International Inequality in Subjective Well-Being: An exploration with the Gallup World Poll

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Abstract

In this paper we compute inequality measures over the distribution of a subjective well-being variable constructed from a life satisfaction question included in the Gallup World Poll in almost all countries in the world. We argue that inequality in subjective well-being may be a better proxy for the degree of unfairness in a society than income inequality. We find evidence that inequality in subjective well-being has an inverse-U relationship with per capita GDP, but it is monotonically decreasing with respect to mean subjective well-being. We argue that this difference might be associated to inequality aversion in the space of utility.

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1. Introduction

Inequality has been typically studied in the space of income, or other objective dimensions of well-being (Atkinson and Bourguignon, 2000). However, a recent literature stresses the relevance of analyzing individual well-being with subjective measures obtained from answers to life satisfaction questions (Stiglitz *et al*., 2009, Deaton, 2012). If these answers were a meaningful approximation to real levels of individual welfare, inequality in subjective well-being could be computed. In fact, analyzing inequality in that space could have some theoretical advantages over the typical income distribution analysis. If some income differences are the outcome of free choices subject to similar constraints, then they should not be considered unfair. In fact, this is one of the main insights of the growing literature on equality of opportunity (Roemer, 1998; Roemer and Trannoy, 2015). In contrast to income, individual utility is less prone to be "contaminated" by these issues. Two individuals with different preferences facing similar circumstances may end up with very different incomes as a consequence of their choices, but individual utilities may not be very different. In that framework, inequality in perceived happiness could be a better approximation to social unfairness than income inequality.

In this paper we discuss these issues and measure inequality in the distribution of subjective well-being, exploiting life satisfaction questions in the Gallup World Poll 2006, a survey that includes identical questionnaires in almost all countries in the world. We also present indicators computed over the answers to perception questions in the World Values Survey. These surveys allow us to have an international perspective of inequality in subjective measures of well-being, and compare the results with those drawn from income variables. Although we are aware of the multiple difficulties in measuring individual well-being with the few simple questions included in general surveys, as well as the concerns about adaptation, comparability and cardinality (Sen, 1987; Graham, 2009), we still believe that these questions include valuable information on people's well-being that is it worth exploring. In fact, the literature on subjective well-being has been growing at a quick pace in the last decades, raising a number of interesting issues relevant to the economic development debate (Decanq *et al*., 2015, Nikolova, 2016).

This paper makes three main contributions. First, it highlights the role of measuring inequality in subjective well-being (SW) as a relevant tool in the analysis of social

unfairness, in comparison with the traditional income inequality framework and the increasingly influential equality-of-opportunity paradigm. Second, the paper provides estimates of inequality in SW in almost all countries in the world based on the same question. Although the literature on SW has been booming, the contributions on inequality in this space have been scarce, and limited to specific countries.[1] Third, the paper reports some interesting results regarding international inequality in SW. In particular, we find evidence that inequality in SW has an inverse-U relationship with per capita GDP, but it turns out to be monotonically decreasing with respect to mean SW. We argue that this difference might be associated with inequality aversion in the space of utility.

The rest of the paper is organized as follows. In section 2 we discuss the role of inequality measures in SW in the analysis of social unfairness. In section 3 we review some issues regarding the measurement of SW, and then specify our approach and present the data. The results of measuring inequality in the space of SW are shown in section 4, where we also explore the links with some indicators of inequality of opportunity. In section 5 we explore the evidence of a Kuznets curve for inequality in SW, and put forward an argument that may account for an inverse-U relationship between inequality and per capita GDP, but a monotonically decreasing association with mean SW. Section 6 closes with some remarks.

2. The role of subjective well-being in fairness analysis

There is a large literature in philosophy, political science and economics about the space in which inequality should be measured to approximate unfairness in a society (Sen, 1973; Atkinson and Bourguignon, 2000). Despite the richness of the theoretical debate, in practice most empirical analysis estimate the degree of social unfairness by some measure of inequality of outcomes, typically income or consumption. The main drawback of this simple approach is that outcomes are in part the result of choices, and hence some differences in outcomes could be socially acceptable, raising no equity concerns. The approach of equity as *equality of opportunity* is better grounded in the philosophy literature (Arneson, 1989; Cohen, 1989), and generally more accepted by

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[1] For instance, Stevenson and Wolfers (2008b) and Dutta and Foster (2013) analyze inequality of happiness in the United States between 1972 and 2006 with data from the General Social Survey.

people in opinion surveys than the equality of outcomes alternative. There is a growing literature on the measurement of inequality of opportunity (IO) that, although promising, faces formidable methodological challenges.[2] A typical IO analysis requires identifying all the factors that affect a relevant outcome and considers as unfair only those outcome differences that are driven by circumstances and not by choice (or by some "acceptable" factors such as innate talent). These requirements pose enormous limitations to the computation of robust IO indicators since only a few determinants of the outcome of interest could typically be measured with the data at hand, and the causal impacts on the outcome could be estimated very imprecisely due to all sorts of identification problems. Given the difficulties in implementing the IO approach, measuring income inequality remains the standard for equity analysis, despite its conceptual drawbacks. The difference in the severity of the implementation issues between both approaches is even more dramatic when the aim is to compare inequality across a large set of countries.

Computing inequality in subjective well-being could serve as a complement to the different approaches aimed at measuring unfairness in a society. In particular, it may have some advantages over the usual practice of measuring income inequality. Some income differences are the result of free choices subject to similar constraints and thus, they should not be considered unfair. For some purposes, these socially acceptable income differences should not be counted as inequality. Subjective well-being is less prone to be contaminated by these issues. Two individuals with different preferences facing similar circumstances may end up with very different incomes as a consequence of their choices, but individual utilities may not be very different. In that framework, inequality in perceived happiness could be a better approximation to social unfairness than income inequality.[3] In the Appendix we present a simple model that illustrates that at least a fraction of income differences that are not rooted in inequality of circumstances can be eliminated if we use subjective well-being as the metric for inequality. If equity is related to equality of opportunity and not outcomes, then

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[2] See Bourguignon, Ferreira and Menendez (2007), Brunori, Ferreira and Peragine (2013), Ferreira and Gignoux (2011), Roemer and Trannoy (2015), and Kanbur and Wagstaff (2015).

[3] Similar arguments could be made if inequality is thought of as an envy-free situation. See Varian (1976), and Dworkin (1981), Fleurbaey *et al*. (2005), Fleurbaey (2006), Nishimura (2008), Cowell and Evert (2009) and Kranich (2009).

measuring inequality in subjective well-being may be more appropriate than measuring income inequality.

The previous discussion assumes that we can measure income and utility without error, which is clearly a strong assumption. In particular, the available surveys provide questions that are only approximations to utility and they have significant limitations in terms of comparability. In the next section, we review some of the issues regarding the measurement of subjective well-being.

3. Measuring subjective well-being

The analysis of SW has been significantly growing, partly given the availability of surveys with life satisfaction questions, and also due to a reassessment of its usefulness in measuring well-being.[4] Some researchers argue that aggregate measures of happiness should be the only indicators to evaluate progress and policy (Layard, 2005). If people behave so as to maximize utility, some aggregate indicator of utility seems to be a reasonable measure for national welfare. On the other hand, others emphasize the pitfalls, ranging from serious measurement issues to the more conceptual problems of adaptation and awareness (Sen, 1999; Graham, 2013).

There are three types of questions typically used to measure SW in surveys: (i) how satisfied are you with your life?, (ii) are you happy, somewhat happy, unhappy?, and (iii) for how long were you happy last week? It is clear that those simple questions cannot perfectly capture concepts like happiness or utility, which are, after all, difficult to properly define (Morris, 2004). The questions may in fact have different meanings in different socio-cultural environments. Measurement issues are a central problem in the subjective well-being literature (Sen, 1999, Layard, 2005, Graham, 2011).

Benjamin *et al*. (2010) analyze to what extent questions on SW capture what economists assume people maximize to make decisions. They find that the three questions listed above are proxies for utility (or what individuals reveal of utility from their choices) but the consistency (correspondence between prediction and choice) is far from perfect and varies across types of questions, being question (i) the most successful.

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[4] See for example Layard (2005), Kahneman and Krueger (2006), Deaton (2008), Senik (2009) and Fitoussi and Stiglitz (2013).

This type of question is included in the surveys used in this study (Gallup World Poll and World Values Survey).

Ferrer-i-Carbonell and Frijters (2004) identify three typical assumptions in the subjective welfare literature in economics, psychology, and other fields. Let x_{it} be the answer of individual i to a SW question in time t, and U_{it} her utility level. The assumptions are:

A1: The answers x are a monotonic transformation of U. If $x_{it}>x_{is}$, then $U_{it}>U_{is}$.

A2: The answers x are ordinally comparable between people. If $x_i>x_j$, then $U_i>U_j$.

A3: The answers x are cardinally comparable between people: $U_i-U_j=\rho(x_i,x_j)$, where $\rho(.)$ is a function known up to a multiplicative constant. It is typical to take $\rho(x_i,x_j)=x_i-x_j$.

Ferrer-i-Carbonell and Frijters (2004) report that in psychology is typical to assume A1-A3, while in economics is more frequent to assume only A1-A2. The expanding literature on national and international comparisons of SW that computes statistics over the distribution of x needs to assume A3, as well. An alternative is to estimate a latent variable from the answers x that is representative of the ordinality of the answers.[5] In this paper we follow most of the literature and take the answers x as direct cardinal proxies of utility U, and also perform a latent variable analysis to check the robustness of some results. Before elaborating further on the characteristics and limitations of the analysis, we first introduce the main data source used in the paper.

The Gallup World Poll

The main source of information used in this study is the Gallup World Poll (GWP). In 2006, the Gallup Organization collected data using the same questionnaire for national samples of adults in 132 countries. Sample sizes of 1,000 households per country were designed to assure national representation. Because the survey uses the same questionnaire in all countries, it provides a unique opportunity to perform cross-country

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[5] Stevenson and Wolfers (2008b) estimate a latent variable from the answers of a question on subjective welfare with just three categories (very happy, pretty happy and not too happy) in the General Social Survey. Instead, Dutta and Foster (2013) argue for the use of more flexible stochastic dominance techniques (Allison and Foster, 2004). The use of these methods is more limited, and less necessary, in the case of subjective welfare variables with more categories. Particularly, Dutta and Foster´s methodology is not applicable for the life satisfaction question in the Gallup World Poll (see discussion in next section), because the median values differ across countries.

comparisons.[6] The Gallup Poll includes basic questions on demographics, education, and employment, several questions on perceptions, and a question on household income. The survey is answered only by an adult (15 years or older) chosen randomly from within the household. We discuss the limitations of the Gallup Poll at greater length in a separate paper (Gasparini and Gluzmann, 2012), as well as sample size and the reliability of some answers. Despite the limitations, we highlight the enormous potential of this type of surveys with identical questionnaires across the world for international comparisons of social variables.

Table 1 presents a general picture of the survey, grouping countries by geographical regions. The dataset includes the answers provided by 141,739 persons in 132 countries: 30 in Eastern Europe and Central Asia, 26 in Sub-Saharan Africa, 17 in Latin America, 6 in the Caribbean, 16 in East Asia and Pacific, 16 in Western Europe, 13 in North Africa and Middle East, 6 in South Asia and 2 in North America. Table 1 shows the number of observations and some basic demographic statistics by region. In a previous paper we find that the demographic and socioeconomic statistics drawn from the GWP are in general consistent with those obtained from household surveys (Gasparini and Gluzmann, 2012).

The Gallup World Poll includes some questions on perceptions and subjective well-being. In this paper, we use the following (question *wp16*): "*Please imagine a ladder/mountain with steps numbered from zero at the bottom to ten at the top. Suppose we say that the top of the ladder/mountain represents the best possible life for you and the bottom of the ladder/mountain represents the worst possible life for you. If the top step is 10 and the bottom step is 0, on which step of the ladder/mountain do you feel you personally stand at the present time?*"

For the purpose of this paper, this Cantril ladder of life question is the most convenient to approximate subjective well-being. Measures constructed from this question reflect a person's capabilities, means and long-term opportunities (Graham and Nikolova, 2015; Nikolova, 2016).[7] In addition, although certainly an ordinal categorical question, the

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[6] Deaton (2008) is one of the first studies to use the 2006 Gallup Poll. Gasparini and Gluzmann (2012) analyze international income inequality using microdata from this survey.

[7] Subjective well-being has both hedonic (*i.e.* affective) and cognitive (*i.e.*, evaluative) dimensions. In contrast, hedonic well-being measures capture the perceptions on experiences at a particular point in time.

idea of equidistant "steps" may introduce some cardinality that is convenient for measurement purposes.

There are several concerns regarding SW questions, such as the one included in the GWP. In particular, there might be significant heterogeneity in the interpretation of the question, linked to cultural factors and individual characteristics. A particular concern arises if respondents give the question a positional meaning, and answer it with a relative-deprivation idea in mind. Although we cannot rule out this possibility, the ladder question in the GWP is clearly stated in order to capture "absolute" well-being. The question asks the respondent about his/her well-being with no reference to any comparison group. Moreover, if most people answered the ladder question comparing their position with people around them, then we would not necessarily expect our measure of SW to grow with income or other objective indicators (both across countries and within countries). However, as we show in our paper (and is shown in several other studies that have used the same data) SW captured by this question is strongly positively correlated with other objective absolute measures of well-being, such as income or assets (Gasparini *et al.*, 2014).

Several authors argue that, despite their limitations, subjective well-being questions are reasonable proxies for effective absolute well-being. For instance, Diener *et al.* (2013) claim that "Several types of data indicate that the scales validly reflect the quality of respondents' lives: (1) Differences between nations in life satisfaction associated with differences in objective conditions, (2) Differences between groups who live in different circumstances, (3) Correlations with non-self-report measures of life satisfaction, (4) Genetic and physiological associations with life satisfaction, (5) Systematic patterns of change in the scales before, during, and after significant life events, and (6) Prediction by life satisfaction scores of future behaviors such as suicide." Van Praag and Ferrer-i-Carbolell (2004) highlight the evidence that links answers to well-being questions to facial expressions, brain activity, and body reactions, whereas Sandvik *et al.*, (1993) and Denier and Lucas (1999) show the strong association between the SW responses of a person and responses about her well-being provided by others.

Although they are positively correlated, both measures are conceptually and empirically distinct (Nikolova, 2016).

Subjective well-being is certainly still a controversial issue. Many social scientists and economists in particular, doubt the reliability and comparability of answers to life satisfaction questions. In contrast, others are convinced by the work of psychologists and economists who have argued that "subjective well-being measures capture the underlying concepts, are valid and reliable as well as being comparable across people, countries and over time (Krueger and Schkade 2008, Exton *et al.* 2015, Helliwell and Barrington-Leigh 2010, OECD 2011)" (Nikolova, 2016). The ample literature on SW has largely recognized the pitfalls and limitations of life satisfaction questions, but still finds that the answers to these questions provide useful information about happiness that should be seriously taken into account in economic analysis. Moreover, although aware of the strong assumptions needed to support the cardinal interpretation of these measures, most of this literature has found it useful to accept those assumptions in order to gain in tractability, and hence to be able to provide insights into the complex issue of subjective well-being. We follow this line in this paper.

There is one point that should not be overlooked. Typical inequality comparisons across countries and regions are plagued by comparability problems that stem from the lack of a homogeneous source of information. The GWP, by contrast, poses exactly the same question in almost all countries in the world, and hence it substantially reduces the spurious differences in the estimations across countries, generated by idiosyncratic factors associated to the design of the surveys. Of course, that does not mean that all people in all countries interpret and answer questions in the same way, but by standardizing the questionnaire (something that is far from reachable in national household surveys) it reduces a significant source of measurement error.

Table 2 shows some basic statistics from the SW question referred above. Western Europe and North America show on average the highest levels of SW, followed by Latin America. Sub-Saharan Africa is the region with the lowest levels of SW. Medians are close to means in all regions, with a range of 4 to 7.

Data from the GWP at the country level reveals a strong positive relationship between SW and per capita GDP (or mean income).[8] Figure 1 shows that countries with higher per capita GDP are also countries with higher levels of SW. The same relationship holds with mean household per capita income computed from the income question in the

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[8] This is related to the discussion on the Easterlin paradox (1995). See Clark and Oswald (1996); Senik, (2004, 2008); Ferrer-i-Carbonell (2005); Deaton (2008) and Stevenson and Wolfers (2008a).

Gallup Poll, instead of per capita GDP.[9] The number of observations in this case is reduced, since the per capita income question cannot be computed in Africa and the Middle East with GWP data. The linear correlation coefficient between SW and (log) income is 0.81 in panel A and 0.7 in panel B, in both cases statistically significant at 1%.[10]

4. Inequality of subjective well-being and opportunity

The positive relationship between subjective well-being and incomes goes beyond the mean values. Inequalities in these variables, as measured by the Gini coefficient, are also positively related (Figure 2). As expected, countries with low income inequality tend to be countries with low dispersion in the distribution of SW. However, the relationship is not very tight: the correlation coefficient is 0.35 (significant at 1%). A given level of income inequality is consistent with different levels of inequality in SW. As discussed above, if income inequality is the result of free choices from an equal-opportunity situation, inequality in SW could be low, while if it is the consequence mainly of differences in circumstances, it could be high.

Table 3 shows the Gini coefficient computed over the distribution of SW and household per capita income. In both cases there are two estimates for each region: the first one is the average of the national Ginis, while the second one is the Gini over the distribution in the entire region, ignoring the political borders. Western Europe and North America are the regions with less inequality both in terms of income and subjective well-being. Latin America is frequently regarded as the most unequal region in the world (Alvaredo and Gasparini, 2015). According to data from the GWP that is only true for income inequality and taking averages across countries (and ignoring sub-Saharan Africa). Inequality is reduced when taking SW, and when considering regions as large geographical units. Instead, inequality in SW in Eastern Europe and Central Asia does not seem to be as low as income inequality, when compared to the rest of the

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[9] Answers to income questions (in local currency units) are standardized. See Gasparini and Gluzmann (2012) for details and a discussion on the income question in the Gallup World Poll.

[10] The corresponding correlation coefficients are 0.79 and 0.68 when taking levels instead of logs for GDP and mean income.

developing world. Inequality in SW seems to be particularly high in the countries of the Caribbean and in sub-Saharan Africa.

Links with inequality of opportunity

The relationship between inequality of subjective well-being and inequality of opportunity can be explored with the help of some perception questions in the Gallup World Poll:

Question 1) *In this country, are you satisfied or dissatisfied with your freedom to choose what you do with your life?*

Question 2) *Do most children in this country have the opportunity to learn and grow every day, or not?*

Question 3) *Can people in this country get ahead by working hard, or not?*

Question 4) *In this country, are you satisfied or dissatisfied with efforts to deal with the poor?*

Question 5) *Is corruption widespread throughout the government in this country, or not?*

Question 6) *Is corruption widespread within businesses located in this country, or not?*

Regarding the first question, although the relationship is far from being straightforward, it is conceivable that in countries with low inequality of opportunity people perceive that they have more "freedom to choose." If the Gini coefficient of SW approximates inequality of opportunity, we should find a negative relationship between this indicator and the percentage of people in a country who are satisfied with the "freedom to choose." The first column in Table 4 shows that this is indeed the case: the regression coefficient for the Gini of SW is negative and significant at 1%. The result holds after controlling for the level of per capita income, the mean value in SW, and the income Gini.

Table 5 replicates column 4 in Table 4 for the other questions (q2 to q6). We expect to find that in countries with high inequality of opportunity, people have a negative perception about the opportunities to "learn and grow" for children, a negative perception about the rewards of effort ("get ahead by working hard"), a negative perception about the government's efforts to deal with the consequences of IO, and a perception that negative factors such as corruption are strong determinants of outcomes. If inequality in SW is a proxy for inequality of opportunity, then the Gini in SW should be correlated with the answers to questions 2 to 6. We find that the coefficients in Table

5 are consistent with the expected results, even when controlling for other variables, such as the income level, the level of SW, and income inequality.[11]

We end this section by reporting correlations between inequality in SW and some direct measures of IO. Unfortunately, although the literature on the measurement of IO is large, the available comparable statistics at the international level are scarce.[12] A recent paper by Brunori, Ferreira and Peragine (2013) is the first serious attempt to compile indicators of equality of opportunity in the world at a large scale.[13] The authors gather 41 observations (countries) of a set of indicators computed from an ex-ante methodology that implies constructing groups of individuals with identical (or similar) observed circumstances, and analyzing the within-group effects.[14] Brunori *et al.* (2013) alert for the several comparability problems in the compilation generated by differences across countries in the specific estimation methodology, data sources, and variables of interest. These problems, added to the fact that the number of observations is small, require assessing the following correlations with prudence.

As argued above, inequality in SW could be seen as a proxy for inequality of opportunity, so we should find a positive correlation between the Gini over the distribution of SW computed with Gallup data and the measures of IO compiled by Brunori *et al.* (2013). Consistent with this expectation, we find a positive (0.4741) and significant linear correlation coefficient (at 1%), even when controlling for various variables. The signs of the correlations are also consistent with expectations when using other proxy measures of IO in Brunori *et al.* (2013): the intergenerational elasticity of income, the intergenerational correlation of education, and the World Bank's Human Opportunity Index, based on the access to certain basic services.

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[11] At the suggestion of a referee, we introduced a set of educational variables as controls in our regressions, such as primary and secondary net enrollment rates, mean years of education and literacy rates. Panel data for education variables was taken from the World Development Indicators and from the Barro and Lee (2013) dataset. Our results are robust to the introduction of the set of educational controls.

[12] For estimates of IO indicators, mostly at the level of specific countries, see Bourguignon *et al.* (2007), Cogneau and Mesple-Somps (2008), Lefranc *et al.* (2009), Pistolesi (2009), Checchi and Peragine (2010), Checchi *et al.* (2010), Ferreira and Gignoux (2011), Ferreira *et al.* (2011), Singh (2012), Belhaj-Hassine (2012) and Piraino (2012).

[13] See also Brunori (2016) for the measurement of inequality of opportunity in Europe.

[14] This strategy estimates a lower bound of the degree of inequality of opportunities, in a specific outcome variable. See Brunori *et al.* (2013) for a detailed explanation.

5. A Kuznets curve for subjective well-being?

The seminal paper by Kuznets (1955) triggered a rich theoretical and empirical literature aimed at documenting and explaining the relationship between income inequality and some measure of economic development, typically mean income or per capita GDP.[15] In particular, the famous *Kuznets curve* depicts an inverse-U shaped relationship between income inequality and development. The empirical test for the Kuznets curve requires time-series or panel data, and not just a cross-section, since it is a hypothesis about the dynamics of an economy over its development process. However, it is still common practice to look at the correlations between inequality and per capita GDP in a cross sections of political units (typically countries), and link the resulting pattern to the seminal observation by Kuznets (1955).[16]

In this section we extend the analysis of the Kuznets curve from the income to the subjective well-being metric. We start in Figure 3 by plotting the Gini coefficient for the distribution of SW and log per capita GDP in a cross section of countries. The relationship clearly exhibits the Kuznets inverse U pattern. The turning point takes place at low levels of per capita GDP, a result also found in other papers that examine the relationship between income inequality and GDP (Ferreira and Ravallion, 2009; Alvaredo and Gasparini, 2015). In panel B we use log per capita income drawn from the Gallup Poll instead of per capita GDP. The evidence for the increasing segment of the curve becomes weak, although this result is likely driven by the absence of the sub-Saharan countries in the sample, since income is not reported in the Gallup survey for that region.

Table 6 shows the coefficients of the OLS regressions for the Gini of SW on log per capita GDP and income (and the squares). In both cases, the linear term is positive and the quadratic term is negative. Lind and Mehlum (2010) propose a formal test for a U (inverted U) relationship when the linear term is negative (positive) and the quadratic term is positive (negative). Table 6 shows that when using per capita GDP in the analysis we could reject (at 1%) the null hypothesis that the relationship has a U form or it is monotonic, against the alternative of an inverse-U shape. When using mean income

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[15] Some examples of empirical studies that analyze this relation are Fields (1980), Anand and Kanbur (1993), Deininger and Squire (1996), Forbes (2000), Dominics *et al.* (2008), Angeles (2010) and Alejo (2012).

[16] Ferreira and Ravallion (2009), Alvaredo and Gasparini (2015).

instead of GDP we could reject the null hypothesis only with a higher significance level, probably given the absence of African low-income countries in the sample.

We now turn to the relationship between inequality and mean SW. Contrary to what is probably expected, we do not find an inverse-U shape for this relationship. Figure 4 suggests that the Gini coefficient for the distribution of SW has a monotonic inverse relationship with the mean of that distribution. The linear correlation coefficient is large in absolute value (-0.79) and highly significant. In a regression of the Gini coefficient on the mean of SW and its squared, the quadratic term is not significant, which suggests that there is a monotonic relationship. Countries with higher levels of self-perceived well-being are also countries with low levels of dispersion in that variable.

Why does inequality in SW seem to have a non-monotonic relationship with per capita GDP and mean income, but a negative monotonic relationship with mean SW? We put forward the following plausible explanation. If inequality in utility is considered a "bad," individual levels of SW will be reduced in an unequal environment. For instance, Bjørnskov *et al*. (2013) find that the perception of fairness in a society is positively related to individual SW and negatively related to the demand for equality.[17] Inequality aversion that reduces utility may account for the change from an inverted-U to an inverse relationship when moving from Figure 3 to 4. We illustrate that possibility in Figure 5 with three representative units. The grey points illustrate an inverted-U curve in the utility inequality-mean income space. With inequality aversion, low-income countries with low inequality will have relatively higher levels of SW (as shown by the move from A to A´); middle-income countries with high inequality will have lower levels of satisfaction (from B to B´); while high-income countries with low inequality will have even relative higher levels of utility (from C to C´). The new curve, now in the space of inequality-mean utility, will be downward-sloping.

To further explore this point, let us assume a quadratic form between income inequality and mean income as observed empirically by Kuznets (1955):

$$G_y = a_0 + a_1 y - a_2 y^2 \tag{8}$$

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[17] Examples of the related literature that links inequality to subjective welfare are Morawetz (1977), Schwarze and Härpfer (2007), Bjørnskov *et al*. (2009) and Senik (2009).

where G_y is the Gini coefficient for the distribution of per capita income and y is per capita income (or GDP). From Figure 2 we can observe that the income Gini is positive related to the Gini coefficient for SW.[18]

$$G_y = bG_u \qquad (9)$$

Finally, if we assume that mean SW u is positively related to mean income (no Easterlin paradox) and negatively related to income inequality (inequality aversion) we should have:

$$u = c_1 y - c_2 G_u \qquad (10)$$

From (8) and (9),

$$G_u = \frac{1}{b}(a_0 + a_1 y - a_2 y^2) \qquad (11)$$

which is what we observe in Figure 3: the Gini index of SW has an inverse U-shaped relationship respect to per capita income. Combining (10) and (11) yields

$$G_u = \frac{a_0}{b} + \frac{a_1}{bc_1}(u + c_2 G_u) - \frac{a_2}{bc_1^2}(u + c_2 G_u)^2 \qquad (12)$$

Computing $\frac{\partial G_u}{\partial u}$ from (12) leads to

$$\frac{\partial G_u}{\partial u} = \frac{a_1 c_1 - 2a_2(u + c_2 G_u)}{bc_1^2 - c_2[a_1 c_1 - 2a_2(u + c_2 G_u)]} \qquad (13)$$

If there were not aversion to inequality, *i.e.* $c_2 = 0$, then

$$\frac{\partial G_u}{\partial u} = \frac{a_1}{bc_1} - \frac{2a_2}{bc_1^2}u \qquad (14)$$

Note that since $\frac{\partial G_u}{\partial u} > 0$ if u is small enough $(0 < u < \frac{a_1 c_1}{2a_2})$ and $\frac{\partial G_u}{\partial u} < 0$ if u is large enough $(u > \frac{a_1 c_1}{2a_2})$, then we may observe an inverse U-shaped relationship between G_u and u.

To examine what happens if $c_2 > 0$, rewrite equation (13) as

$$\frac{\partial G_u}{\partial u} = \frac{A}{bc_1^2 - c_2 A} \qquad (15)$$

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[18] For simplicity we assume proportionality.

with $A \equiv a_1 c_1 - 2a_2(u + c_2 G_u)$. Equation (15) can be positive or negative, but if c_2 is large enough (*i.e.* if inequality aversion is large enough) then $A < 0$ which implies $\frac{\partial G_u}{\partial u} < 0$ and thus, for any positive value of u, we observe a negative relationship between inequality in u and mean value of u.[19]

In other words, if the inequality aversion effect is large enough to generate changes in the ranking of countries when we switch from evaluating by income to evaluating by utility, we will observe an U-shaped curve between inequality and incomes and an always negative relationship between inequality and SW.[20]

With the objective of further exploring this effect, we compute the deviation from the mean ratio between SW and log per capita GDP for each country. Countries with positive deviations have levels of satisfaction relative to GDP higher than average. Figure 6 suggests that these countries are also those with low inequality in the distribution of SW. The correlation is high: -0.71, significant at 1%. In those societies where people perceive low differences in terms of utility, life satisfaction is relatively high controlling for GDP. It is interesting to note that the correlation becomes much looser when using the Gini for the distribution of income instead of the distribution of SW. The linear correlation is just -0.13.[21] That difference could be driven by a substantially more intense aversion to inequality in subjective well-being than to income inequality. In other words, people in countries with high utility inequality have substantially lower levels of life satisfaction; meanwhile, the utility-reduction effect is milder in countries with high income inequality. This result is consistent with the discussion in previous sections. In part, the level of income inequality includes acceptable differences that are not considered unjust; instead, differences in utilities are clearer signs of unfair situations, and hence reduce the level of life satisfaction.

The first column in Table 7 summarizes the main results for the Gini of SW: an inverse U relationship with log per capita GDP, a monotonic inverse relationship with mean

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[19] Even if $0 < u < \frac{a_1 c_1}{2a_2}$, if $c_2 > \frac{a_1 c_1}{2a_2 G_u}$, then $A < 0$.

[20] If SW contained mainly information about *relative* deprivation, inequality in subjective well-being questions would capture mainly within-inequality, i.e. the dispersion in well-being within the reference groups. In that case, our interpretation of the facts would be similar but in reference to within-inequality and not to overall inequality.

[21] The correlation is even lower (-0.06) when we use Gini coefficients taken from the WIDER database.

SW, and a strong negative correlation with the ratio SW/GDP. The Table also shows the results of some robustness analysis.

In contrast to income variables, the typical categorical question used to measure the SW variable is truncated. That truncation may generate a negative bias in countries with high levels of well-being. With the aim of checking that possibility in column (2) of Table 7 we redo the analysis ignoring in each country all answers that are higher than the mean. The main results remain unaltered after this transformation.

In column (3) instead of cardinality (A3 in section 3) we assume only ordinality (A2). To be able to still compute inequality indices, we follow a latent-variable strategy (Ferrer-i-Carbonell, 2005). In a first step, we estimate an ordered probit of the SW answers in households characteristics (per capita income, household size, urban-rural, and dummies by countries), individual characteristics (age and its square, gender, and occupational status) and a set of variables available in the survey designed to gather perceptions of the individual about different issues (health, nutrition, social networks, personal finance, transportation, environment, law and order, religion, youth development, and leadership). Then, in a second step, we compute a latent variable representing the cardinal welfare of each individual using the coefficients of the model.[22] Column (3) in Table 7 shows the results when using the Gini computed over the distribution of that latent variable, instead of using the actual responses to a categorical question. The main results remain basically unchanged.

We also check the robustness of the results with a different data source: the World Values Survey (WVS), which includes a similar question of SW in ten steps (*a170*). The WVS has some disadvantages as coverage is low in low-income countries, and there are some comparability limitations in terms of sampling design and questionnaires (see Deaton, 2008). In column (4) we report the results drawn from a cross-section for year 2006, including data for 63 countries.[23] The main results are similar to those

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[22] Inequality indices are typically not designed to evaluate inequality for a dimension that includes negative values, but the linear prediction has predicted a few negative values of welfare (1.05% if cases). Because of this measurability problem and in order to keep all observations respecting cardinality we add to all observations of the latent variable, the absolute value of the minimum value predicted plus 0.5.

[23] In most cases data is for 2006; in some few cases we take an earlier year (2000 is the earliest).

obtained with Gallup data. In some cases, the significance level is lower, probably due to the smaller number of observations in the WVS.[24]

Our final check involves the compilation of inequality of opportunity measures carried out by Brunoni *et al.* (2013), discussed above. Table 8 suggests that inequality of opportunity has an inverted-U relationship with per capita GDP, but a downward-sloping relationship with mean SW, a result that is consistent with the discussion in this section.[25]

7. Concluding remarks

In this paper we take advantage of life satisfaction questions included in the Gallup World Poll 2006, a survey conducted in almost all countries in the world, to compute indicators of inequality in subjective well-being. Although we are aware of the several problems raised by the measurement of subjective well-being, we believe that the results are relevant on two grounds. First, inequality in subjective well-being may be a better proxy of the degree of unfairness in a society than income inequality, so any effort to measure that dimension in an international context is valuable. Second, we find some of the results of the analysis interesting and motivating for future research. In particular, we find evidence for a Kuznets curve between inequality in subjective well-being and the level of economic development, but a negative relationship between inequality and subjective well-being, suggesting the presence of aversion to inequality in utility.

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[24] We also checked the robustness of the results to other inequality indices. Results are available upon request.

[25] Brunoni *et al.* (2013) also find an inverted-U curve between IE and per capita gross national income (instead of GDP).

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Table 1: Basic statistics. Gallup World Poll, 2006

	Observations	Share of males	Mean age of respondent	Children in the household
East Asia and Pacific	19,630	48.8%	42.1	1.0
Eastern Europe and Central Asia	32,757	48.1%	42.0	0.9
Latin America	17,144	48.2%	37.1	1.5
The Caribbean	4,056	48.4%	38.4	1.2
North Africa and Middle East	15,837	53.3%	33.9	1.5
South Asia	7,380	52.0%	35.6	2.0
Sub-Saharan Africa	26,506	49.0%	34.3	
Western Europe	16,073	48.0%	47.0	0.6
North America	2,356	47.5%	46.6	0.7

Source: own calculations based on the Gallup World Poll, 2006.

Table 2: The subjective well-being question in the Gallup World Poll

	Mean	Median	Percentage of the sample with value										
			0	1	2	3	4	5	6	7	8	9	10
East Asia and Pacific	4.9	5	0%	3%	4%	5%	10%	13%	31%	17%	10%	6%	1%
Eastern Europe and Central Asia	5.0	5	0%	2%	4%	6%	12%	14%	29%	13%	12%	8%	2%
Latin America	6.4	7	0%	2%	2%	3%	6%	8%	24%	12%	16%	20%	8%
The Caribbean	5.2	5	0%	4%	5%	8%	11%	13%	23%	13%	11%	10%	4%
North Africa and Middle East	5.3	5	0%	3%	3%	6%	9%	13%	25%	14%	13%	10%	4%
South Asia	5.3	5	0%	0%	3%	4%	10%	18%	31%	16%	8%	8%	2%
Sub-Saharan Africa	4.2	4	0%	2%	5%	12%	18%	20%	23%	12%	5%	3%	1%
Western Europe	6.9	7	0%	1%	1%	1%	2%	3%	14%	13%	28%	29%	9%
North America	7.1	7	0%	1%	1%	1%	1%	3%	14%	13%	24%	31%	11%

Source: own calculations based on the Gallup World Poll, 2006.

Table 3: Inequality in income and subjective well-being
Gini coefficients by region

	Subjective well-being		Income	
	Averages	Global	Averages	Global
East Asia and Pacific	0.167	0.224	0.474	0.670
Eastern Europe and Central Asia	0.217	0.233	0.424	0.481
Latin America	0.206	0.210	0.517	0.536
The Caribbean	0.242	0.278	0.483	0.601
North Africa and Middle East	0.204	0.242		
South Asia	0.203	0.209	0.497	0.579
Sub-Saharan Africa	0.240	0.245		
Western Europe	0.132	0.137	0.375	0.413
North America	0.129	0.144	0.414	0.451

Source: own calculations based on the Gallup World Poll, 2006.

Table 4: Regression results on satisfaction with freedom to choose

	(1)	(2)	(3)	(4)
Gini of SW	-1.598	-1.673	-0.917	-0.845
	(7.57)***	(5.08)***	(2.36)**	(2.25)**
Log of pc income		0.017	-0.012	0.017
		(0.98)	(0.64)	(0.82)
Mean SW			0.070	0.072
			(3.27)***	(3.50)***
Gini of pc income				0.513
				(2.67)***
Constant	1.052	0.928	0.617	0.133
	(23.66)***	(5.04)***	(3.11)***	(0.50)
Observations	128	86	86	86
R2	0.31	0.38	0.45	0.49

Notes: OLS regressions at the country level. Dependent variable: proportion of affirmative answers to "In this country, are you satisfied or dissatisfied with your freedom to choose what you do with your life?." Data from the Gallup World Poll, 2006.

SW=subjective well-being variable constructed from the ladder question of the GWP.

pc income=household per capita income constructed from the income and the demographic questions of the GWP.

Notes: t statistics in parenthesis, p values in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Regression results on several satisfaction questions

	Questions				
	q2	q3	q4	q5	q6
Gini of SW	-1.225	-0.902	-0.845	1.327	1.532
	(2.81)***	(1.87)*	(2.25)**	(2.18)**	(3.48)***
Log of pc income	0.110	-0.032	0.017	-0.087	-0.061
	(4.49)***	(1.24)	(0.82)	(2.77)***	(2.47)**
Mean SW	-0.016	0.026	0.072	-0.035	-0.034
	(0.65)	(1.01)	(3.50)***	(1.08)	(1.42)
Gini of pc income	0.121	0.699	0.513	-0.733	-0.803
	(0.54)	(2.98)***	(2.67)***	(2.48)**	(3.51)***
Constant	0.090	0.758	0.133	1.707	1.515
	(0.29)	(2.32)**	(0.50)	(4.27)***	(4.85)***
Observations	87	78	86	83	85
R2	0.51	0.22	0.49	0.43	0.50

Notes: OLS regressions at the country level. Dependent variables: q2= Do most children in this country have the opportunity to learn and grow every day, or not?; q3= Can people in this country get ahead by working hard, or not?; q4= In this country, are you satisfied or dissatisfied with efforts to deal with the poor?; q5= Is corruption widespread throughout the government in this country, or not?; q6= Is corruption widespread within businesses located in this country, or not? Data from the Gallup World Poll, 2006.

SW=subjective well-being variable constructed from the ladder question of the GWP.

pc income=household per capita income constructed from the income and the demographic questions of the GWP.

t statistics in parenthesis, p values in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Regressions for Gini of subjective well-being

	(1)	(2)
log per capita GDP	0.186	
	(4.48)***	
log per capita GDP squared	-0.012	
	(5.01)***	
log per capita income		0.177
		(1.94)*
log pc income squared		-0.012
		(2.32)**
constant	-0.487	-0.413
	(2.75)***	(1.07)
Observations	127	88
R-squared	0.40	0.40
Lind & Mehlum test	3.318***	0.561
	{0.001}	{0.288}

Notes: OLS regressions at the country level for the Gini coefficient of the subjective well-being indicator constructed from the GWP. Per capita GDP is taken from WDI and per capita income is constructed from the GWP.
t statistics in parenthesis, *p* values in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Robustness analysis

	Benchmark	Truncated sample	Latent variables	World Values Survey
	(1)	(2)	(3)	(4)
log pc GDP	0.186	0.234	0.111	0.119
	(4.48)***	(4.50)***	(3.76)***	(1.91)*
log pc GDP squared	-0.012	-0.014	-0.007	-0.009
	(5.01)***	(4.82)***	(4.45)***	(2.42)**
constant	-0.487	-0.743	-0.307	-0.188
	(2.75)***	(3.36)***	(2.35)**	(0.69)
Observations	127	127	81	62
R-squared	0.40	0.26	0.63	0.53
Lind & Mehlum test	3.318***	3.784***	2.438***	0.401
	{0.001}	{0.000}	{0.009}	{0.345}
Mean subjective welfare	-0.036	-0.032	-0.042	-0.049
	(14.21)***	(8.69)***	(24.42)***	(14.75)***
constant	0.394	0.344	0.237	0.505
	(28.46)***	(17.13)***	(37.39)***	(22.38)***
Observations	129	129	82	63
R-squared	0.61	0.37	0.88	0.78
Correlation with ratio (mean subjective welfare/log GDP)	-0.705***	-0.639***	-0.693***	-0.295**
	{0.000}	{0.000}	{0.000}	{0.020}

Notes: OLS regressions at the country level for the Gini coefficient of the subjective well-being indicator constructed from the GWP. Per capita GDP is taken from WDI, per capita income and mean subjective well-being is constructed from the GWP. In column (4) subjective well-being is computed with microdata from the World Values Survey 2006.
t statistics in parenthesis, *p* values in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
For mean subjective well-being Lind & Mehlum test is trivially not applicable because the slope of the curve is always negative in the data interval.

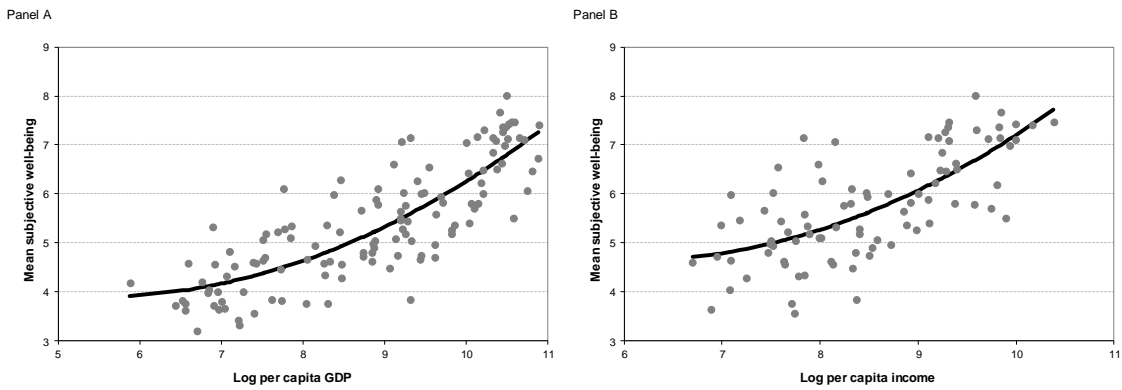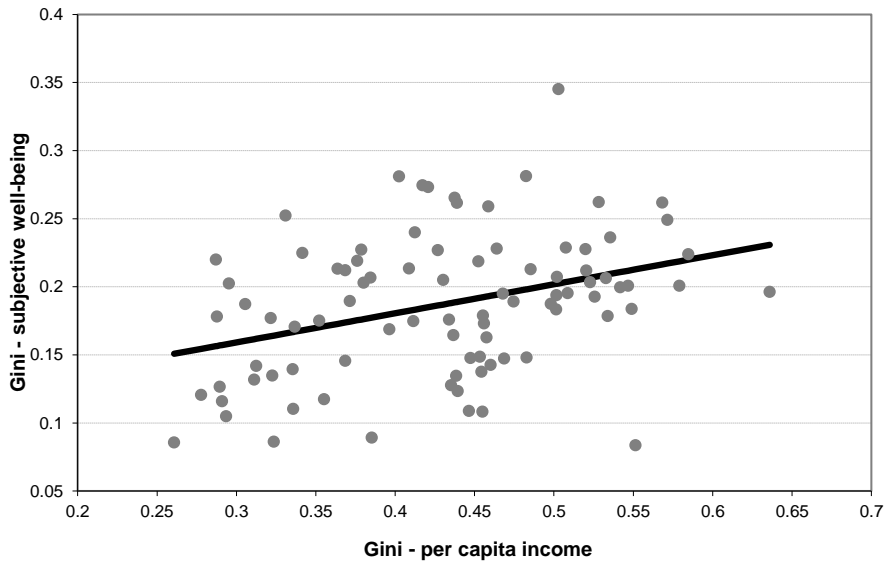**Table 8: Dependent variable: inequality of opportunity index**

	(1)	(2)	(3)
log pc GDP	0.404		
	(3.78)***		
log pc GDP squared	-0.024		
	(4.02)***		
Mean subjective well-being		-0.016	0.120
		(1.79)*	(1.31)
Mean subjective well-being squared			-0.011
			(1.48)
Constant	-1.579	0.155	-0.237
	(3.33)***	(2.90)***	(0.88)
Observations	38	38	38
R-squared	0.46	0.08	0.14

Notes: OLS regressions at the country level for the inequality of opportunity index in Brunoni *et al*. (2013). Per capita GDP is taken from WDI and mean subjective well-being is constructed from the GWP. *t* statistics in parenthesis, *p* values in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1: Subjective well-being and per capita GDP/mean income
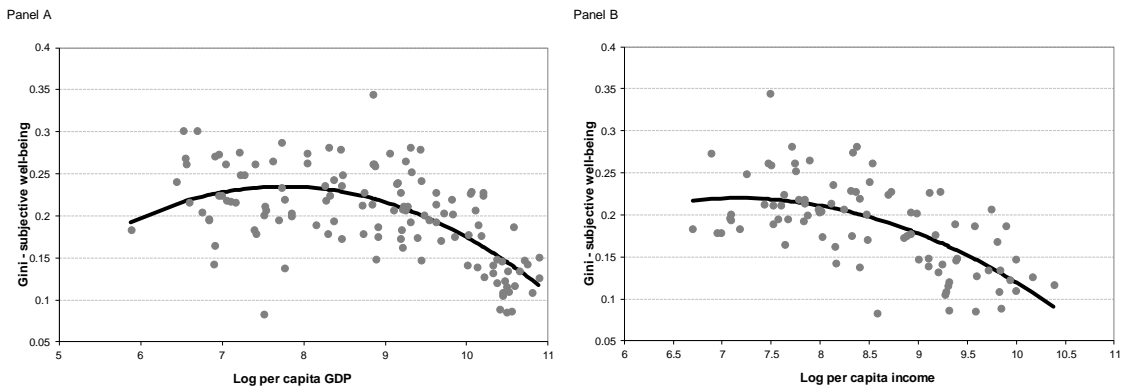
Panel B

Source: own calculations based on the Gallup World Poll, 2006 and WDI.
Note: the smoothed lines are second-order trend lines that fit the data.

Figure 2: Inequality in subjective well-being and income

Source: own calculations based on the Gallup World Poll, 2006.

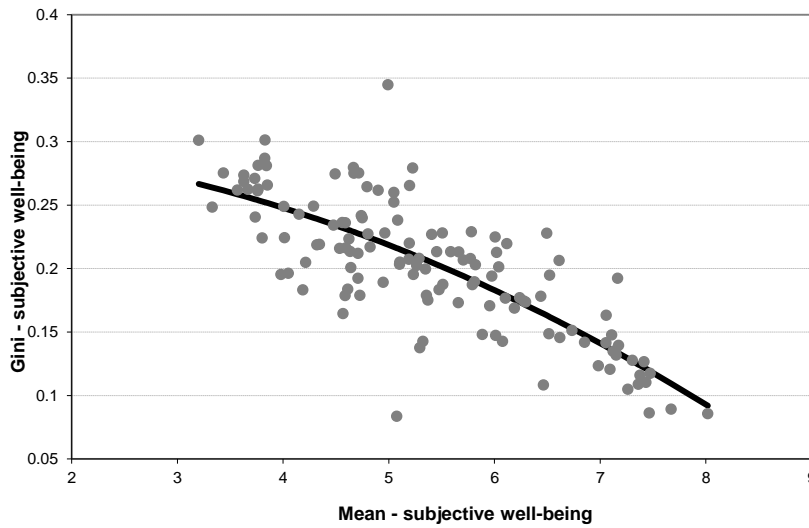**Figure 3: Inequality in subjective well-being and log per capita GDP or income**

Panel A   Panel B

Source: own calculations based on the Gallup World Poll, 2006 and WDI.

Note: in panel A the sample includes 127 countries, while in panel B it includes 88 countries (it excludes all nations in sub-Sahara Africa).
Note: the smoothed lines are second-order trend lines that fit the data.

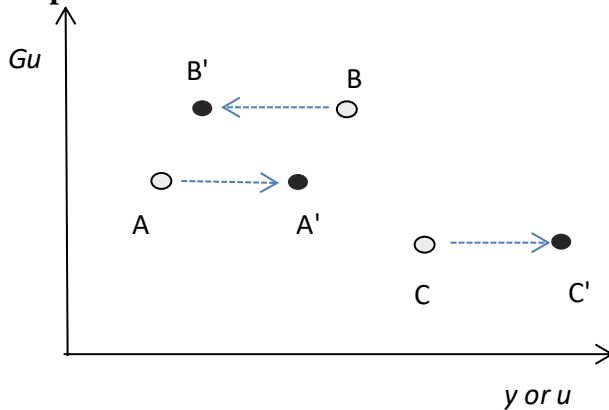**Figure 4: Inequality in subjective well-being and mean subjective well-being**

Source: own calculations based on the Gallup World Poll, 2006.
Note: the sample includes 127 countries.
Note: the smoothed lines are second-order trend lines that fit the data.
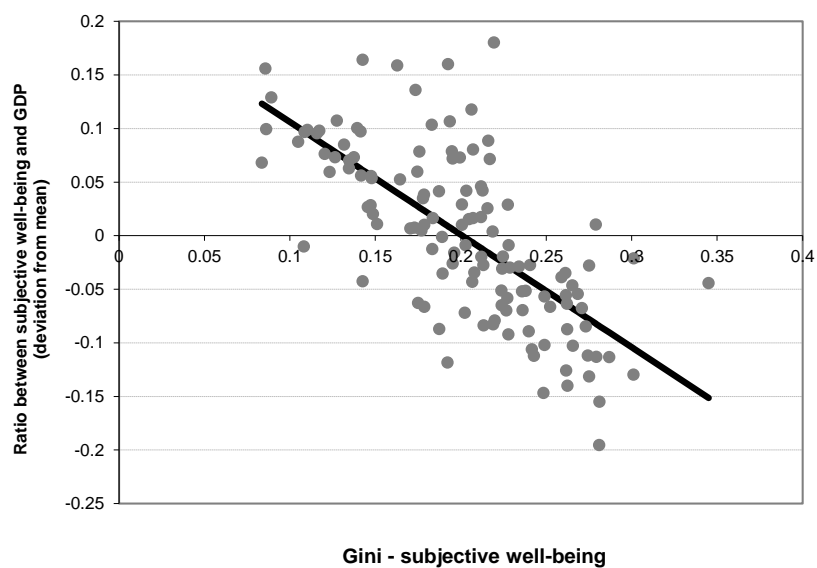
Figure 5: Inequality in subjective well-being and mean subjective well-being: an example

Note: Gu = Gini of subjective well-being, y = mean income, u = mean of subjective well-being
The grey points correspond to y in the horizontal axis, while the black points correspond to u in that axis.

Figure 6: Deviation from ratio (subjective well-being/log per capita GDP) and Gini of subjective well-being

Gini - subjective well-being

Source: own calculations based on the Gallup World Poll, 2006 and WDI.

APPENDIX

The following simple model illustrates the fact that at least a fraction of income differences that are not rooted in inequality of circumstances can be eliminated if we use subjective well-being as the metric for inequality. Assume individuals, indexed by i, derive utility from consumption c_i and leisure l_i:

$$U_i(c_i, l_i) \equiv \ln c_i + b_i \ln l_i \tag{1}$$

In this simple static model, individual consumption is equal to income, which in turn is the sum of labor and non-labor income k_i

$$c_i = y_i = w_i h_i + k_i = w_i(1 - l_i) + k_i \tag{2}$$

where w_i is the hourly wage, h_i represents hours of work, and available time is normalized to one unit.

Assume, for simplicity, that wages w are driven by individual ability, k is given by circumstances, and hours of work h represent the level of effort, chosen by the individual. Then, as in Roemer (1998), income is a function of circumstances, ability and effort.

Solving the individual maximization problem, the optimal choice of time allocated to leisure l^* is:

$$l_i^* = \frac{b_i}{(1+b_i)}\left(1 + \frac{k_i}{w_i}\right) \tag{3}$$

Individual income at the optimum is

$$y_i^* = \frac{w_i + k_i}{(1+b_i)} \tag{4}$$

Assume now that two individuals $i=1,2$ have identical circumstances ($k_1 = k_2$) and abilities ($w_1 = w_2$), but they differ in their preferences for leisure, in particular $b_1 > b_2$. An inequality-of-opportunity analysis would reveal an absence of unfairness in this situation. Instead, inequality in outcomes is positive. In particular, from (4) the income gap θ_y between the two individuals is

$$\theta_y \equiv lny_2^* - lny_1^* > 0 \tag{5}$$

If instead we compare utilities U, the gap θ_u will be

$$\theta_u \equiv U_2 - U_1 = lny_2^* + b_2 lnl_2^* - lny_1^* - b_1 lnl_1^* \tag{6}$$

Combining (5) and (6)

$$\theta_u = \theta_y - A \tag{7}$$

where $A = b_1 lnl_1^* - b_2 lnl_2^* > 0$. Individual 1 receives less utility than individual 2 from income but more utility from leisure. The income gap is at least partly offset by the difference in the disutility generated by effort. Equation (7) reveals that the gap in perceived well-being θ_u is lower than the income gap θ_y, and then closer to the gap in opportunities, which is zero in the example.