Authors: Leandro Elia, Beatrice d'Hombres, Anke Weber and Andrea Saltelli

Luxembourg: Publications Office of the European Union

2013 – 68 pp. – 21.0 x 29.7 cm

EUR – Scientific and Technical Research series – ISSN 1831-9424 (online), ISSN 1018-5593 (print)

ISBN 978-92-79-28229-4

doi:10.2788/80746

Abstract

The last two decades have been marked by a growing concern about rising inequality. In a recent book (2012), Joseph Stiglitz, a former Nobel prize winner in Economics argues that rising income inequality is one of the main factors underlying the economic and financial crisis in the United States. The Economist magazine has also recently devoted a special report on income inequality in the world (issue 13th- 19th October 2012). The social and economic challenges associated with rising income inequalities have gained prominence in the public debate, after the publication in 2009, of a widely cited book by Richard Wilkinson and Kate Pickett entitled ''The Spirit Level, Why More Equal Societies Almost Always Do Better". Using cross- national data, the authors show that income inequality correlates with lower levels of social capital as well as with a host of other social challenges from poor health, crime, to underage pregnancies. The current report takes part in this debate by examining the bivariate correlations at subnational level (NUTS 1 level) between income inequality and indicators of education, health, criminality, political participation, social capital and happiness at the EU level. Findings suggest a statistically significant negative relationship between income inequality and recorded voter turnout and participation in voluntary organizations, used as a proxy of social capital; while a significant positive correlation between inequality and crime rates as well as the percentage of early school leavers. On the contrary, rising income inequality seems not to be associated with health and wellbeing indicators.

LB-NA-25761-EN-N

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Publications Office

ISBN 978-92-79-28229-4