



A Twofold Subjective Measure of Income Inequality

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Abstract

Social scientists have been aiming to calculate a “subjective income Gini coefficient” of survey respondents that would describe their beliefs about income inequality in their country. Niehues (Subjective perceptions of inequality and redistributive preferences: an international comparison, Cologne Institute for Economic Research, IWTTRENDS Discussion Paper, 2014) derives this estimate from respondents’ beliefs about the relative sizes of different social classes (answers to “shape of society” questions), while Kuhn (The individual perception of wage inequality: a measurement framework and some empirical evidence, Technical report, Institute of Labor Economics (IZA), 2015) estimates it using beliefs about the pay structure. We combine their efforts to calculate what we call a twofold subjective Gini coefficient, which incorporates both pieces of information independently from one another. We present the country-level distribution of perceived and desired twofold subjective Gini coefficients using the ISSP Social Inequality V survey (ISSP Research Group in International social survey programme: social inequality—issp 2019, 2019. <https://doi.org/10.4225/13/511C71F8612C3>). Accounting for both subjective class structure and pay structure yields much lower perceived and desired levels of inequality. At the country level the averages of the twofold subjective Gini coefficients are closer to actual income Gini coefficients than the previous measures. At the individual level the twofold subjective Gini coefficients are better predictors of the individual’s verbal assessment of inequality and their preferences towards redistribution.

Keywords Inequality · Subjective inequality · Desired inequality · Preferences for inequality

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1 Introduction

Economic inequality is typically defined as the unequal distribution of income and opportunity between different groups in a society.¹ Previous research has shown that perception of economic inequality matters much more than actual inequality when people assess how happy they are with their economic standing and decide which policies they would support (Hauser & Norton, 2017). Perceived inequality is also linked to health outcomes, crime and present-oriented behavior (Han, 2014; Rogers & Pridemore, 2020; Bak & Yi, 2020). Given the practical importance of perceived inequality, income inequality in particular, our goal should be to capture the differences between actual inequality and its perception with accuracy. Inequality, however, is an abstract concept, and compressing its different dimensions into a single index is non-trivial; this applies to perceived inequality even more so. The researcher who wants to elicit the views of survey respondents on income inequality has to trade off simplicity for precision. Very simple and stylized measures of economic inequality (such as the “shape of society”-type of questions) are easy to grasp for respondents, but provide a coarse estimate that also needs a range of non-neutral assumptions before they can be translated into a numerical estimate of income inequality (such as a subjective Gini coefficient). More sophisticated measures, on the other hand (such as “distribution builder” tools) are rather complex and tend to be harder to grasp; a respondent who is not properly incentivized into paying enough attention might be inclined to respond randomly.

In this paper we propose a measure of subjective income inequality that merges two previous attempts at calculating a “subjective income Gini coefficient”, namely, that of Niehues (2014) and later Gimpelson and Treisman (2018), with that of Kuhn (2015). The first approach builds on the simple and intuitive “shape of society” approach to measuring inequality where survey respondents are shown a set of pictures representing stylized income distributions (see Fig. 1) and are asked to pick the one that represents their own country the best. The second approach uses numerical assessments of salary gaps between different low- and high-earning professions and combines that with the actual share of those professions in a society, to arrive at a perceived income Gini coefficient. While both approaches are simple and intuitive, they are both very sensitive on the actual assumptions that researchers are willing to make (Knell & Stix, 2020). The first approach is very sensitive to the assumptions on within-class inequality and cross-class earnings differences. The second approach neglects the beliefs of the individuals on the relative sizes of income classes.

To highlight the potential issues with the first approach, imagine a person who sees society as having a small elite at the top and a large mass of people at the bottom. This person can have different opinions on the relative income of the elite and the masses. Does the elite earn thousand times more, or a million times more? We do not know. The researcher has to make an assumption, and stick with that assumption when dealing with all respondents. If we only use society shape figures to arrive at a subjective income Gini coefficient, we will only have as many different possible values of the estimate as the number of figures shown to respondents, usually five (the ones we replicate in Fig. 1). Moreover, some of

¹ Definition of the Institute of Labor Economics (IZA). Source: <https://wol.iza.org/key-topics/economic-inequality> Economic inequality can have many facets, including inequality of opportunity, inequality of wealth, inequality of status. In this paper we focus exclusively on income inequality, which is just one, but perhaps one of the most important aspects of the broader sense of economic inequality. Hence, throughout this paper we use the terms “economic inequality” and “income inequality” interchangeably.

these can be very close to one another in terms of their implied income Gini coefficients (depending on the assumptions), further limiting the variation in the data (Knell & Stix, 2020). The problem with the second approach is that a person might think that a medical doctor earns fifty times more than an untrained worker; however, their actual assessment of inequality is very different if they believe there is a doctor for every fifty factory workers, or if they believe there is one for every ten thousand. With the Kuhn (2015) method the researcher assumes away these potential differences.

We introduce a novel way to calculate a type of subjective income Gini coefficient that combines the merits of both approaches, and implement it using the International Social Survey Programme's 5th survey on social inequality (ISSP Research Group, 2019). First we take individuals' responses to the shape of society question and infer from this their subjective assessment of the size of the upper, lower and middle classes. Next we take the pay difference questions and infer from these the relative incomes of these three classes, as perceived by each individual respondent. Once the subjective class structure and subjective pay structure are at hand, we are able to calculate what we call the twofold subjective perceived income Gini coefficient for each individual. As in the ISSP data the respondents are also asked about the desired levels of pay differences and desired shapes of society, we are also able to calculate a twofold subjective desired income Gini coefficient for every individual.

The most important feature of our twofold subjective income Gini coefficient is that it uses fewer assumptions, and accommodates multiple dimensions of income inequality; because of this, it is more directly comparable to the objective income Gini coefficient of a country.² For example, a respondent might think that their society is completely owned by a small billionaire elite on the top, so their shape of society based income Gini estimate would be high; in the meantime they can plausibly think that inequality is so high, that even medical doctors and cabinet ministers who are not members of the billionaire class earn little, so their paygap-based income Gini estimate would be, in fact, relatively low. Our twofold subjective Gini coefficient would incorporate both subjective ideas about inequality that this particular respondent had had in mind, while the other measures would contradict one another as they only utilize part of the information available.

The twofold subjective income Gini coefficient produces a different overall picture of subjective inequality across countries than previous studies did, while outperforms previous measures in explaining verbal assessment of inequality of survey respondents. Our novel measure produces systematically lower levels of perceived inequality than the paygap-based subjective income Gini coefficient: most individuals in most countries underestimate inequality in their own countries; also, most people in most countries in the sample desire lower levels of inequality than they perceive. On the level of countries the average twofold subjective Gini coefficients are better predicted by actual Gini coefficients than the paygap-based or shape of society based measures. On the individual level we show that our proposed Gini coefficient is more closely correlated with responses to general statements on whether domestic income differences are too large, and how respondents think about redistribution.

² By "objective" in this case we mean an income Gini coefficient estimated from actual income data, not the population ("true") value of the Gini coefficient, which could be hypothetically derived from a "true" (non-estimated) income distribution.

2 Data

We use wave 5 of the International Social Survey Programme's survey on economic inequalities (ISSP Research Group, 2019). ISSP is the gold standard in the inequality perception literature. At the time of writing this paper ISSP has published data for 22 countries in the 5th survey wave. Each country level survey is nationally representative; the overall sample consists of 35 thousand individual respondents. ISSP is an extremely popular original data source for social scientists: as of May 2022, the bibliography of papers using ISSP data boasts 610 pages.³

The most important questions for us are the ones where respondents are asked to give their opinion on inequality in their own country. In one such question, respondents are asked to pick a geometrical shape out of five possibilities which according to them best describes their own country. Each shape is the composite of seven vertical bars of different length, corresponding to the share of the population who are on the top, in the middle, or at the bottom of society (see Q15a in the ISSP questionnaire, which we reproduce as Fig. 1). We interpret this as the class structure of the country according to the respondent.

ISSP respondents are also asked to give an estimate on the earnings of specific professions in their own country, such as shopkeepers and unskilled factory workers (Q2c and Q2d), physicians who work as general practitioners, CEO-s of large national companies and cabinet ministers (Q2a, Q2b, Q2e). We interpret these as the respondent's assessment of earnings at the bottom (Q2c and Q2d) and at the top (Q2a, Q2b, Q2e) of their society.

Both the shape of society and the earnings questions are asked in a prescriptive mode as well: respondents are asked what is the shape of society that they would prefer, and according to their judgment, how much those who work as shopkeepers, factory workers, physicians, CEO-s and cabinet ministers *should* earn.

Besides the questions on economic inequality, we also heavily rely on ISSP V's rich information on demographic and socio-economic background, such as age, marital status, educational attainment, and income. We also use questions that are related to respondents' redistributive preferences and how they evaluate income differences. We proxy actual income inequality of each country with the newest available income Gini coefficient estimate available at the World Bank data repository, from where we also download data on GDP per capita of each country. Data on the actual income distribution of the countries comes from the World Income Inequality Database (UNU-WIDER, 2021). We downloaded purchasing power parity conversion rates from the OECD homepage.

3 Existing Methods of Measuring Subjective Inequality

The most widely used measure of inequality in a country is the Gini coefficient. Most commonly we look at the Gini coefficient of income, but the concept can be applied to any frequency distribution, so wealth Gini coefficients are also frequently calculated.⁴ The income Gini coefficient measures the degree to which the cumulative income distribution of groups in society falls short from a perfectly equal distribution of income (Sen et al., 1997). Thus, it ranges from 0 (where there is no such shortfall, and every group controls as much of

³ https://issp.org/wp-content/uploads/2022/02/2021_ISSP_Bibliography.pdf.

⁴ See, for example Global Wealth Report made by Credit Suisse (Credit Suisse, 2022).

the income as their share in the population) to 1 (where the richest group disposes of all income, so there is perfect inequality).

The measure is attractive to researchers because of its scale independence and because it describes the inequality of a distribution in a single statistic that is comparable across contexts. Since it is a useful tool for describing economic inequality, previous papers in subjective inequality research have been trying to define a “subjective income Gini coefficient”, which would encompass subjective beliefs about inequality instead of the actual distribution of income. Such a subjective income Gini coefficient can either be defined at the country level, or at the level of the individual. The first approach involves aggregating a subjective economic measure over a representative sample of survey respondents; examples for these are found in Niehues (2014), who uses the perceived shape of society measure, and Choi (2019), who uses perceived economic status of individuals. The second approach involves calculating a Gini coefficient for every survey respondent, such as Kuhn (2015) does. We follow the second approach. Given the definition of the income Gini coefficient, defining its subjective counterpart involves an assessment of the relative sizes of the groups in society, and the relative amount of economic means that they control. Niehues (2014) and Gimpelson and Treisman (2018) use the shape of society questions in the ISSP to assess the subjective sizes of societal groups by the survey respondents and make assumptions on the relative incomes; Niehues (2014) assumes that the income of the seven classes each represent a fraction of the median, while Gimpelson and Treisman (2018) assume constant income differences between the seven groups. Knell and Stix (2020) show that these assumptions are not neutral, and the resulting Gini coefficients can be very different under differing assumptions. Niehues (2014) also proceeds to average out individual responses to the shape of society question to arrive at a “collective” subjective Gini, which it is argued, better explains variation in the average assessment of inequality in the country. To reproduce the country-level subjective Gini from Niehues (2014) we follow the parametrization from Knell and Stix (2020): we calculate the average class sizes by country as estimated by the respondents in ISSP, then assume income levels of each classes that are proportional to the median (0.3, 0.7, 0.95, 1.3, 1.75, 2.25 and 3 for the 7 bars in the shape of society question).

A different approach is taken by Kuhn (2015), who calculated the average subjective earnings of high earners (assessment of the pay of doctors, cabinet ministers and CEO-s by every individual), then calculated the share of low earners in the respective country based on the occupation code of individuals in the sample. As the ISSP is representative on a country level, the share of low earners in the ISSP is a sample-based estimate of low earners in the respective country. Consequently, this approach does not allow for subjectivity in the *share of low and high earners*, which is potentially an important factor in assessing domestic economic inequality as a whole.

4 Adding More Subjectivity

Subjective income inequality has two components. The first is the perceived wage structure. How much do people earn on the top, in the middle, at the bottom? The second is the perceived class structure: how many people are there on the top, in the middle, at the bottom? Previous subjective inequality measures put the emphasis on either the first (Kuhn, 2015) or the second (Niehues, 2014; Gimpelson & Treisman, 2018).

We propose a measure which builds on both these sources - we call it the twofold-subjective perceived Gini coefficient. Let $\bar{w}_{i,c}$ represent individual i 's assessment of the average wage of class c with $c \in \{top, middle, bottom\}$. Let $f_{i,c}$ represent individual i 's assessment on the population share of the top, middle and bottom class respectively. Once $\bar{w}_{i,c}$ and $f_{i,c}$ are at hand, we can formulate the subjective income share of each class of total national income as

$$q_{i,c} = \frac{f_{i,c} * \bar{w}_{i,c}}{\bar{w}_i}$$

where $\bar{w}_i = f_{i,bottom} * \bar{w}_{i,bottom} + f_{i,middle} * \bar{w}_{i,middle} + f_{i,top} * \bar{w}_{i,top}$

Having calculated the subjective income shares $q_{i,c}$ and subjective class sizes $f_{i,c}$, calculating the subjective Gini coefficient is straightforward, and can be done in a number of mathematically identical ways. We go with the simplest and draw a "twofold subjective Lorenz-curve" (see Fig. 2) and calculate the Gini-index from the area underneath it. We have two inner points on the horizontal axis at $f_{i,bottom}$ and $f_{i,bottom} + f_{i,middle}$, and on the vertical axis at $q_{i,bottom}$ and $q_{i,bottom} + q_{i,middle}$. The Gini coefficient is the area between the Lorenz curve and the 45-degree line divided by the whole area under the 45-degree line (which is just 1/2).

The total area under the Lorenz curve is given by (with the omission of the i index which is the same everywhere):

$$A = \frac{f_{bottom} \times q_{bottom}}{2} + \frac{f_{middle} \times q_{middle}}{2} + \frac{f_{top} \times q_{top}}{2} \\ + f_{middle} \times q_{bottom} + f_{top} \times q_{middle} + f_{top} \times q_{bottom}$$

And the subjective Gini coefficient is

$$Gini_i = \frac{\frac{1}{2} - A}{1/2} = 1 - 2A$$

To calculate $Gini_i$ in practice we need estimates of $\hat{f}_{i,c}$ and $\hat{w}_{i,c}$ for every individual i and group c . We estimate the respondent's assessment of the population shares of the three groups ($\hat{f}_{i,c}$) from the question about the perceived shape of society. The subjective assessment of the perceived population share of the top class is the share of the top two bars in the total area of the shape. The share of the middle class is the share of the middle three bars, while the share of the bottom class is the share of the bottom two. See Table 1 for the values for each shape. To estimate individual i 's assessment of the average earnings of the top class we use the average of perceived earnings of physicians, CEOs and cabinet ministers (Q2a, Q2b, Q2e in ISSP); to estimate their assessment of the average earnings of the bottom class we use the average of perceived earnings of unskilled factory workers and shop assistants (Q2c and Q2d in ISSP). We parametrize $\hat{w}_{i,middle}$ as $(\hat{w}_{i,top} + \hat{w}_{i,bottom})/2$. We provide an R-code which goes through these steps using ISSP data.⁵

Every question that we use from the ISSP is asked in two different ways: participants are asked how the shape of society looks like, but also how they think should look like; similarly, they are asked about the actual earnings in different professions, while also asked

⁵ https://github.com/attilagaspár/subjective_gini.

what level of earnings they would actually consider fair. This means that for every subjective perceived income Gini coefficient we can also calculate a subjective *desired* income Gini coefficient as well using all methods. This is important because attitudes towards redistributive policies are arguably guided by the perceived and desired levels of inequality at the same time; so when we look at how different subjective Gini coefficients perform in terms of explaining individual level attitudes towards policy, we will consider both perceived and desired income Gini coefficients.

5 Results

5.1 Aggregate Performance of Subjective Gini Coefficients in Relation with Actual Income Inequality

One of the goals of the measurement of subjective inequality is to gauge the extent to which nations collectively understand their own level of economic inequality. We first study how the different measures of subjective inequality perform in this regard. We calculate our twofold subjective income Gini coefficient and take its average by country; we do the same with the Kuhn (2015) subjective Gini coefficient; we contrast these to the country-averaged shape of society based Niehues (2014) measure.⁶

Figure 3 shows the results. We plot the actual income Gini coefficients (vertical axis) against the subjective Gini coefficients of each country. Putting the actual income Gini on the vertical axis means that the three different versions of the subjective perceived Gini of a country will be along the same horizontal line. For all three subjective measures we include a linear regression line; we also include a 45-degree line which partitions countries into two groups: those which (by the given measure) overestimate inequality on average (southeast from the 45-degree line) and those who underestimate (northwest from the 45-degree line). For the sake of clarity we only note the names of the countries for those where the different estimates are particularly far away from one another.

The twofold subjective Gini coefficient explains 55% more variation in the actual Gini coefficient as the subjective Gini from estimated paygaps (R^2 of 0.17 against 0.11); more strikingly, the twofold subjective measure explains three times more variation in actual income Gini than the shape-based measure (R^2 of 0.17 against 0.05) from Niehues (2014). It seems that when we construct a measure that is *more subjective*, the aggregate measure will *better fit the objective data*.

It is important to note that the slope of the estimated linear correspondence between the twofold subjective measure and the income Gini coefficient (0.67) is not significantly different from 1, meaning that we cannot reject the null hypothesis that average twofold subjective Gini is directly proportional to objective income inequality. This is not true for the pay gap only measure; while the slope for the shape of society based measure is also not significantly different from 1, it is not significantly different from 0 either, so we cannot really infer anything from that relationship.

Qualitatively, when taken on a country-by-country basis, the results are broadly in line with previous results: countries like Germany and Hungary, which Niehues (2014)

⁶ In an unreported robustness check we did the latter using country medians of the first two instead of averages, which did not change the results.

finds overestimating their own inequality level, still overestimate on the average, though by much less so; generally people are much more like to err on the underestimation side, which is more in line with the findings of Engelhardt and Wagener (2014) and (Kiatpong-san & Norton, 2014).

5.2 Disaggregated Comparisons Between Different Measures

We now turn to analyzing the individual level subjective Gini estimates, and how they are distributed across countries. Since the shape of society based subjective Gini coefficient can only take 5 discrete values, we do not consider them when looking at the distributions of the subjective Gini coefficients.

In Fig. 4 we plot the twofold subjective perceived Gini coefficient against those calculated using the method from Kuhn (2015). We also plot the 45-degree line: observations below the line are the ones where our estimate of the perceived Gini is smaller, while above are the ones where they are larger. Since the shape of society question can only take five values, we group the observations according to this question.

The first important lesson from this picture is that in most cases our twofold subjective perceived Gini coefficient is smaller than the previous estimate. This is not very surprising, since we include an additional dimension of subjectivity: the subjectivity of the class structure. We estimate a larger subjective inequality for those people who choose a very unequal society shape (A or B shape) yet their pay gap question suggests lower inequality level. This seems inconsistent on the surface; but it might be entirely plausible that a person thinks that there is a small elite on the top, and many at the bottom, but that small elites are neither cabinet ministers or doctors, but rather tech billionaires, hedge fund managers or owners of large agricultural estates, for example.

In Fig. 5 we plot the twofold subjective desired Gini coefficient against the desired Gini based on paygaps only, analogous to Kuhn (2015). Most importantly, the twofold subjective measure (vertical axis) is almost always smaller than the paygap only desired coefficient. The few counterexamples are the people who hold somewhat contradictory desires: they would prefer modest paygaps, but would want to live in a society which is obelisk- or pyramid-shaped (A and B). Most people choose a fairly equal desired society shape, such as a Diamond (D) or a Most on top (E) type, implying a smaller twofold subjective desired Gini than the one implied by the measure based on the Kuhn (2015) method.

Fig. 6 plots the distribution of the twofold subjective perceived Gini coefficient by country compared to the subjective Gini-coefficient calculated by Kuhn (2015). We normalize the figures by subtracting actual income inequality from perceived figures; this way the area west to the vertical line corresponds to people who underestimate inequality in their country. The red mass corresponds to our measure, the green mass corresponds to the baseline Kuhn-estimate. We see that the red distribution in most countries is shifted to the left compared to the green distribution. Figure 7 plots a similar comparison with desired Gini coefficients. Here the red distributions are not just shifted leftwards, but also shrink considerably, which is because people tend to choose more equal society shapes which implicitly means much less inequality than the baseline figure that only takes earnings differences into account.

Finally, Fig. 8 plots the joint distribution of perceived and desired Gini coefficients by country using the normalization that we subtract the actual income Gini coefficient from both numbers. Consequently, area west to the vertical line corresponds to mass of people who underestimate inequality; area south of the horizontal line corresponds to people who

want less economic inequality than there actually is. Area south-east to the 45-degree line correspond to people who want less economic inequality than they perceive. The long-dashed blue lines correspond to the regression line between perceived and desired Gini coefficients. Previous research has already found strong correlation between perceived and desired inequality (Osberg & Smeeding, 2006). Pedersen and Mutz (2019) argue that this might be due to an anchoring effect: by first asking perceived inequality, the survey anchors desired levels of inequality to the perception. Interestingly, while the correlation exists with our measure, it is far from unity. Oddly enough, the two figures are most removed from one another in the most unequal societies in ISSP: Chile (CL) and South Africa (ZA). In their case the slope is almost zero, meaning that the statistical association between perceived and desired inequality is very weak. We do not have an intuitive explanation why the anchoring effect should be bigger in more unequal countries.

5.3 Explanatory Power

We now ask how well different measures of subjective inequality explain questions related to redistributive preferences in the ISSP. We concentrate on two outcome variables: first is a verbal assessment whether inequality in one's own country is too high (Question 4a). The response is recoded from -2 (completely disagree) to 2 (completely agree). The second is an index of redistributive preferences which we generate as the first principal component of the degree of agreement with the following statements:

- Q4a - cross country differences are too large;
- Q4b - it is the government's responsibility to reduce differences;
- Q4c - the government should provide a decent standard of living for the unemployed;
- Q8a - the rich should pay more taxes;
- Q9a - it is unjust that rich people can buy better healthcare;
- Q9b - it is unjust that rich people can buy better education;
- Q16 - the current income distribution is fair.

We estimate the following linear relationship:

$$y_i = \beta_0 + \beta_1 Gini_i^{perceived} + \beta_2 Gini_i^{desired} + \epsilon_i, \quad (1)$$

where y_i is one of the two outcome variables. We estimate the regression for all three sets of perceived and desired Gini coefficients, and report the estimated coefficients along with the adjusted R^2 statistics. Table 2 shows the results. Panel A shows that, based on the adjusted R^2 metric, the twofold subjective perceived and desired Gini coefficients (Column 1) explain 30 to 35% more variation in the outcome variable (opinion on whether economic differences are too large) than the paygap-based Gini coefficients calculated based on Kuhn (2015) or the shape of society based Gini coefficients based on Niehues (2014), which are shown in Columns 2 and 3 respectively. When the outcome variable is the redistributive preferences index (Column 2), the twofold subjective Gini coefficients perform 10.54% and 57.26% better than their paygap-based and shape of society-based counterparts.

The regressions show that perceived and desired Gini have an effect on redistributive preferences that have similar size but opposite sign. Based on this observation we create a new variable which helps visualize the same correspondences. We define subjective excess Gini to be the difference between perceived and desired inequality; so a subjective excess Gini of 0.1 means that a person thinks that the Gini coefficient of their country is 0.1 points

above their desired level. We calculate subjective excess Gini measures for all three versions of the subjective perceived and desired Gini coefficients, and we plot them against the outcome variables of the regressions. Figure 9 shows the results. In Column 1 (Panels 1, 2 and 3) on the horizontal axis we plot Question 4a in the ISSP “Differences in income in [COUNTRY] are too large”) which we recoded to go from -2 (completely disagree) to 2 (completely agree). In Column 2 (Panels 4, 5 and 6) on the horizontal axis we put the index created from all questions on redistributive preferences using principal component analysis. The vertical axis shows subjective excess Gini. On all panels we plot all three versions of the subjective Gini: hollow blue circles correspond the twofold subjective Gini; red circles correspond to the paygap-based Gini while hollow squares correspond to the shape of society-based subjective Gini coefficients. In the first row we plot the correspondences without further control variables; in the second row we use country fixed effects; in the third row we introduce individual controls besides the fixed effects. These include demographic characteristics (age, marital status, educational attainment), and absolute and relative measures of income (in particular, percentile rank in their own country sample and in the whole database).

In all six cases the twofold subjective Gini coefficients account for the most variation in the responses to variables plotted on the vertical axis; the correspondence is also steepest in the case of the twofold subjective measure.⁷

6 Discussion and Conclusion

In this paper we presented a novel way to estimate subjective income inequality. We argue that our measure, the twofold subjective perceived income Gini coefficient, is better suited to capture the complexity of thinking about inequality, as it allows for subjectivity in both how the class structure is perceived, and how the income levels of classes relative to one another are seen. Questions on pay structure are very concrete, but also very arbitrary in which occupation the survey is inquiring about; questions on class structure are very abstract, but they go for the holistic perception on inequality in a country. Our measure combines these two elements. A similar argument can be made in favor of our analogous twofold subjective desired income Gini coefficient.

Importantly, the country averages of twofold subjective perceived Gini coefficients are closer to actual income Gini coefficients than other estimates. It seems that as we allow for more subjectivity in the measure, we get a more precise statistic on the average. Though this might seem counterintuitive at first, in reality we just allow for more information to be incorporated in the way we construct the perceived Gini coefficient, so a better fit is not surprising. At the level of the individuals our twofold subjective Gini coefficients also explain higher variation in redistributive preferences as previous subjective measures of inequality do.

Our results paint a more consistent picture on inequality perception than previous studies. Paygap and society-type based measures show that residents of some countries on average underestimate Gini, while others overestimate, without getting into details while this should be the case (Hauser & Norton, 2017). From our perspective it seems that

⁷ The adjusted R^2 statistics are: Panel 1: 0.05, 0.03, 0.04; Panel 2: 0.03, 0.02, 0.02; Panel 3: 0.03, 0.02, 0.02; Panel 4: 0.09, 0.08, 0.06; Panel 5: 0.05, 0.04, 0.04; Panel 6: 0.05, 0.04, 0.04.

cross-country differences are smaller than previously thought; for example, while Germans according to our estimate still overestimate income inequality (by .047 points), they are much less of an outlier than when one only takes pay differences into accounts (their average error is .21 in that case). It seems that most people in fact underestimate inequality in their own country, while they would also prefer lower levels of it even compared to their own perceived baseline.

Appendix

Q15. These five diagrams show different types of society. Please read the descriptions and look at the diagrams and decide which you think best describes [COUNTRY] ...

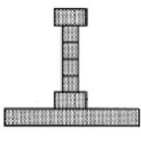
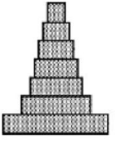
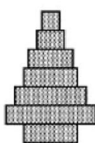
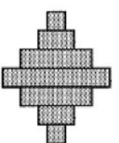
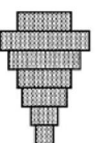
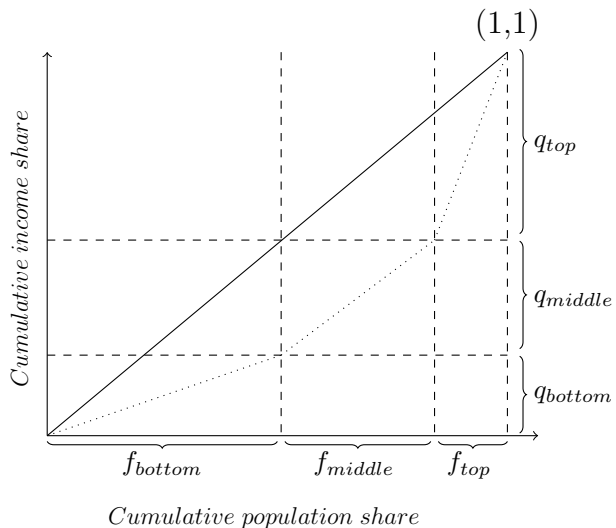
				
Type A A small elite at the top, very few people in the middle and the great mass of people at the bottom.	Type B A society like a pyramid with a small elite at the top, more people in the middle, and most at the bottom.	Type C A pyramid except that just a few people are at the bottom.	Type D A society with most people in the middle.	Type E Many people near the top, and only a few near the bottom.

Fig. 1 Shape of society question in ISSP V. *Notes:* The figure is an excerpt from the ISSP V questionnaire

Fig. 2 Lorenz curve. *Notes:* The figure plots the Lorenz curve with three social classes



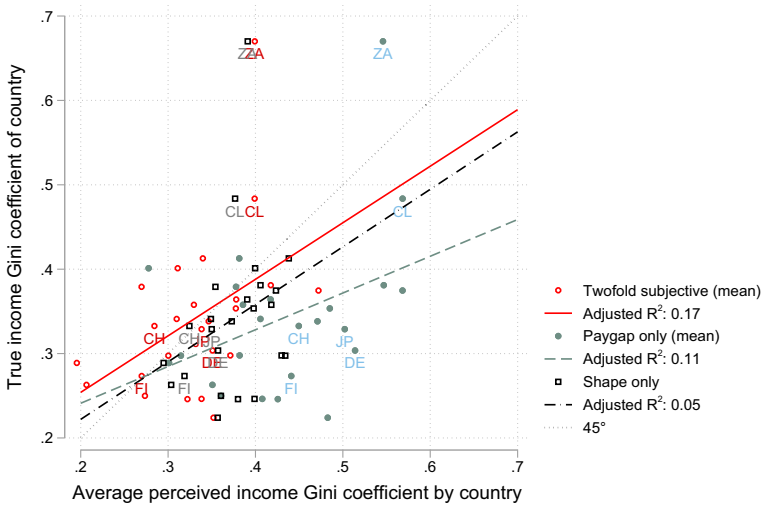


Fig. 3 Country level perception of inequality. *Notes:* The figures compare the country average of subjective inequalities (vertical axes) to the actual income Gini coefficients (horizontal axis) Twofold subjective refers to our measure, which combines subjective perceived paygaps and society shapes; the “paygap only” refers to the country-wide (Kuhn, 2015) estimates; “shape only” refers to the (Niehues, 2014) estimate as parametrized in the online appendix of (Knell & Stix, 2020) The lines are linear regression lines fitted on the 24 country-level observations Observations to the northwest of the dotted 45-degree line show nations which, on average and using the given metric, overestimate their own inequality; nations southeast to the dotted line underestimate it on average Since the vertical axis always shows the “true” income Gini coefficients, the different perceived measures are plotted always along the same horizontal line We plot the country codes for countries where the variation across competing perceived inequality measures is the largest

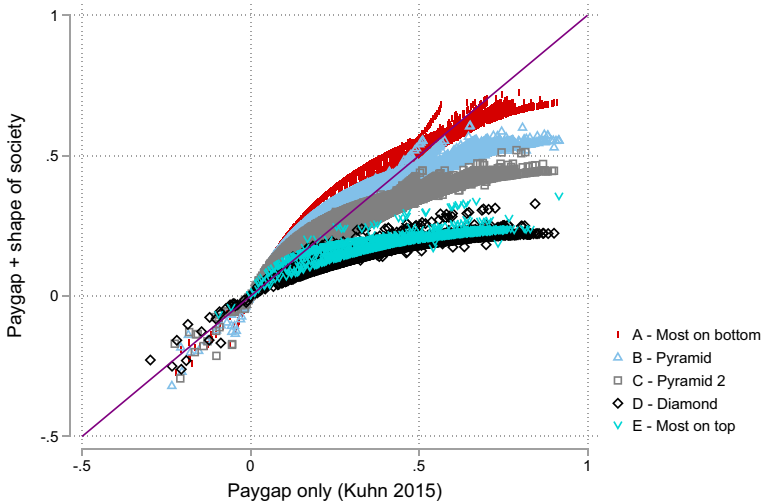


Fig. 4 Relationship between subjective Gini coefficients. *Notes:* The figure plots how our estimated subjective Gini coefficient for respondents in the ISSP V relate to estimates based on the method of Kuhn (2015) The difference is that we infer subjective class sizes from the perceived shape of society question On the X axis we plot the Kuhn estimate, on the Y axis we plot our calculation We group the data points by the individual’s response to the perceived shape of society question

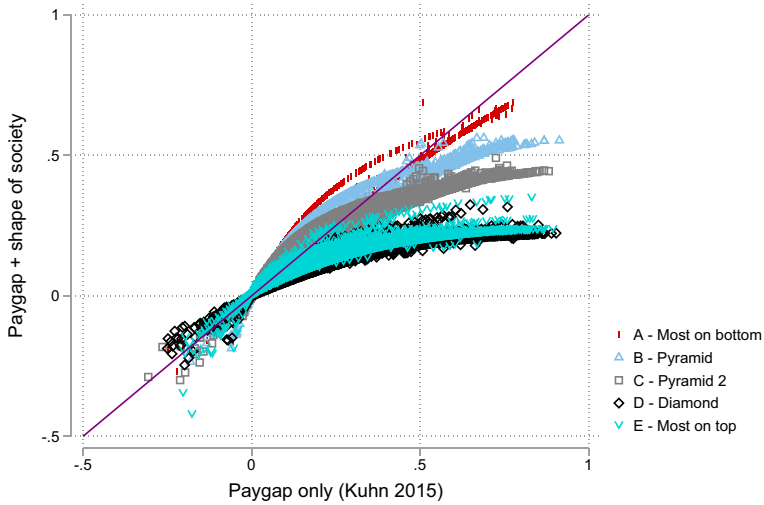


Fig. 5 Relationship between desired Gini coefficients. *Notes:* The figure plots how our estimated desired Gini coefficient for respondents in the ISSP V relate to estimates based on the method of Kuhn (2015). The difference is that we infer desired class sizes from the desired shape of society question. On the X axis we plot the Kuhn estimate, on the Y axis we plot our calculation. We group the data points by the individual’s response to the desired shape of society question

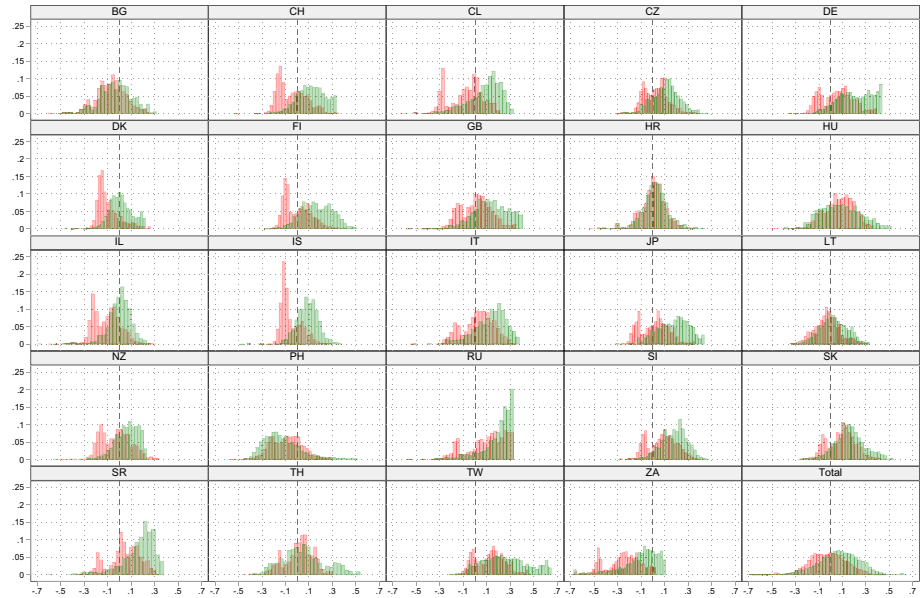


Fig. 6 Distribution of perceived Gini coefficients by country. *Notes:* The figure plots the histograms of twofold subjective perceived Gini coefficients by country which we calculate using the subjective paygap and the subjective shape of society questions (in red). We compare this to the histograms of the respective measure of Kuhn (2015) who uses only the paygap information (in green). We normalize the figures by subtracting the actual Gini coefficient of the country from each subjective measure, thus the vertical lines correspond to the share of respondents whose subjective Gini coefficient coincides with the actual Gini coefficient. Respondents left of the vertical lines underestimate inequality, while people right of the vertical line overestimate it. (Color figure online)

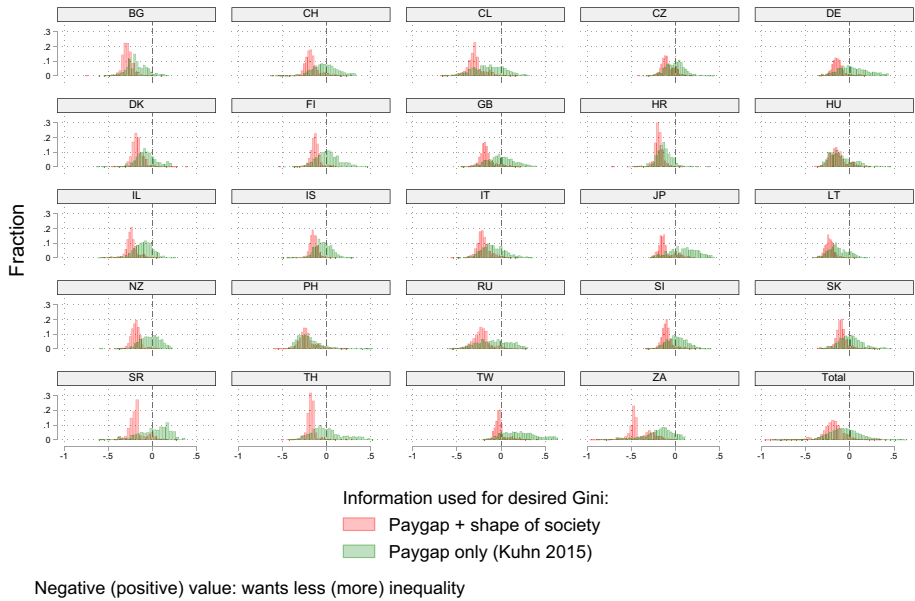


Fig. 7 Distribution of desired Gini coefficients by country. *Notes:* The figure plots the histograms of two-fold subjective desired Gini coefficients by country which we calculate using the subjective paygap and the subjective shape of society questions (in red). We compare this to the histograms of the respective measure of Kuhn (2015) who uses only the paygap information (in green). We normalize the figures by subtracting the actual Gini coefficient of the country from each subjective measure. People left of the vertical line want less inequality than there is, and people right of the vertical line want more. (Color figure online)

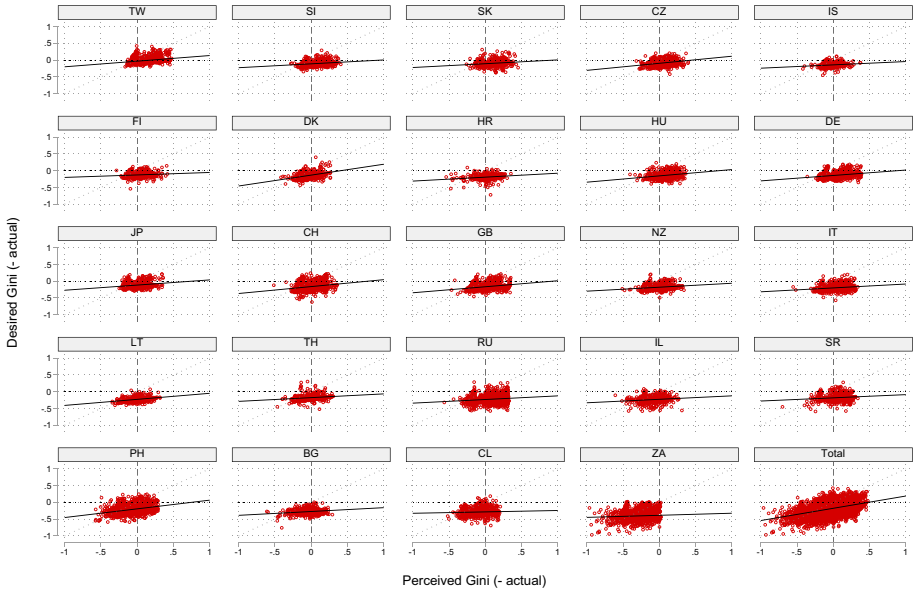


Fig. 8 Joint distribution of perceived and desired Gini by country. *Notes:* The figure plots the joint distribution of perceived and desired Gini coefficients by country using the normalization that we subtract the actual income Gini coefficient from both numbers. Consequently, area west to the vertical line corresponds to mass of people who underestimate inequality; area south of the horizontal line correspond to people who want less economic inequality than there actually is. Area south-east to the 45-degree line correspond to people who want less economic inequality than they perceive. Within the cloud of dots the higher colored areas note increased concentration of observations. The long-dashed lines correspond to linear regression lines

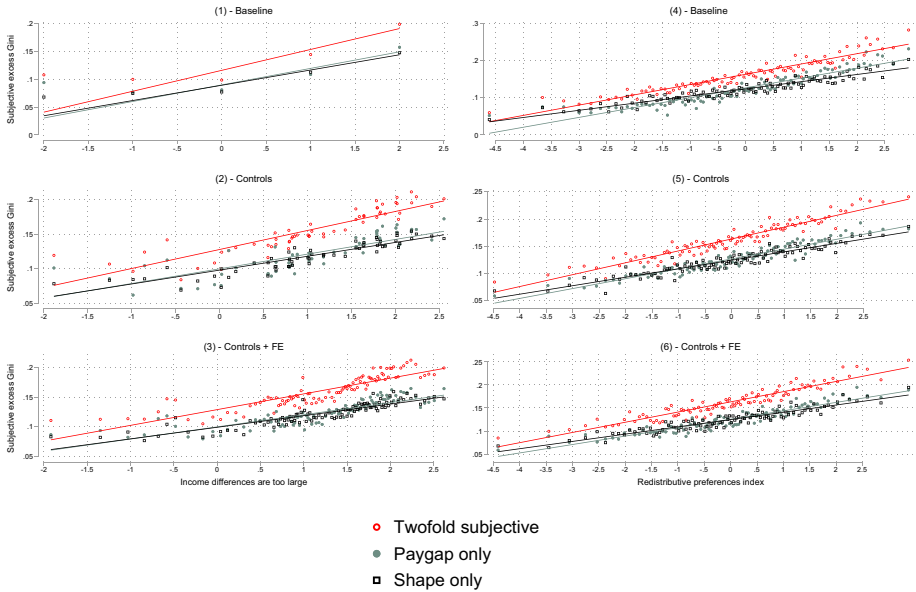


Fig. 9 Subjective Gini coefficients and attitudes towards inequality. *Notes:* The figure plots the relationship between ISSP questions on inequality and the three versions of the subjective Gini coefficients using binned scatterplots with percentile bins. In Column 1 (Panels 1, 2 and 3) on the horizontal axis we plot Question 4a in the ISSP “Differences in income in [COUNTRY] are too large”) which we recoded to go from -2 (completely disagree) to 2 (completely agree). In Column 2 (Panels 4, 5 and 6) on the horizontal axis we put the index created from all questions on redistributive preferences using principal component analysis. The vertical axis shows subjective excess Gini, which is the difference between perceived and desired Gini coefficients. On all panels we plot all three versions of the subjective Gini: hollow blue circles correspond the twofold subjective Gini; red circles correspond to the paygap-based Gini while hollow squares correspond to the shape of society-based subjective Gini coefficients. In the first row we plot the correspondences without further control variables; in the second row we use country fixed effects; in the third row we introduce individual controls besides the fixed effects. These include demographic characteristics (age, marital status, educational attainment), and absolute and relative measures of income (in particular, percentile rank in their own country sample and in the whole database)

Table 1 Perceived economic status and attitudes towards international economic inequality

Class	Type A	Type B	Type C	Type D	Type E
$f_{i,top}$	17.6%	12.5%	12%	15%	40%
$f_{i,middle}$	17.6%	37.5%	49%	70%	47.5%
$f_{i,bottom}$	64.8%	50%	39%	15%	12.5%

The table shows the relative group sizes implied by different shape of society figures. The top group is calculated from the area of the top two bars of the respective shapes of Figure 1 relative to the whole area; the bottom group corresponds to the relative area of the bottom two; the middle group size is calculated as the area of the middle 3 bars relative to the whole shape

Table 2 Explaining the variation in attitudes towards policy

	(1) Twofold subjective	(2) Paygap only	(3) Shape only
<i>Panel A</i>			
Perceived Gini	1.441*** (0.037)	1.367*** (0.041)	1.616*** (0.050)
Desired Gini	- 1.258*** (0.058)	- 0.971*** (0.040)	- 1.016*** (0.074)
Adjusted R^2	0.053	0.039	0.040
N	30477	30477	30477
<i>Panel B</i>			
Perceived Gini	2.737*** (0.066)	3.127*** (0.073)	2.975*** (0.090)
Desired Gini	- 4.069*** (0.103)	- 3.065*** (0.073)	- 3.020*** (0.126)
Adjusted R^2	0.091	0.082	0.058
N	27591	27591	27591

The table shows the linear regressions from Equation 1, The outcome variable in Panel A is agreement with the statement that economic differences are too large in the respondent's country, ranging from -2 (completely disagree) to +2 (completely agree) In Panel B the outcome is the redistributive preference index which is created from a set of questions aimed at redistributive preferences using principal component analysis, The independent variables are perceived and desired subjective Gini coefficients In the first column these are defined as the twofold subjective measures as developed in the paper; in the second column these use subjective paygap information only (Kuhn, 2015), and in the third these use only the shape of society question (Niehues, 2014; Kneall & Stix, 2020)

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

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References

- Bak, H., & Yi, Y. (2020). When the American dream fails: The effect of perceived economic inequality on present-oriented behavior. *Psychology & Marketing*, 37(10), 1321–1341.
- Choi, G. (2019). Revisiting the redistribution hypothesis with perceived inequality and redistributive preferences. *European Journal of Political Economy*, 58, 220–244.
- Credit Suisse. (2022). Global wealth report. <https://www.credit-suisse.com/about-us/en/reports-research/global-wealth-report.html>.
- Engelhardt, C., & Wagener, A. (2014). Biased perceptions of income inequality and redistribution. Technical Report.
- Gimpelson, V., & Treisman, D. (2018). Misperceiving inequality. *Economics & Politics*, 30(1), 27–54.
- Han, C. (2014). Health implications of socioeconomic characteristics, subjective social status, and perceptions of inequality: an empirical study of china. *Social Indicators Research*, 119(2), 495–514.
- Hauser, O. P., & Norton, M. I. (2017). (mis) perceptions of inequality. *Current Opinion in Psychology*, 18, 21–25.
- ISSP Research Group (2019). International social survey programme: Social inequality v - issp 2019. <https://doi.org/10.4225/13/511C71F8612C3>.
- Kiatpongsan, S., & Norton, M. I. (2014). How much (more) should ceos make? A universal desire for more equal pay. *Perspectives on Psychological Science*, 9(6), 587–593.
- Knell, M., & Stix, H. (2020). Perceptions of inequality. *European Journal of Political Economy*, 65, 101927.
- Kuhn, A. (2015). *The individual perception of wage inequality: A measurement framework and some empirical evidence*. Institute of Labor Economics (IZA): Technical report.
- Niehuus, J. (2014). Subjective perceptions of inequality and redistributive preferences: An international comparison. *Cologne Institute for Economic Research. IW-TRENDS Discussion Paper*, 2, 1–23.
- Osberg, L., & Smeeding, T. (2006). 'fair' inequality? Attitudes toward pay differentials: The united states in comparative perspective. *American Sociological Review*, 71(3), 450–473.
- Pedersen, R. T., & Mutz, D. C. (2019). Attitudes toward economic inequality: The illusory agreement. *Political Science Research and Methods*, 7(4), 835–851.
- Rogers, M. L. & Pridemore, W. A. (2020). Perceived inequality and cross-national homicide rates. *Justice Quarterly*, 1–27.
- Sen, A., Sen, M. A., Foster, J. E., Amartya, S., & Foster, J. E. (1997). On economic inequality. Oxford university press.
- UNU-WIDER (2021). World income inequality database (wiid). version 31 may 2021. <https://www.wider.unu.edu/database/world-income-inequality-database-wiid>.

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