



The Mediating Role of Perception of Society Between Income Inequality and Life Satisfaction. Insights from the European Social Survey

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Abstract

The mechanisms between inequality and well-being are not fully known. There is a body of knowledge assuming personal information on the social environment can be important here. In this article, we consider this perception of society (POS) as a mediator between income inequality and life satisfaction. Our research questions are: 1) How are various measures of income inequality associated with life satisfaction, and 2) does the POS mediate the effect of inequality on life satisfaction? The individual-level data come from the European Social Survey 2008 ($N=56,752$) and the macro-level data from OECD and World Bank. We use a comprehensive and psychometrically valid measure of the POS to capture individuals' full societal perceptions. The data is analysed with a multilevel linear regression and the mediation effect is tested with a Sobel test. The results reveal significant differences between indicators of income inequality in their ability to predict life satisfaction. Moreover, POS is strongly associated with life satisfaction and mediates the association of income inequality on life satisfaction. In addition, we observed the so-called 'saturation effect.' The effect of POS depends on objective conditions—the better the society, the smaller the effect.

Keywords Income inequality · Subjective well-being · Life satisfaction · Perception of society

Introduction

Income inequality has become a popular topic in the social scientific, especially in Europe where it has been increasing since 1980s. In Europe, numerous inequalities have been steadily increasing since the 1980s, income inequality being among

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them. While European countries have been somewhat successful in ensuring those at the bottom of the income distribution get a fair share of the economic growth, the UN's Sustainable Development Goals have not been achieved (Blanchet et al., 2019). Income inequality is associated with various negative consequences, including health problems, lower life expectancy, and higher crime rates at the national level. It also affects mental health at the county level (Amate-Fortes et al., 2023) and increased mistrust, unfairness, and status anxiety at the individual level (Oishi et al., 2022; Polacko, 2021; Wilkinson & Pickett, 2022). Inequality tends to lower well-being even among the well-off, though this is debated (Berg & Veenhoven, 2010; Haller & Hadler, 2006).

Recent studies suggest inequality *has* an impact on well-being, but only under certain conditions. In Schneider's (2016) literature review, sixteen out of twenty-seven studies found negative associations between income inequality and subjective well-being, six studies found positive associations, and five were inconclusive. Subgroup-specific analyses revealed the negative associations in (west) European countries. The most compelling evidence to date comes from Ngamaba et al. (2018), who performed a meta-analysis of twenty-four studies. While their pooled effect size was close to zero, indicating no association, their subgroup analyses followed Schneider's (2016) and Ferrer-i-Carbonell and Ramos' (2014) results: inequality has a negative association with well-being in European countries. As the results were not entirely conclusive, Ngamaba and colleagues (2018, p. 577) aptly conclude: "[the] association between income inequality and SWB is weak [and] complex".

The studies presented above focus on the question of *whether* inequality affects well-being, which leaves open the question of the interrelatedness of the individual and society. Fewer studies have focused on *how* inequality affects well-being (Böhnke, 2008; Delhey & Dragolov, 2014; Schneider, 2019). Understanding these mechanisms is essential for those interested in how the well-being of individuals varies within and between nations (Buttrick et al., 2017). The mechanisms mediating this effect are not well known (Walasek & Brown, 2019). Currently, two dominant theories explaining this relationship exist. First, the *tunnel effect* was introduced in 1973 by Hirschman (Davis, 2019; Hirschman, 1973). The theory assumes an individual's well-being depends on their present state, but also on their expectations of future contentment (Hirschman, 1973). These expectations are based on other people's success and/or failure, which signals "an improvement in their own future prospects" (Davis, 2019). In Hirschman's words "advances of others supply *information* about a more benign [or hostile] *environment*" (Hirschman, 1973, p. 546 italics added). The precise mechanisms of the tunnel effect have been discussed in the contexts of different countries. For example, some scholars have stressed the importance of future expectations especially in the context of unequal societies (e.g. Senik, 2004).

The second theory, *status hypothesis*, assumes people's status on various social ladders affects life satisfaction: the higher an individual is in social comparisons, the higher his or her life satisfaction. These comparisons can relate to anything, but one of the most studied is probably income, which has been linked with life satisfaction in many studies (Davis & Wu, 2020). Inequality is considered to increase concern with status, and thus also social comparison. Increased concern with status

and social comparison are assumed to have negative psychological consequences, such as diminished life satisfaction. (Walasek & Brown, 2019.) For example, Delhey and Dragolov (2014) found status anxiety to be an important mediator in poorer societies, whereas in more affluent societies social trust was more important. Both theories assume knowledge of the social environment, against which one's future expectations or status are assessed. Most often this assumption is implicit, but for example Davis and Wu (2020) assumes that "individuals know x_i [= income and average income level] and correctly use this information". However, this information has not received enough attention in previous studies.

The above-mentioned approaches have gained remarkable support from the empirical evidence. However, both theories are primarily concerned with perceptions of others and their economic progress, not the society. For this reason, we extend the analysis and use a more comprehensive construct that captures various facets of perception of society, such as the perceived quality of welfare state institutions and social conditions in society. In the rest of this paper, we will refer to our construct as 'POS' and to the phenomenon itself as 'perception of society.'

Our task is twofold. First, we examine how various income inequality measures are associated with life satisfaction and the POS. Although the objective income distribution is fixed at the time, the ways of measuring this distribution vary (e.g. the Gini coefficient, or the Palma ratio). We argue some of these measures are closer to the lay understanding of income inequality, and hence provide more information for life satisfaction judgments. Second, we test how the POS is associated with life satisfaction and whether it acts as a mediator between inequality measures and life satisfaction. We aim to answer these questions by applying a set of combined multi-level linear regressions followed by a mediation analysis.

Life Satisfaction, Perception of Society, and Income Inequality

The interaction between the individual and society is important to well-being. However, life satisfaction is not a straightforward function of the society we live in, nor is it a function of individual characteristics, but rather it is a function of both: an individual embedded and interacting with the environment (Bentley Brymer et al., 2020; Little, 2000). Thus, we think the mere presence of income inequality is not enough to affect the life satisfaction, as for the environment to have an impact on life satisfaction, it must be experienced and perceived somehow by someone (Böhnke, 2008). As life satisfaction judgment is a cognitive process, people need information to form it. Therefore, it is implied the way we understand and/or perceive the society we live in could have an impact on our life satisfaction.

In this study, we use life satisfaction as a measure of subjective well-being, as it combines information and perception in a particularly useful way. According to Diener (Diener, 2009, p. 1), subjective well-being is the extent to which "a person feels and *thinks* his or her life is desirable". Similarly, Veenhoven (1996a, p. 6) defines life satisfaction as "the degree to which a person positively *evaluates* the overall quality of his/her life as a whole". These definitions emphasize life satisfaction as a *cognitive assessment*. This cognitive nature of life satisfaction

judgments is partly the reason these assessments are “invariantly stable and consistent” (Diener & Larsen, 1984). Studies have shown this is due to the type of information used in life satisfaction judgments (Schimmack & Oishi, 2005; Schimmack et al., 2002). Surveys usually allow individuals to use any information they find relevant for assessing their well-being (Lea & MacLeod, 2019). This information can be divided into chronically and temporarily accessible information, the first referring to information salient only in assessment situation, and the latter being accessible at any given time. The above-mentioned consistency is because chronically accessible information accounts for some 80% of life satisfaction assessment. (Schimmack et al., 2002.) Therefore, life satisfaction is a stable assessment involving information about one’s surroundings.

Life satisfaction is proposed to form through either a bottom-up or top-down process (Lucas, 2004). The top-down model suggests people evaluate their general life satisfaction first and then assess specific domains based on this judgment. Conversely, the bottom-up model posits that specific domains are assessed first, forming the basis for general life satisfaction. Lucas (2004) found that bottom-up models explain more variance, indicating life satisfaction relies more on these processes. In accordance with the bottom-up model, society provides a constant stream of information through daily interactions and media, for instance. These small inputs lead to an idea of what society is like. We call this idea the ‘perception of society’ (POS). While some studies have examined perceptions of specific societal facets like social mobility (Alesina et al., 2004; Bjørnskov et al., 2013), inequality (Oshio & Urakawa, 2014; Willis et al., 2022), and conflicts (Delhey & Dragolov, 2014), few have focused on the perception of the society as a whole. Böhnke (2008) is the only scholar we have found to refer specifically to ‘perceptions of society’, by which they refer to the perception of the *quality* of society. Although socio-ecological approaches are gaining in popularity (i.e. King et al., 2014), the idea that our societal perceptions affect well-being is relatively new.

We selected income inequality to represent the environment due to its strong perceptual nature. As noted by the OECD (2011), it is “one of the most visible manifestations of differences in living standards within each country”. Income inequality refers to the distribution of income within society and can be measured in several ways, despite the underlying income distribution being the same. The Gini coefficient is the most commonly used measure in well-being studies, comparing cumulative proportions of the population to the cumulative

income they receive. For instance, in Schneider’s (2016) review, it was used in 84.6 per cent of studies, while Ngamaba and colleagues’ (2018) meta-analysis reported 87.2 per cent.

Other income inequality measures include decile ratios, such as the P90/P10 and P90/P50, and share ratios, such as the Palma ratio. For instance, the P90/P10 ratio is the ratio of the ninth decile’s upper bound against the upper bound of the first decile (OECD, 2022) Some of the measurements are sensitive to the tails of the income distribution, some of them put more weight on the middle, while others are insensitive to changes in the middle of the distribution. Despite these differences, the various indicators are “mainly in agreement when comparing inequality differences across countries” (Trapeznikova, 2019). This agreement is illustrated in Table 1,

Table 1 Intercorrelations of various income inequality measures, countries' average life satisfaction (LS) and average POS

	Gini	Palma	P90P10	P90P50	P50P10	LS	POS
Gini	1						
Palma	0.92	1					
P90P10	0.91	0.95	1				
P90P50	0.90	0.98	0.94	1			
P50P10	0.82	0.77	0.93	0.76	1		
LS	-0.47	-0.49	-0.51	-0.55	-0.45	1	
POS	-0.54	-0.52	-0.59	-0.56	-0.59	0.91	1

which presents the intercorrelations of various income inequality measures. As can be seen, the correlations between different measures are strong, but not perfect.

These measures are rough approximations of actual income inequality, reducing complex societal distributions into a single number. This raises the question of which measure aligns best with peoples' perceptions. As Oshio and Urakawa (2014, p. 755) argue, it is not reasonable to "assume that individuals have precise information about actual income inequality". Gimpelson and Treisman (2018) found people performed only slightly better than chance in estimating their country's income inequality, average wage, or wealth share of the top percent. This indicates a discrepancy between lay understanding and objective reality. As Gimpelson and Treisman (Gimpelson & Treisman, 2018, p. 42) aptly state: "if people do not know how high inequality is, we should not expect actual inequality to predict public preferences and behaviour" and continue "but perceived inequality could still matter".

When considering society, individuals perceive more than just inequality. For instance, Veenhoven (1996a, 1996b, 1997) has listed aspects of the good society. These include education, health services, and other public services, which are not only connected to inequality (Polacko, 2021), but are visible phenomena in society as such. One would expect these elements to contribute to the perception of society and inform life satisfaction judgments.

The Mechanisms Linking Income Inequality and Life Satisfaction

The associations between income inequality, POS, and life satisfaction can be modelled with Veenhoven's (1997, 2012) *sequence model of life satisfaction judgments*. According to this model, we can trace individual's life satisfaction judgments back to life chances. This model can also be designed to resemble James Coleman's macro–micro model about the association between society and individual action (Coleman, 1986). In this model (Fig. 1), life chances and average life satisfaction are at the macro level, with the representing the often found association between inequality and well-being discussed above. However, life satisfaction is inherently an individual property and average life satisfaction is just an aggregation, a sort of by-product at the individual level. We propose, that this association flows through the individual level as follows.

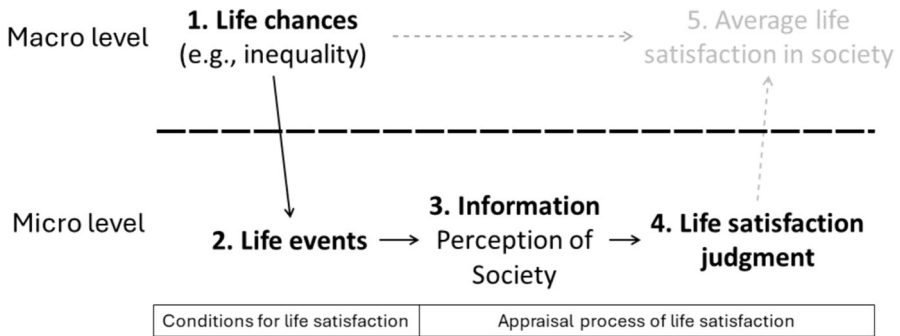


Fig. 1 Two-level model of the association between inequality and countries' life satisfaction

Life chances (step 1) are broader conditions (e.g. democracy, economic welfare, and inequality) that make certain life events (step 2) more probable. Together these two form conditions for life satisfaction (Veenhoven, 1997). The chances of experiencing 'rewarding' or 'aversive' life events depends on the inequality in the country. For instance, in unequal societies, the poor face more deficits and challenges than the rich. These conditions influence the appraisal process of life satisfaction, which involves a flow of experiences leading to an assessment of life satisfaction. In our case, income inequality causes certain life events, shaping individuals' perception of society. These perceptions form part of the information (step 3) used in the final life satisfaction assessment (step 4). Notably, inequality does not necessarily have to cause negative (or positive) events, but "causality can skip a step" (Veenhoven, 2012, p. 72). In this sense, the mere awareness of inequality can lead to negative experiences, such as anxiety, as is implied in Hirschman's (1973) tunnel theory, for example.

These remarks form the basis of our study. As perceptions of inequality are biased, we ask 1) which measure best captures our everyday experience of income inequality, if any. After this, we test 2) whether a broader concept of POS is associated with life satisfaction, and subsequently, 3) whether it mediates the effects of inequality on life satisfaction. To avoid the narrow version of perception used in previous studies, we use more comprehensive, but psychometrically valid measure of the POS (discussed below).

Data, Variables, and Methods

The European Social Survey, round 2008 (31 countries, $N=56752$) was used as our data. This round was chosen because it includes a "Welfare Attitudes" module containing multiple variables on the POS. This module can also be found in European Social Surveys' eighth round from 2016. However, the eighth round was not used in our analyses due to its shortcomings, namely the number of countries ($N=23$) and insufficient between-country variation due to the sample size at the country level. These issues and their implications are discussed in more detail in Appendix A. We

begin by describing the key variable, the POS, and then continue by describing the other individual-level variables. The descriptive statistics of these can be found in Tables 6 and 7 in Appendix B. Lastly, we describe the macro-level variables.

The Dependent Variable: Perception of Society (POS)

The essential question for this study is which aspects of society we perceive. One could argue that the economy is an essential aspect, but the same could be said for the energy sector. These are both observable parts of society about which perceptions can be formed. Society is so complex that no single indicator can measure all its aspects. Therefore, all constructs that claim to measure POS are inherently proxies. Our measure is no exception, and we acknowledge that it captures only part of societies' complexities.

In developing our concept of the POS, we draw on Böhnke's (2008) perceived quality of society, while acknowledging the differences between our datasets. Böhnke used European Quality of Life Survey (EQLS), while we use European Social Survey (ESS), limiting our measure to available variables. We constructed POS from nine variables, each reflecting a respondent's view of an aspect of society. From Böhnke's (2008), we adopted the following items representing POS: 'Standard of living of pensioners', 'Most people can be trusted, or you can't be too careful', 'The state of the health services in the country nowadays', and 'The state of education in the country nowadays.' The two latter were also framed as 'outcomes policy' Roosma et al. (2013). We could not include societal tensions, such as those between rich and poor, which were present in Böhnke's construct (2008). Additionally, Roosma et al. (2013a), we included the welfare state goal: 'The government should reduce differences in income levels.' As income inequality is an economic issue (Polacko, 2021), we added 'Of every 100 people of working age how many are unemployed and looking for work?' and 'How satisfied are you with the present state of the economy in the country?'. Finally, we included perceptions of quality of government with 'How satisfied are you with the way democracy works in the country?' and 'How satisfied are you with the national government?'

POS can be considered a latent variable having various empirical manifestations. It is conceivable that other sets of observed items could indicate similar latent factor. These alternative measurement possibilities are discussed in more detail at the end of this article. However, with the chosen set of available items from our dataset we have a variable that is psychometrically and substantially satisfying. The psychometric properties were studied with a confirmatory factor analysis (Fig. 2). Initially, no covariances between items were allowed in the model, resulting in goodness of fit indices close to acceptable, but not quite. Modification indices suggested covariance between health and education items, likely due to a 'method factor' (see e.g., Alessandri et al., 2011), where similar answers are caused by similar wordings of the questions. After allowing for the suggested covariance, the model fit acceptably (Fig. 2). The POS indicator was then calculated as an average of these nine items. Before calculating, we scaled the individual items so that they ranged from 0 to 10, and hence the calculated variable has a range from zero to ten, with zero meaning

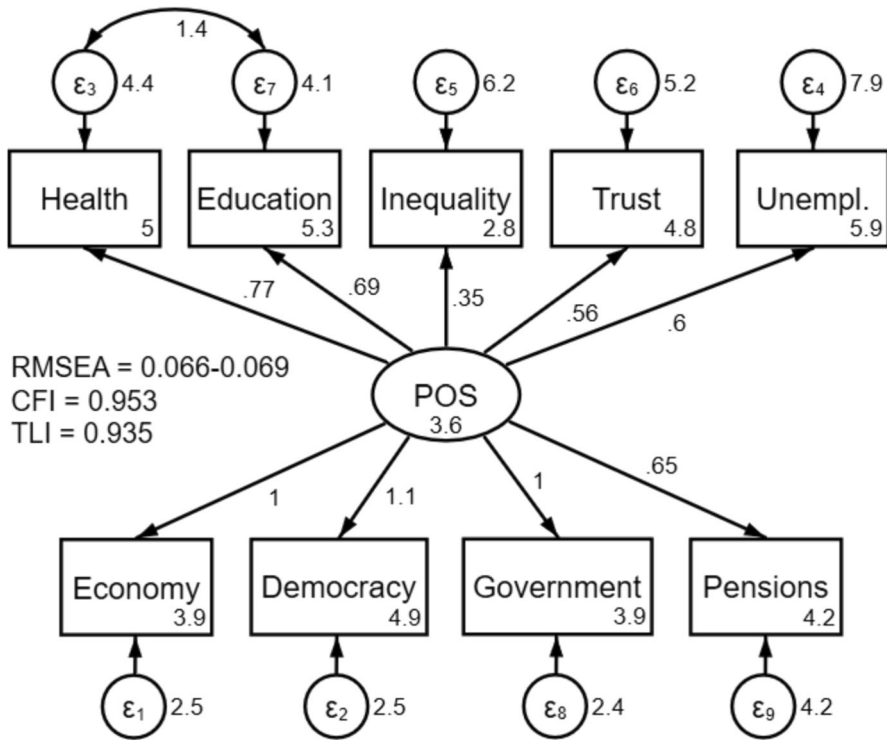


Fig. 2 Confirmatory factor analysis of the POS construct

an extremely negative perception and ten meaning an extremely positive POS. The rescaling process for individual items is described in appendix A.

Other Individual-level Variables

The dependent variable, life satisfaction, was assessed with the widely established question ‘*All things considered, how satisfied are you with your life as a whole nowadays?*’ Responses ranged from zero (extremely dissatisfied) to ten (extremely satisfied).

To control for individuals’ varying positions in society, we included age, gender, education, employment status of the respondents, and feeling about household’s income. Age and education were measured in years and used as a continuous variable. Unemployed respondents actively looking for work or not looking for work were grouped into a dummy variable (unemployed = 0, employed = 1). Furthermore, as the association between inequality and wellbeing is driven by political preferences (Alesina et al., 2004), we also controlled for the political orientation of the respondents. This was measured with “In politics people sometimes talk of ‘left’ and ‘right’—where would you place yourself on this scale?” using a scale from 0 (left) to 10 (right).

Although income is commonly used in well-being studies, due to missing income data for over 15,000 observations, including complete missing data for Bulgaria, Cyprus, and Slovakia, we excluded household income. The multilevel linear regression uses listwise deletion, which would have excluded these countries from the analyses completely. Instead, we controlled for respondent's financial status using a variable that measures feelings about household income. The responses were on a four-point scale, recategorized into a dummy variable (1 & 2 = 'Coping with present income', 3 & 4 = 'Difficult on present income').

Macro-Level Variables

We supplemented the dataset with country-level income inequality data from the OECD database (2022). We applied the post-tax-and-transfers Gini coefficient, as it is perceived as a slightly more accurate measure compared to pre-tax-and-transfers coefficient (Gimpelson & Treisman, 2018). The Gini is scaled so that it varies between 0 and 100. Alongside the Gini coefficient, we utilized the Palma ratio and three decile ratios, namely, P90P10, P90P50 and P50P10. At the time of data retrieval, the OECD database did not contain any data on Ukraine or Cyprus. Thus, the Gini coefficient was replaced by the World Bank equivalent, but the other inequality measures are missing from analyses. The data were retrieved early in June 2023 and may have changed since.

Multilevel Modelling

People live within a society and are exposed to common culture, media, and aspects such as social services, all of which shape their perception of society. Statistically, these observations are clustered. To account for this clustering, we use a multilevel approach, with Level-1 comprising individuals and Level-2 comprising countries. In such models, the variance of variables can be partitioned into within-country and between-country components (Preacher et al., 2010.) Since inequality varies only between countries, mediation can only occur at the between-country level (Delhey & Dragolov, 2014). So, although we have included individual level to our analyses, we are explaining country level variance.

To address potential issues where within- and between-country effects differ or cancel each other out (see also Preacher et al., 2010; Zhang et al., 2009), we decomposed the variance of the POS into individual-level and country-level components. The first was calculated by subtracting the country mean from the individual values, and the latter was the country mean. This "centering within context" (CWC) method allows us to separate individual-level effect from country-level effect, improving the mediation test results (Zhang et al., 2009).

The parsimonious random intercept model applied in this study is defined as:

$$LS_{ij} = \beta_1 + \beta_2 x_{ij} + \beta_3 y_{3j} + \gamma_{1j} + \varepsilon_{ij}$$

where LS_{ij} is the life satisfaction of individual i in country j , β_1 is the mean intercept and γ_{1j} is country-specific deviation from the mean intercept, and $\beta_3 y_{3j}$ is a country

level variable along with regression coefficient. On the individual level x_{2ij} is an individual level covariate with corresponding regression coefficient β_2 , and ε_{ij} is a residual error term, which consists of both individual-specific error and country-specific error. The random intercept model is defined as follows:

$$LS_{ij} = \beta_1 + \beta_2 x_{ij} + \gamma_{1j} x_{ij} + \beta_3 y_{3j} + \gamma_{1j} + \varepsilon_{ij}$$

where γ_{1j} represents country-specific deviation from the mean slope β_2 . From these models we can see variance of life satisfaction is divided into country and individual level, whereas income inequality varies only on country level. (Rabe-Hesketh & Skrondal, 2022.)

Our procedure follows the typical three steps of a mediation analysis: 1) establishing the link between a level-2 antecedent and level-1 mediator, 2) examining the association between the level-2 antecedent and level-1 outcome, when the mediator is controlled, and 3) checking whether the mediation effect is statistically significant (e.g., Krull & Mackinnon, 2001). As we are interested only in a single mediator, the POS, Zhang et al. (2009) recommends the Sobel test. The standard errors for the Sobel tests were acquired by bootstrapping each model five hundred times with resampling at the country-level. The models were estimated using the residual maximum likelihood (REML), as it usually leads to better estimates with small sample sizes on country level (Joop & McNeish, 2020). Stata/IC 15.1 for Windows was used in preparing the data, merging the datasets, and analyses. The data is easily accessible, and the do-files are available upon request.

Results

Following a typical procedure of a mediator analysis, we began by establishing associations between various income inequality measures and the mediator variable, the POS (Table 2). To account for individuals' varying social status, we included control variables. All income inequality measures showed associations with POS with varying degrees of strength. The standardized coefficients indicated the strongest associations were with the decile ratios P50P10, P90P10, and P90P50, in that order.

Next, we conducted three multilevel regression analyses for each income inequality measure (Table 3). The first models (M1) aimed to establish a link

Table 2 The association of various income inequality measures with the POS (multilevel linear regression; controls included)

	Standardized β	Unstandardized β	s.e	p
P90P10	-0.314	-0.428	0.099	<0.001
P90P50	-0.291	-1.622	0.443	<0.001
P50P10	-0.317	-1.607	0.349	<0.001
Gini	-0.223	-0.078	0.029	0.006
Palma ratio	-0.249	-1.223	0.319	<0.001

Standard errors are for unstandardized estimates and from bootstrapped models

Table 3 Non-standardized coefficients from multilevel linear regression of life satisfaction on various income inequality measures. Standard errors for estimates are reported in the parentheses

Variables	P90P10			P50P10			Gini			Palma					
	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3			
Income inequality	-0.274** (0.0951)	0.068 (0.0829)	-0.031 (0.0496)	-1.237*** (0.339)	-0.033 (0.344)	-0.245 (0.184)	-0.860* (0.391)	0.510* (0.211)	0.079 (0.195)	-0.047 (0.0253)	0.015 (0.0152)	0.001 (0.0101)	-0.901*** (0.262)	0.017 (0.253)	-0.161 (0.167)
POS (country level)	0.754*** (0.0727)	0.450*** (0.0597)	0.431*** (0.0444)	0.703*** (0.0745)	0.495*** (0.0745)	0.488*** (0.0444)	0.803*** (0.0563)	0.803*** (0.0563)	0.502*** (0.0702)	0.488*** (0.0702)	0.506*** (0.0617)	0.501*** (0.047)	0.711*** (0.0638)	0.442*** (0.0638)	0.488*** (0.05)
POS (individual level)	0.495*** (0.0298)	0.488*** (0.0222)	0.488*** (0.0222)	0.495*** (0.027)	0.488*** (0.027)	0.488*** (0.0216)	0.495*** (0.0297)	0.488*** (0.0297)	0.488*** (0.0226)	0.488*** (0.0226)	0.501*** (0.0285)	0.501*** (0.0213)	0.495*** (0.0291)	0.488*** (0.0225)	0.488*** (0.0225)
Gender (ref. Male)	0.101** (0.0315)	0.181*** (0.0302)	0.167*** (0.0294)	0.102** (0.0311)	0.181*** (0.0275)	0.168*** (0.0281)	0.101** (0.0323)	0.181*** (0.0301)	0.167*** (0.0274)	0.089** (0.0301)	0.153*** (0.0288)	0.153*** (0.0298)	0.101*** (0.029)	0.181*** (0.029)	0.167*** (0.0287)
Age	-0.008*** (0.00172)	-0.007*** (0.00169)	-0.007*** (0.00168)	-0.008*** (0.00176)	-0.007*** (0.00176)	-0.007*** (0.00174)	-0.008*** (0.00184)	-0.007*** (0.00175)	-0.007*** (0.00166)	-0.008*** (0.00175)	-0.007*** (0.00177)	-0.007*** (0.00157)	-0.008*** (0.00185)	-0.007*** (0.00173)	-0.007*** (0.00162)
Education	0.020*** (0.0054)	0.009 (0.00515)	0.012* (0.00513)	0.020*** (0.00526)	0.009 (0.00531)	0.012* (0.00529)	0.020*** (0.00506)	0.009 (0.00512)	0.012* (0.0054)	0.019*** (0.00511)	0.010* (0.00485)	0.012* (0.00495)	0.020*** (0.00495)	0.009 (0.00495)	0.012* (0.0048)
Unemployment (ref. Employed)	-0.686*** (0.0804)	-0.593*** (0.0824)	-0.602*** (0.0772)	-0.686*** (0.084)	-0.593*** (0.0788)	-0.602*** (0.0781)	-0.686*** (0.0857)	-0.593*** (0.0776)	-0.601*** (0.0823)	-0.681*** (0.0814)	-0.587*** (0.0763)	-0.598*** (0.0771)	-0.686*** (0.0834)	-0.593*** (0.0747)	-0.602*** (0.0738)
Political orientation	0.103*** (0.013)	0.060*** (0.00839)	0.065*** (0.00707)	0.103*** (0.0137)	0.064*** (0.00814)	0.065*** (0.0072)	0.103*** (0.0133)	0.064*** (0.00859)	0.064*** (0.00729)	0.100*** (0.0132)	0.063*** (0.00854)	0.063*** (0.00722)	0.103*** (0.0134)	0.064*** (0.00818)	0.065*** (0.00741)
Sufficiency of income (ref. Coping with income)	-1.336*** (0.0726)	-1.063*** (0.0613)	-1.049*** (0.0626)	-1.336*** (0.0668)	-1.063*** (0.0625)	-1.049*** (0.0607)	-1.336*** (0.0717)	-1.064*** (0.0619)	-1.050*** (0.0638)	-1.312*** (0.0654)	-1.040*** (0.062)	-1.027*** (0.0625)	-1.336*** (0.0682)	-1.063*** (0.0608)	-1.049*** (0.0612)

Table 3 (continued)

Variables	P90P10			P50P10			Gini			Palma					
	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3			
Intercept	7.800***	3.134***	4.865***	9.075***	3.708***	5.305***	8.476***	2.123***	4.341***	8.129***	2.822***	4.410***	7.736***	3.588***	4.965***
Countries	0.401	0.593	0.426	0.661	0.906	0.462	0.813	0.572	0.683	0.827	0.656	0.456	0.342	0.502	0.368
N	27	27	27	27	27	27	27	27	27	29	29	29	27	27	27
	44,607	44,607	44,607	44,607	44,607	44,607	44,607	44,607	44,607	46,612	46,612	46,612	44,607	44,607	44,607

between inequality and life satisfaction, including a single income inequality measure and control variables. Consistent with previous studies, more equal societies tend to have higher life satisfaction. The Gini was negatively associated with life satisfaction, but the association is not statistically significant.

The second models (M2) examined the effects of the POS on life satisfaction and the possible changes in inequality inequalities' coefficients (Table 3). As the between-country and within-country variables were not correlated, introducing them simultaneously into the model does not impede the interpretation. Notably, the association between inequality measures and life satisfaction dropped to zero, indicating a strong mediator effect. POS was positively associated with life satisfaction: the more positive one's view of society, the higher their life satisfaction. Estimates and standard errors from these models (M2) were used for the subsequent Sobel tests.

In the final model (M3), POS was included as a random effect (Table 3), allowing the regression slope of the POS measure to vary between countries. The most notable difference compared the previous model was the reduction in the estimate of the average mean of POS.

After acquiring the all the information needed, we conducted the Sobel test for all five inequality measures (Table 4). According to the tests, the effect of income inequality on life satisfaction was mediated by the POS. Note that as measures of inequality only vary at the between-country level, the mediation effect also occurs at this level. In other words, the POS mediates income inequality's effect on the countries' average life satisfaction. It is also worth noting, that in multilevel models the mediation effect and Sobel test can be severely inaccurate (Zhang et al., 2009). Fortunately, in models like ours with similar effects both on within-groups and between-groups, the Sobel test is quite accurate (ibid., Table 3).

After the random effect models (M3), the regression coefficients of POS were extracted. These regression slopes were used in scatterplots showing the association between slopes and various income inequality measures (Fig. 2). First, we can see association between the POS and life satisfaction varies quite a bit between countries. The weakest association is systematically in Denmark, and the strongest is in Hungary. Finally, we can see the more equal the society, the smaller the effect one's POS has on life satisfaction (Fig. 3).

Table 4 The Sobel tests for mediation effects of various income inequality measures

	a	s.e	b	s.e	Z	p
P90P10	-0.428	0.099	0.495	0.0298	-4.18	<0.001
P90P50	-1.622	0.443	0.495	0.0270	-3.59	<0.001
P50P10	-1.607	0.349	0.495	0.0297	-4.44	<0.001
Gini	-0.078	0.029	0.504	0.0285	-2.66	<0.001
Palma	-1.223	0.319	0.495	0.0291	-3.74	<0.001

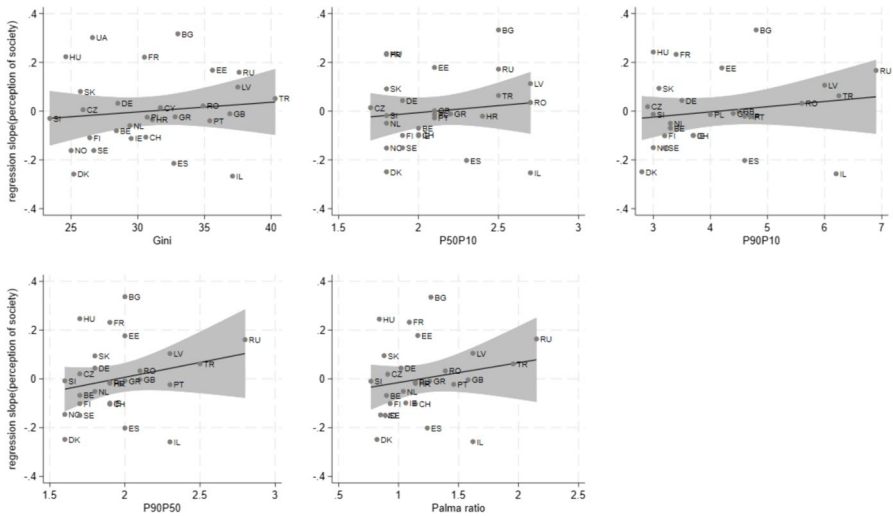


Fig. 3 Association between POS and life satisfaction by income inequality measures. Zero on the horizontal axis denotes the regression slope from the corresponding model and the points represent deviations from it

Discussion

Income inequality's impact on well-being remains an open question, as do the mechanisms mediating the effect from the societal to the individual level. Previous research has suggested the perception of various aspects of society is associated with life satisfaction. This study presents original findings contributing to understanding how information about society is used in life satisfaction judgments and how it acts as a mediator. We expanded on this by examining how a broadened POS is related to life satisfaction. We analysed the associations of various income inequality measures with life satisfaction, constructed a psychometrically valid measure of the POS which covers the society broadly, and examined whether it acts as a mediator between inequality and life satisfaction. Using multilevel linear regression and Sobel test on data from the 2008 European Social Survey, which includes items on the POS, we found that POS is strongly associated with life satisfaction and mediates the impact of income inequality on it.

Our results indicate that POS significantly influences life satisfaction: individuals with a positive POS tend to have higher life satisfaction. Additionally, after controlling for the POS, income inequality measures showed no significant association with life satisfaction. Subsequent mediator analyses revealed the mediating effect was statistically significant, suggesting that the causal pathway from inequality to life satisfaction may run through the POS. This aligns with Diener and colleagues' (2002) proposal that the perception of the environment is more important than the environment itself.

However, this is not to say environment has no effect on well-being, as we found the association between the POS and life satisfaction is stronger in more unequal

societies. This finding might be related to a more justified assessment of the surrounding unequal society. Our observations concerning difference between country-level inequality measures support this idea. Veenhoven's (2012) model posits that more striking inequalities increase the probability of perceiving factors causing misery. However, a second explanation, at least on the micro-level, could be the visibility of people's wealth and its distribution vary. We proposed income distribution acts as chronically accessible information, which in turn is used in life satisfaction assessments. However, the mere presence of the environment is not enough; perception is also necessary. In Nishi and colleagues' (2015) experiment, the visibility of a neighbour's wealth systematically undermined social welfare by lowering the cooperation and the degree of networking, for example. Whether this also true at the societal level, we do not know. Thus, this mechanism needs more attention in future studies.

Our results show the effect size between various income inequality measures and life satisfaction are small to medium, consistent with previous studies. Although these measures are "mainly in agreement" as Trapeznikova (2019) suggested, some measures were more strongly associated with life satisfaction. The strongest predictors of life satisfaction were P90P10 and P50P10, both using the lowest decile as the reference point, highlighting the wealth of the poorest. Surprisingly, the widely used income inequality measure, the Gini coefficient, had the lowest association with the POS and life satisfaction. This suggests the Gini coefficient may not carry much informational value (Senik, 2004) or capture the everyday conception of inequality as well as the other measures. We interpret this to mean that people's perceptions of inequality align more closely with more simplified indicators. Oshio and Urakawa (2014) argue that it is unrealistic to assume that individuals have precise information about their country's actual income distribution. So, could it be that instead of precise information about income distribution, people have heuristics according to which other people have either lower, higher, or equal incomes to theirs (see e.g. Senik, 2004)?

A similar phenomenon was also found, for example, in a study by Amate-Fortes's and colleagues (2023), who examined the association between income, gender, and racial inequalities with mental health, mental distress, and suicide. They applied two different inequality measures for one explanatory variable. Although these indicators measured approximately the same underlying phenomenon, their associations with the dependent variables varied. For instance, the Gini index was associated with mental health, while the 80/20 ratio showed no association. (Amate-Fortes et al., 2023.) Similarly, we argue weak associations between inequality and life satisfaction may stem from choosing the usual Gini coefficient as a measure of income inequality. Applying indicators that account for the polarization of income distribution might yield stronger and more consistent results. This finding is one contribution of our study, and we suggest well-being studies adopt measures besides the Gini coefficient, such as percentile and share ratios. In summary, selecting the appropriate measures is crucial to empirical studies. If our perception of our own position on the income ladder is flawed, as we wrote before, what reason do we have to believe we are better at perceiving the income of others? Not all measures are equally representative of people's range of experiences.

It is important to acknowledge our study is subject to limitations. The cross-sectional nature of our study limits our ability to establish causal relationships. In our theoretical framework supported by research literature, however, our results seem convincing. Still, future research should consider longitudinal designs to examine the temporal dynamics of the relationships examined in this study.

Concerning the key variable, POS, we claim to measure perceptions of society, but so does Böhnke (2008), for example. Who, if anyone, is closer to accurate interpretation? At present, there seems to be no 'golden standard' for measuring POS, and rightfully so, as it is impossible to develop an indicator that covers every aspect of society. This means every indicator, including ours, is deficient in some way. As many studies have shown, the perception of reality can be skewed regardless of the subject under consideration (Duffy, 2019; Duffy et al., 2008; Gimpelson & Treisman, 2018; Oshio & Urakawa, 2014). So, the interesting question is, of course, have we touched something essential about perceptions of society? We think so. First, we based our construct on existing research, although we were unable to construct identical indicator. Here, our results complement the earlier studies on welfare attitudes (Roosma et al., 2013) and perception of (the quality of) the society (Böhnke, 2008). We have demonstrated the satisfaction with economy, democracy, and government, and perceived unemployment are all integral part of our perceptions of society. Second, the goodness-of-fit statistics were good, indicating model fits the data well. Based on numbers, there seems to be a latent phenomenon behind the variables we use, which we call POS. Then again, statistics are a different matter from whether the indicator works in practice. Alexandrova (2017) warns against this kind of a validation based solely on statistical tests and suggests asking whether the indicators work. The results speak for themselves. POS is associated with life satisfaction, and it does mediate the inequality-wellbeing link.

However, the content of the indicators should be considered carefully as it may affect the results of the analyses. While Böhnke's POS indicator stresses trust and social systems, our indicator places more emphasis on factors such as perceived unemployment and pensioners standard of living, which are at least indirectly related to the economic situation of countries. So, it may be our indicator work well in the case of inequality, but not with other societal factors. The way we perceive society and what constitutes this perception should be further studied along with how to measure these perceptions. Especially the contents of POS should be further investigated, and different compositions should be explored.

Conclusion

This study explores the relationship between income inequality and life satisfaction, highlighting the mediating role of perception of society (POS). The findings suggest that life satisfaction is strongly associated with POS, indicating that how people perceive their society is crucial for their well-being, alongside actual inequalities.

The study also emphasizes the importance of choosing appropriate measures for income inequality, as different measures (e.g., P90P10, P50P10) are more strongly associated with life satisfaction than the Gini coefficient, suggesting that simplified,

reliable measures may better capture individuals' perceptions and experiences. Therefore, the study advocates for using a diverse set of indicators in well-being research.

While presenting a valid POS measure, the study acknowledges that no single indicator can fully capture societal perceptions, highlighting the need for continuous refinement and validation. The results underline the interdependence between individual and society, with both environmental factors and individual traits being associated with life satisfaction. We encourage considering both when studying life satisfaction or related concepts.

In conclusion, the study contributes to the understanding of how perceptions of society mediate the relationship between income inequality and life satisfaction, advocating the use of other measure of inequality that more closely correspond to lay experience, in addition to Gini index, in efforts to improve well-being research.

Appendix A. Data and methods

As we said in the main text, the 'Welfare Attitudes' module can also be found in the eighth wave of ESS, which was collected in 2016. This dataset is, however, incomplete in many respects, which led us to use the 2008 data. Here, we explore some features of the data and justify why we use the 2008 data instead.

The most striking feature of 2016 dataset is the small sample size of countries. While 2008 is one of the most extensive rounds in the European Social Survey via its 31 countries, 2016 is one of the most limited in ESS's history with only 23 countries. For linear models, as Bryan and Jenkins (2016) have demonstrated, it is country effects that are sensitive to this kind of a small sample sizes. They have recommended 25 to be the very minimum number of countries for "relatively complicated models". With this they mean "models with multiple country-level or cross-level fixed effects – and more generally, models that differ from the 'basic' specifications that we have focused on". Our models use two country-level effects AND random slope for Perception of Society. Sample sizes below this number results in "substantial uncertainty associated with the estimation of the fixed country effect" (Bryan & Jenkins, 2016, p. 12). As we are interested in these country effects, the 2016 data is too small to carry enough information to infer this.

The problem was not only that several countries were missing from the dataset, but also which countries were missing. It seems that the countries with highest and lowest inequalities are missing from the dataset. To examine this, we gathered full information on Gini coefficient of the countries in ESS2008 and ESS2016 from OECD and World Bank. We calculated the mean and standard deviation for these datasets. We then edited the data so that only the countries in the '08 and '16 waves remained and calculated the mean and standard deviation for these. These statistics are and Gini coefficients are presented in Table 5 and the distributions are illustrated in A Fig. 4.

Looking at the standard deviations, the 2008 data is very close to the actual values. However, this is not the case with the 2016 data, as there is striking decrease in standard deviations. Looking at the table, we can see why. First, the countries with

Table 5 Comparison of Gini coefficients between “full information” and ESS samples from 2008 and 2016

	ESS		OECD (FULL)		OECD (ESS)		WORLD BANK (FULL)		WORLD BANK (ESS)	
	2008	2016	2008	2016	2008	2016	2008	2016	2008	2016
Belgium	•	•	28.4	27.6	28.4	27.6	28.4	27.6	28.4	27.6
Bulgaria	•		33	40.2	33	-	33.6	40.6	33.6	-
Croatia	•		31.1	29.8	31.1	-	32.6	30.9	32.6	-
Cyprus	•		31.7	32.9	31.7	-	31.7	32.9	31.7	-
Czechia	•	•	25.9	25.3	25.9	25.3	26.3	25.4	26.3	25.4
Denmark	•		25.2	26.1	25.2	-	25.2	28.2	25.2	-
Estonia	•	•	35.6	31.4	35.6	31.4	31.9	31.2	31.9	31.2
Finland	•	•	26.4	25.9	26.4	25.9	27.8	27.1	27.8	27.1
France	•	•	30.5	29.1	30.5	29.1	33	31.9	33	31.9
Germany	•	•	28.5	29.4	28.5	29.4	30.9	31.4	30.9	31.4
Greece	•		32.8	33.3	32.8	-	33.6	35	33.6	-
Hungary	•	•	24.6	28	24.6	28	27.5	30.3	27.5	30.3
Iceland		•	30.6	26.4	-	26.4	31.8	27.2	-	27.2
Ireland	•	•	29.5	30.9	29.5	30.9	30.9	32.8	30.9	32.8
Israel	•	•	37.1	34.6	37.1	34.6	41.6	39	41.6	39
Italy		•	31.7	32.7	-	32.7	33.8	35.2	-	35.2
Latvia	•		37.5	34.6	37.5	-	37.2	34.3	37.2	-
Netherlands	•	•	29.4	29.2	29.4	29.2	29.3	28.2	29.3	28.2
Norway	•	•	25	26.2	25	26.2	27	28.5	27	28.5
Poland	•	•	30.7	28.5	30.7	28.5	33.5	31.2	33.5	31.2
Portugal	•	•	35.4	33.1	35.4	33.1	36.6	35.2	36.6	35.2
Romania	•		34.9	33.2	34.9	-	36.4	34.4	36.4	-
Russia	•	•	37.6	33.1	37.6	33.1	41.6	36.8	41.6	36.8
Slovakia	•		25.7	24.1	25.7	-	26	25.2	26	-
Slovenia	•	•	23.4	24.4	23.4	24.4	23.7	24.8	23.7	24.8
Spain	•	•	32.7	34.1	32.7	34.1	34.2	35.8	34.2	35.8
Sweden	•	•	26.7	28	26.7	28	28.1	29.6	28.1	29.6
Switzerland	•	•	30.6	30.2	30.6	30.2	33.8	33	33.8	33
Turkey	•		40.3	40.4	40.3	-	39	41.9	39	-
Ukraine	•		26.6	25	26.6	-	26.6	25	26.6	-
United Kingdom	•	•	36.9	35.1	36.9	35.1	35.4	33.1	35.4	33.1
Mean			30.84	30.41	30.82	29.68	31.90	31.73	31.84	31.20
Std.Dev			4.51	4.25	4.67	3.21	4.64	4.51	4.79	3.84

Information on Ukraine’s inequality was not found in OECD database. The values are from World Bank

high income inequalities are missing. These countries include Bulgaria (Gini = 40.2), Turkey (Gini = 40.4), and Romania (Gini = 33.2). On the other hand, low inequality countries such as Denmark (Gini = 26.1), Slovakia (Gini = 24.1), and Ukraine (Gini = 25.0) are missing too. Including these countries in the dataset would correct

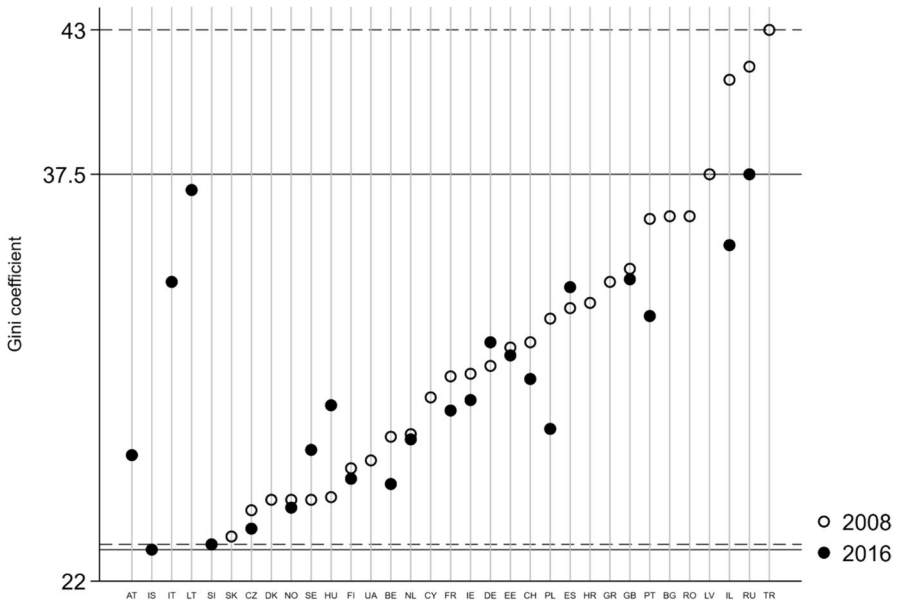


Fig. 4 Gini coefficients in 2008 and 2016. The dashed line marks the minimum and maximum values for 2008 and the solid for 2016

the standard deviation and quite possibly make the association between inequality and life satisfaction more pronounced. Operating on data that has been truncated at both ends is not suitable for regression analysis.

So, the problem with this particular data set is not only its size, but also the homogeneity of the countries. In conclusion, the 2016 data does not reflect the actual distribution of inequality in Europe. Coupled with the small sample size, the 2016 dataset is hopelessly flawed.

However, the association between income inequality and life satisfaction in European countries was established in a longitudinal study by Ravazzini & Chávez-Juárez (2018). In their analysis they used multiple waves of ESS with 31 countries and 133 country-year observations for inequality. The results were clear: income inequality’s effect on life satisfaction were “large, negative and highly significant.” This supports our argument that the effect exists, but it just doesn’t show up in the 2016 data.

Scaling Items for Perception of Society

As presented in the main text, some of the items of perception of society variable had to be rescaled so that all items were on a scale of 0–10. Seven out of nine items were already on a scale of 0–10. The items rescaled were the perceived unemployment rate and perceived inequality. The perceived unemployment was on a scale of 1–11, so we simply subtracted one from the item. Perceived inequality was on a scale of 1–5. We first subtracted one from the values and then multiplied the result by 2.5 (0=0, 1=2.5, 2=5, 3=7.5, 4=10).

Appendix B. Descriptive statistics

Table 6 Descriptive statistics of income inequality measures

	n	mean	sd	min	max
Gini	56,752	31.56	5.58	23.4	43
p90p10	52,208	4.26	1.21	2.8	6.9
p90p50	52,208	1.98	0.30	1.6	2.8
p50p10	52,208	2.13	0.32	1.7	2.7
Palma	52,208	1.23	0.36	0.77	2.15

Table 7 Descriptive statistics of individual-level variables (weights used)

Gender	n	percent			
<i>Man</i>	27,246	48.04			
<i>Woman</i>	29,472	51.96			
Employment status					
<i>Employed</i>	52,846	93.12			
<i>Unemployed</i>	3902	6.88			
Feeling about household's income nowadays					
<i>Coping with present income</i>	37,560	67.16			
<i>Difficult on present income</i>	18,369	23.84			
	n	Mean	sd	min	max
Age	56,541	45.27	18.52	15	99
Education (years)	56,235	11.82	4.07	0	48
Political orientation (0 = left/right = 10)	47,568	5.23	2.27	0	10
Perception of Society	n	Mean	sd	min	max
Economy	55,406	3.78	2.48	0	10
Democracy	54,037	4.85	2.61	0	10
Health services	56,023	5.03	2.60	0	10
Inequality	55,607	2.78	2.55	0	10
Unemployment	50,912	5.76	3.07	0	10
Trust	56,339	4.70	2.55	0	10
Education	53,622	5.28	2.44	0	10
Government	54,832	3.90	2.55	0	10
Pensions	55,714	4.10	2.42	0	10
Perception of Society (0 = negative, 10 = positive)	56,535	4.44	1.63	0	10

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Data Availability This research use data from European Social Survey. The ESS Research Infrastructure Consortium (ESS ERIC) adheres to the Declaration on Professional Ethics of the International Statistical Institute. The ESS ERIC treats all the information with strict confidentiality, abiding the GDPR and national data protection laws. The respondents were of legal age and provided their informed consent during the interview process. Data supporting the findings available at European Social Survey's data repository and the syntaxes for data preparation and analysis are available from the first author.

Declarations

Ethical Standard All authors meet the criteria for authorship and have approved the final manuscript. The study is original and is not submitted to other journals. The study adhered to ethical guidelines as per the Finnish National Board on Research Integrity (TENK).

Conflicts of Interest The authors have no conflicts of interest to declare.

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