NBER WORKING PAPER SERIES

# THE WELFARE COSTS OF WELL-BEING INEQUALITY

Leonard Goff
John F. Helliwell
Guy Mayraz

Working Paper 21900
http://www.nber.org/papers/w21900

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 2016

All three authors are grateful for research support from the Canadian Institute for Advanced Research, through its program on Social Interactions, Identity and Well-Being. We are also grateful to Gallup for access to data from the Gallup World Poll and the Gallup-Healthways Well-Being Index® survey. The authors wish to thank Carol Graham, Richard Layard, Eric Snowberg and Joe Stiglitz for helpful comments on an earlier version. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

The Welfare Costs of Well-being Inequality
Leonard Goff, John F. Helliwell, and Guy Mayraz
NBER Working Paper No. 21900
January 2016, Revised April 2016
JEL No. D6,D63,I31


## ABSTRACT

If satisfaction with life (SWL) is used to measure individual well-being, its variance offers a natural measure of social inequality that includes all the various factors that affect well-being. As such, it may be a better proxy in estimating the effect of inequality on welfare than a more narrow measure of inequality, such as the inequality of income. We explore this possibility empirically and find: (i) that SWL levels are negatively correlated with SWL inequality, (ii) that this correlation is substantially stronger than the corresponding correlation with income inequality; (iii) that it is stronger for those who want inequality to be reduced, and (iv) that the correlation with SWL inequality extends to social trust and other contributors to well-being that are likely to be affected by inequality. While we cannot prove that the correlation is causal, we are able to reject the most likely alternative explanations. If the causal interpretation is correct, differences in SWL among rich countries have as much to do with differences in inequality as with differences in GDP.



Leonard Goff
Department of Economics
Columbia University
420 W. 118th Street, MC 3308
New York, NY 10027
leonard.goff@columbia.edu

John F. Helliwell
Vancouver School of Economics
University of British Columbia
6000 Iona Drive
Vancouver, BC V6T 1L4
CANADA
and NBER
john.helliwell@ubc.ca

Guy Mayraz
Department of Economics
University of Melbourne
111 Barry Street
Carlton VIC 3010
AUSTRALIA
guy.mayraz@unimelb.edu.au

# 1 Introduction

Inequality is attracting a great deal of public attention. Inequality of income and wealth attracts the most attention, but there is also substantial interest in inequality in other domains, such as health, education, the criminal justice system, marriage rates, and access to supportive social networks (Piketty, 2014; Neal & Rick, 2014; Wang & Parker, 2014; Case & Deaton, 2015).

Surveys of public attitudes towards inequality are unambiguous: most people worldwide believe they would be happier if inequality were lower (Wike, Simmons, & Oates, 2014). But is this belief justified? And supposing that lowering inequality would indeed increase happiness, would the increase be large enough to justify making reducing inequality a priority? Short of actually reducing inequality and reviewing the consequences, we can examine the evidence we have at hand and ask the following question: *comparing countries and states at different points in time, what is the other-things-being-equal relationship between happiness and inequality?*

Addressing this question requires empirically useful measures of both happiness and inequality at a variety of countries at different times. While happiness data is not without its problems, the situation is quite good. A number of established surveys ask participants about their satisfaction with life (SWL), and economists have been using the resulting data for some time.[1] We now have SWL data for about 150 countries going back to 2006, and for at least some countries we have data going back to the 1970s.

Because of its multi-dimensional nature, the measurement of inequality presents a greater challenge. The Gini coefficient of income is available for many countries, but there is little or no internationally comparable data for inequalities in wealth, health, education, social networks, and other domains. Moreover, even if we had data on inequality in all these domains, it would be impractical to identify their separate relationship with happiness. We could, perhaps, try to combine separate indicators to construct a compound measure of inequality, but we would not know what weights to assign to inequality in different domains.

Instead of seeking separate indicators for each aspect of inequality, we can look for an overall indicator for each person's welfare, and use its variation in a given society as the measure of inequality in that society. The great advantage of this approach is that we already have an overall indicator of individual welfare, namely each person's satisfaction with his or her life. A person's SWL gives proper weight to all the different aspects of life that

[1] See Section 2.1 for further details.

person cares about, that is, with the weights that he or she ascribes to them. The variation of SWL in a given society can thus be used as a measure of overall inequality in that society, which aggregates inequalities across separate domains with the weights that the individuals in that society ascribe to them. This is our approach in this paper.

We use the standard deviation of SWL as our measure of inequality.[2] A high inequality society is one in which there are many who achieve a life they are delighted with and many others who are stuck in a life that makes them despondent. This could be because the former are rich and the latter poor, but it could also be for any number of other reasons. We do not impose any preconceived notions on how people judge their own lives or those of their fellow citizens.

The few existing studies of SWL inequality mostly treat it as a secondary outcome variable to complement the study of average SWL (Stevenson & Wolfers, 2008; Dutta & Foster, 2013; Clark, Flèche, & Senik, 2015; Jordá, López-Noval, & Sarabia, 2015). These studies note trends in both average SWL and SWL inequality, but do not try to link them systematically. The major exceptions are Ott (2005) and Bolle, Okhrin, and Vogel (2009). Ott (2005) uses the World Values Survey to correlate life satisfaction means and standard deviations across 78 countries, finding a strong negative correlation between the two. Bolle et al. (2009) combine the Becker (1974) model of interdependent utility with the Fehr and Schmidt (1999) model of inequity aversion to create a version of Fehr and Schmidt (1999) preferences with reported happiness instead of earnings. They use the World Database of Happiness[3] to estimate the model for 71 countries in 1999-2000.

We examine the relationship between SWL and SWL inequality in a number of different surveys: the European Social Survey, the World Values Survey, the Gallup World Poll, and the Gallup-Healthways Well-Being Index (comparing U.S. states). Taken together, these surveys include over 160 countries and (for some of these countries) survey waves from 1990 to 2015.

We estimate individual level regressions with SWL inequality and GDP per capita in clusters defined by the combination of country/wave (state/wave in the Gallup-Healthways Well-Being Index). We start with simple regressions, replicating the Ott (2005) and Bolle et al. (2009) finding of a strong and strongly statistically significant negative relationship between SWL and SWL inequality in all the surveys we use. Higher SWL inequality is consistently associated with substantially lower SWL. We test the robustness

[2] See Section 2.2.

[3] http://worlddatabaseofhappiness.eur.nl/

of this relationship by adding log GDP per capita (in PPP terms), region dummies, and personal controls. The magnitude of the coefficient on SWL inequality is reduced, but it remains large and strongly statistically significant in all the surveys.

In order to compare the explanatory power of SWL inequality with that of income inequality, we reestimate the same regression equations with income inequality replacing SWL inequality. The standardized coefficient on income inequality is consistently smaller in magnitude and less statistically significant. We also estimate a combined regression with both inequality indicators. The coefficient on income inequality is substantially reduced in magnitude, while the coefficient on SWL inequality is unchanged. These results are precisely what we would expect if SWL inequality is indeed a more comprehensive measure of inequality than is the inequality of income.

One concern with interpreting these correlations as causal is omitted variable bias. For example, the education system in a country affects both SWL inequality and individual SWL, and since we don't control for the various characteristics of education in each country, the direct effect of education on SWL could bias the correlation between SWL and SWL inequality. The key question is whether omitted variables not only introduce some bias to our estimates, but are actually the reason the correlation between SWL and SWL inequality is significant. We study this possibility by exploiting questions that ask respondents whether they think income differences should be reduced. We take this question as a measure of aversion to inequality, and test whether the correlation between those respondents' SWL and SWL inequality in their country is stronger than the corresponding correlation for respondents who are not as averse to inequality. This indeed proves to be the case, consistent with the causal interpretation of the correlation.

A second concern is the possibility of reverse causality from SWL back to SWL inequality. The distribution of reported SWL may be compressed in countries with particularly high SWL, either because SWL itself is bounded (you cannot be more than 'extremely satisfied') or because SWL reports are bounded (you cannot report higher satisfaction levels). A mechanical correlation links a high level of mean SWL to a lower level of reported SWL inequality (Figure 1). We explore this possibility using regressions in which the dependent variable is a determinant of SWL that is expected to be affected by inequality. If SWL inequality captures the causal effect of inequality (Figure 1a) we would expect a strong correlation that is not significantly affected by adding mean SWL as a regressor. If, however, the correlation is mechanical (Figure 1b) we would expect only a weak correlation that disappears when mean SWL is included in the regression, since compression would

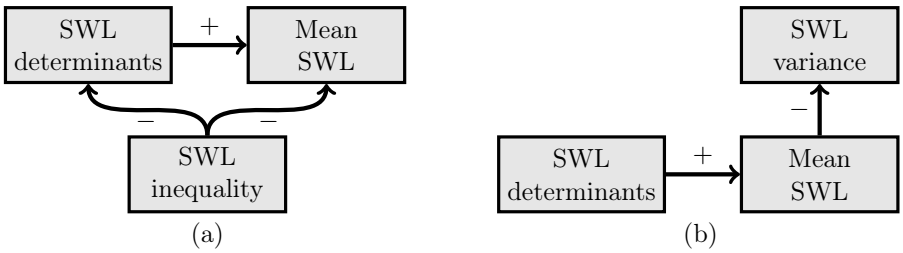


Figure 1: SWL and SWL inequality. Panel (a) depicts the proposed causal relationship between SWL and SWL inequality. SWL inequality reduces SWL in two ways: (i) directly, through aversion to inequality, and (ii) indirectly, by reducing other determinants of well-being such as public safety and social trust. Panel (b) depicts the spurious correlation interpretation. Increases in mean SWL compress the distribution of reported SWL, and thereby reduce its variance. This mechanical effect creates a spurious correlation between SWL and our measures of SWL inequality.

affects clusters with mean SWL near the boundaries of the SWL response scale.

One such SWL determinant is social trust, which is available in three of the surveys we use. Social trust has been found to be a strong support for SWL, both directly (Helliwell & Putnam, 2004; Helliwell & Wang, 2011) and through its effects on the growth of incomes (Knack & Keefer, 1997), and has been found in turn to be correlated with income inequality (Bjørnskov, 2007; Rothstein & Uslaner, 2005). We find that SWL inequality is more strongly related to social trust than is income inequality, and that the coefficient on SWL inequality is barely changed if mean SWL is added to the regression. In the Gallup World Poll we examine other well-being determinants: recent feelings of worry and stress, and whether the respondent feels safe walking alone. Again we find strong correlations with SWL inequality in the expected direction (more worry, stress, and fear of walking alone), and only a small decline in the coefficient when mean SWL is added as a regressor. These results support the causal interpretation of the negative correlation between SWL and SWL inequality.

We thus conclude that the strong negative correlation between SWL and SWL inequality cannot be given a purely mechanical explanation, and is unlikely to be an artifact of omitted variable bias. Hence we argue that the most convincing explanation is the causal one. If this interpretation is correct, the effect of inequality is substantial. Consider the magnitude

of changes associated with a one point increase in SWL. While the exact coefficients vary between the surveys, a one point change in SWL on a 0–10 scale is associated either with a tripling of GDP per capita, or with a one point decrease in the standard deviation of SWL. As an example, New Zealand's GDP per capita is about 35% lower than in the United States, and SWL inequality is about 0.3 points less. According to the estimated coefficients, these two differences roughly cancel out. Indeed, according to the Gallup World Poll, the mean SWL in 2014 the US and New Zealand was a nearly identical 7.28 and 7.35. If the US could reduce its inequality to New Zealand levels, while retaining its GDP per capita, its mean SWL is predicted to increase to about 7.58—precisely the level obtained in 2014 by Denmark, which has the world's highest level of happiness.

# 2 Data

## 2.1 Satisfaction with life

We use the term *satisfaction with life* (SWL) to refer to a person's overall evaluation of his or her life. A typical survey question is "All things considered, how satisfied are you with your life as a whole nowadays?" with answers given on a scale ranging from "extremely dissatisfied" to "extremely satisfied". Another commonly used approach, the *Cantril Ladder*, is to ask respondents to rank their life between the worst and best possible life for them.

SWL provides a measure of individual welfare that includes all the things a person cares about with the importance he or she assigns to them. The first well-known economics paper using SWL data as a proxy for welfare or utility is probably Easterlin (1974). The rate of publications has substantially increased around 2005, with such papers as Luttmer (2005), Van Praag and Baarsma (2005), Di Tella and MacCulloch (2006), Frey, Luechinger, and Stutzer (2007), Clark, Frijters, and Shields (2008), and Layard, Mayraz, and Nickell (2008). Deaton (2010) advocates its use in measuring international differences in poverty.

The use of SWL data raises two important concerns: interpersonal comparability and the linearity of the transformation between true utility and reported SWL. To appreciate these concerns, let $h_j$ denote the reported SWL of person $j$, and let $u_j$ denote her underlying utility. Assume that both are normalized to a common scale. The interpersonal comparability problem is that we observe that one person reports higher SWL than another: $h_j > h_k$, but what we want to know is whether the first person is really better off:

$u_j > u_k$. The linearity problem is that OLS regressions with $h_j$ as the dependent variable necessarily assume that equal differences in reported SWL correspond to equal differences in true utility.

There are two answers to these concerns. First, far from being a new and questionable requirement of SWL studies, interpersonal comparisons of well-being are a normal and unavoidable assumption in everyday life. As Harsanyi (1955) writes, "There is no doubt about the fact that people do make, or at least attempt to make, interpersonal comparisons of utility, both in the sense of comparing different persons' total satisfaction and in the sense of comparing increments and decrements in different persons' satisfaction." Second, research shows that SWL reports correlate as expected with other people's estimates, with neuropsychological measures, and with external factors that are expected to affect utility, and that they are in turn a good predictor of decisions, such as quitting and marital break-up[4].

In common with other SWL papers, we take interpersonal comparability for granted. SWL reports may be subject to idiosyncratic noise, but the error is uncorrelated with our regressors. It may happen that some person with an SWL report of 8 is actually more satisfied than another person reporting 9, but there is no systematic tendency for people in high inequality countries to report their SWL differently than people in low inequality countries. Most of the analysis assumes linearity: equal differences in reported SWL correspond to equal differences in actual SWL. Relaxing linearity requires strong distributional assumptions that are best avoided, and has generally been found to make only a small difference to parameter estimates.[5] Nevertheless, it does have value as a robustness check (Section 3.3).

## 2.2 Inequality

We use the Gini coefficient of income as our measure of income inequality, and the standard deviation of SWL as our measure of SWL inequality. The Gini is the standard measure for income inequality, and is invariant to the units used to measure income. This is an important property, since it is difficult to ensure that income is measured in comparable units across clusters; using a unit-invariant measure of inequality sidesteps this concern. Because we use SWL as the dependent variable, we are already committed to the assumption that it can be compared across clusters, so there can be no gain from using a unit invariant measure of SWL inequality. What *is* important is to avoid a mechanical correlation between mean SWL in a cluster and our measure

[4]See Clark et al. (2008).

[5]See Clark et al. (2008) and Layard et al. (2008).

of SWL inequality in that cluster. The Gini fails in this respect, as does the coefficient of variation. Consider two clusters in which the distribution of SWL is the same, except for an additive shift, so that the mean is higher in one cluster than in the other. Both the Gini and the coefficient of variation would be lower in the cluster with the higher mean—precisely the situation we seek to avoid. This is not the case with the standard deviation, which is invariant to additive shifts.

## 2.3 SWL surveys

We use data from four surveys: the World Values Survey (WVS), the European Social Survey (ESS), the Gallup World Poll (GWP), and the Gallup-Healthways Well-Being Index (GHWBI). Table 1 summarizes key statistics about these surveys. The sections below provide more details.

### European Social Survey

The European Social Survey[6] includes 36 European countries and Israel. We use waves 1-7 with data from 2006 to 2015 with a total of 303,385 individual SWL observations. The SWL variable is life satisfaction (`stflife`), which is recorded on a 0–10 scale, with end points labeled *Extremely dissatisfied* and *Extremely satisfied*. Clusters are defined by the combination of country (`cntry`) and wave (`essround`). The interview year (`inwyye`, `inwyr`, `inwyys`, and `supqyr`) is used for matching with macro variables. Personal controls include gender (`gndr`), age (`age` and `agea`), education (`edulvla` and `eisced` values recoded into the `edulvla` range), marital status (`marital`, `marsts`, `maritala`, and `maritalb`), and unemployment (`unemp3m` and `unempla`). We use post-stratification weights (`pspwght`) for weighting, except in wave 7 when only design weights (`dweight`) are available. We use the variable `gincdif` as measuring a preference for equality. Subjects were asked to record their agreement or disagreement to the following statement: *"The government should take measures to reduce differences in income levels"*. Answers were originally on a 5 level scale ranging from *Agree strongly* to *Disagree strongly*, which we invert to a $-2$ to $+2$ range, with $+2$ denoting strong agreement. The trust variable `ppltrst` is a 0–10 variable with endpoints labeled *You can't be too careful* and *Most people can be trusted*.

[6] http://www.europeansocialsurvey.org

Table 1: The SWL surveys used in the paper.

| | ESS[a] | WVS[a] | GWP[a] | GHWBI[a] |
|---|---|---|---|---|
| Year range | 2002–2015 | 1989-2014 | 2006–2014 | 2008–2011 |
| Geographic Units | countries | countries | countries | states |
| No. geog. units | 36 | 93 | 164 | 50 |
| No. clusters | 166 | 222 | 1,120 | 200 |
| Individual obs. | 303,853 | 314,903 | 1,341,049 | 1,404,982 |
| SWL variable | Satisfaction with life | Satisfaction with life | Cantril Ladder | Cantril Ladder |
| SWL range | 0–10 | 1–10 | 0–10 | 0–10 |
| Mean SWL[b] | 4.22–8.58<br>$6.85 \pm 0.96$ | 3.94–8.49<br>$6.58 \pm 1.05$ | 2.69–8.02<br>$5.45 \pm 1.11$ | 6.28–7.48<br>$6.81 \pm 0.19$ |
| SWL inequality[b] | 1.39–3.08<br>$2.10 \pm 0.36$ | 1.33–3.00<br>$2.19 \pm 0.33$ | 0.86–3.22<br>$1.94 \pm 0.32$ | 1.68–2.39<br>$2.03 \pm 0.10$ |
| Income inequality[b] | 0.24–0.43<br>$0.32 \pm 0.04$ | 0.17–0.65<br>$0.39 \pm 0.10$ | 0.17–0.65<br>$0.38 \pm 0.08$ | 0.40–0.50<br>$0.46 \pm 0.02$ |
| Log GDP[b] | 8.89–11.40<br>$10.35 \pm 0.45$ | 6.75–11.75<br>$9.36 \pm 0.97$ | 6.42–11.81<br>$9.27 \pm 1.17$ | 10.24–11.06<br>$10.60 \pm 0.16$ |
| Social trust[c] | Yes | Yes | Partial | |
| View of inequality[c] | Yes | Yes | | |
| Emotions yesterday[c] | | | Yes | |

[a] Section 2.3 explains these acronyms.

[b] The columns report for each of the surveys the overall range, mean, and standard deviation of the variable in that row. The row variables correspond to $\mu_i$, $\sigma_i$, $g_i$, and $Y_i$ in the regression equations.

[c] Columns report whether the survey has the information in the row.

### World Values Survey

The World Values Survey includes data from 98 countries. We use waves 1-6 with data from 1981 to 2014 with a total of 314,903 individual SWL observations.[7] The SWL variable we use is life satisfaction (`A170`) reported on a 1–10 scale with endpoints labeled *Dissatisfied* and *Satisfied*. Clusters are defined by the combination of country (`S003`) and wave (`S002`). The interview year (`S020`) is used for matching with macro variables. Personal controls include gender (`X001`), age (`X003`), education (`X025`) and marital status (`X007`). Weights are given by `S017`. The variable `E035` codes a preference for equality. Subjects were asked to report their view on a 1 to 10 scale with 1 labeled "Incomes should be made more equal" and 10 labeled "We need larger income differences as incentives for individual effort". We inverted this scale, so that higher values denote a preference for equality. Finally, the trust variable `A165` is a binary question, asking people whether "Most people can be trusted" or "you can't be too careful". We recode it so that a positive value denotes agreement with "Most people can be trusted".

### Gallup World Poll

The Gallup World Poll[8] includes data from over 160 countries. We used the December 2014 version of the dataset, which includes data for every year from 2008 to 2014, and about 1.34 million individual observations. The SWL variable is the Cantril Ladder of Life (`WP16`) recorded on a 0–10 scale with end points labeled "Worst possible life for you" and "Best possible life for you". Clusters are defined by the combination of country code (`ccode`) and the interview year (`YEAR_CALENDAR`). Personal controls include gender (`WP1219`), age (`WP1220`), and marital status (`WP1223`). We use `wgt` for weighting observations. As in the World Values Survey, the trust variable `WP9039` is binary, asking whether "most people can be trusted" or "you have to be careful in dealing with people". We recoded answers so that a positive value denotes agreement with "most people can be trusted". The emotions data we use includes the following variables: `WP60` (well-rested), `WP67` (enjoyment), `WP69` (worry), `WP70` (sadness), `WP71` (stress), `WP74` (anger), and `WP6878` (happiness). These are all binary questions, asking whether the respondent experienced that particular emotion in the previous 24 hours.

[7] http://www.worldvaluessurvey.org. We exclude data from Egypt in 2001 and from India in 2001 and 2006, as these particular surveys did not use the full SWL range.

[8] http://www.gallup.com/services/170945/world-poll.aspx

### Gallup-Healthways Well-Being Index

Gallup-Healthways Well-Being Index[9] includes data from the United States with enough observations for useful statistics at the state level. We use the May 2012 version of the dataset, which includes data for every year from 2008 to 2011 and a total of 1.4 million individual SWL observations. The subjective well-being variable is the Cantril Ladder of Life recorded on a 0–10 scale. Clusters are defined by the combination of state (`zipstate`) and the interview year (obtained from the interview date, `int_date`). Personal controls include gender (`sc7`), age (`age`), marital status (`wp1223`) and education (`d4`). We use `weight` for weighting observations.

## 2.4 Macro data

We use the World Bank's World Development Indicators[10] as our primary source for GDP per capita and income inequality data in different countries. GDP per capita is in constant prices adjusted for purchasing power parity. Income inequality is measured using the Gini coefficient. We interpolate data linearly using the closet data points when there are gaps (this is a particular problem with income inequality). We use the most recently available data when recent data is not yet available (this happens often with 2014 and 2015 data). At the opposite end, the World Bank data we use starts at 1990, and some World Values Survey observations are for earlier years. We use GDP data from version 8.1 of the Penn World Tables to fill in the missing years.[11] For missing Gini data we use the data from the closest year for which we have data. For the Gallup-Healthways Well-Being Index we need state level data in the United States. We use the U.S. Census Bureau's American Community Survey for Gini coefficients, and the Bureau of Economic Analysis for GDP.[12]

We use GDP per capita for our income measure since it is available in comparable form for all surveys. We have used household income data from the European Social Survey (ESS) and Gallup World Poll (GWP) for robustness checks against the possibility that use of aggregate income might bias upwards our estimate of the effects of SWL inequality on average SWL. In

[9] http://www.well-beingindex.com

[10] http://data.worldbank.org/data-catalog/world-development-indicators

[11] https://pwt.sas.upenn.edu. We use data from the earliest year in which we have GDP data from both sources (1990 for most countries) to normalize the Penn data that we use for years prior to 1990. This corrects for differences in the GDP, purchasing power, and population figures that the two datasets use, as well as for the across-the-board difference in the base year.

[12] https://www.census.gov/programs-surveys/acs and http://www.bea.gov.

the ESS sample our estimates of the effects of SWL inequality are actually higher using logs of household incomes, national means of the logs of household incomes, or logs of the national means of household incomes than they are using log GDP. The GWP results are more mixed, but for both surveys the sign and significance of the coefficients on SWL inequality as well as the results comparing SWL inequality and income inequality reported below are unchanged by using any of the alternative income measures.

# 3 Analysis

We base our analysis on the assumption that the effect of inequality on well-being is negative, and ask what measure of inequality best captures this effect. The specific hypotheses we wish to test are (1) that SWL inequality is a good proxy for the effect of inequality on well-being, and (2) that it is a *better* proxy than is income inequality. The testable predictions are (i) that SWL is negatively correlated with SWL inequality, and (ii) that this correlation is stronger (more negative) than the correlation between SWL and income inequality.

SWL inequality, income inequality, and log GDP per capita are measured in clusters, defined by the combination of geographic unit (country or state) and time (survey wave or year). In order to control for individual determinants of SWL, as well as cluster level factors, we estimate individual level regressions with standard errors corrected for clustering. Observations with ambiguous values (e.g. "no answer", "don't know") are treated as missing. The following sections describe the regression equations.

## 3.1 Subjective well-being

We first estimate a simple regression:

$$h_{ij} = \alpha + \beta_\sigma \sigma_i + \epsilon_{ij} \tag{1}$$

where $h_{ij}$ denotes the reported SWL of person $j$ in cluster $i$, and $\sigma_i$ denotes the standard deviation of SWL in this cluster. In the World Values Survey and Gallup World Poll we also add region dummies in order to control for between-region differences in SWL levels.[13]

[13]Regions include: (i) the West (Europe, North America, and Oceania), (ii) Latin America, (iii) Asia, (iv) Middle East and North Africa, and (v) Sub-Saharan Africa.

In order to test the extent to which SWL inequality merely reflects the impact of other factors, we add the logarithm of GDP per capita (in purchasing power parity terms), $Y_i$, and personal controls, $x_{ijk}$:

$$h_{ij} = \alpha + \beta_\sigma \sigma_i + \beta_Y Y_i + \sum_k \gamma_k x_{ijk} + \epsilon_{ij} \tag{2}$$

We also estimate a similar regression for income inequality, with the Gini coefficient of income, $g_i$, replacing $\sigma_i$. Both measures of inequality are then compared directly in a combined regression:

$$h_{ij} = \alpha + \beta_\sigma \sigma_i + \beta_g g_i + \beta_Y Y_i + \sum_k \gamma_k x_{ijk} + \epsilon_{ij} \tag{3}$$

Our primary hypothesis is that SWL is negatively correlated with SWL inequality: $\beta_\sigma < 0$ in Equations 1–3. Our secondary hypothesis is that the correlation with income inequality is weaker: $|\beta_g| < |\beta_\sigma|$ in Equation 3.

In two of the surveys we use: the World Values Survey and the European Social Survey, respondents are asked whether income differences should be reduced. If SWL inequality has a causal effect on SWL, we would expect the correlation between SWL and SWL inequality to be stronger for respondents who agree with this statement than for respondents who disagree with it. We estimate the following equation, where $e_{ij}$ denotes person's $i$ level of agreement that inequality should be reduced:

$$h_{ij} = \alpha + \beta_\sigma \sigma_i + \beta_g g_i + \beta_e e_{ij} + \beta_{e\sigma} e_{ij} \sigma_i + \beta_{eg} e_{ij} g_{i+} \beta_Y Y_i + \sum_k \gamma_k x_{ijk} + \epsilon_{ij} \tag{4}$$

We expect the negative correlation to increase in $e_{ij}$, leading to the hypothesis that $\beta_{e\sigma} < 0$. We further expect this relationship to be stronger for SWL inequality than for income inequality. Hence, our secondary hypothesis is that $|\beta_{eg}| < |\beta_{e\sigma}|$.

Finally, we estimate a model with geographic unit (country or state) dummies in order to test whether changes in SWL are correlated with changes in SWL inequality.

### 3.2 Well-being determinants

While our main interest is in the effect of SWL inequality on SWL, we also look at the relationship between SWL inequality and specific determinants of well-being that are affected by inequality. For a well-being determinant $w_{ij}$ we estimate the following two regressions:

$$w_{ij} = \alpha + \beta_\sigma \sigma_i + \beta_Y Y_i + \sum_k \gamma_k x_{ijk} + \epsilon_{ij} \tag{5}$$

and

$$w_{ij} = \alpha' + \beta_\mu \mu_i + \beta'_\sigma \sigma_i + \beta'_Y Y_i + \sum_k \gamma'_k x_{ijk} + \epsilon'_{ij} \tag{6}$$

where $\mu_i$ denotes the mean SWL level in cluster $i$. These regressions offer an additional test to our assumption that SWL inequality is a good proxy for inequality more generally, and a test for the possibility that the correlation between SWL and SWL inequality is merely a mechanical consequence of high SWL causing a compression of the distribution of reported SWL.

If SWL inequality captures the causal effect of inequality on well-being and its various determinants, we would expect the correlation coefficient $\beta_\sigma$ to be negative (its magnitude should depend on the degree to which $w_{ij}$ is affected by inequality). Since $\mu_i$ is positively correlated with $w_{ij}$, we would expect the correlation with SWL inequality to weaken (as should the correlation with other regressors, such as $Y_i$). However, since the correlation between $w_{ij}$ and $\mu_i$ is only moderate, $\beta'_\sigma$ should still be negative. These predictions can be summarized as follows:

$$\beta_\sigma \leq \beta'_\sigma < 0. \tag{7}$$

If, instead, the correlation between SWL and SWL inequality is due to reverse causality (Figure 1b), any correlation between $w_{ij}$ and $\sigma_i$ should be mediated entirely by $\mu_i$. Since $\mu_i$ is only moderately correlated with $w_{ij}$, $\beta_\sigma$ should be small in magnitude, and the correlation should disappear when $\mu_i$ is added to the regression:

$$\beta_\sigma < \beta'_\sigma \approx 0. \tag{8}$$

#### 3.2.1 Social trust

The first well-being determinant we focus on is social trust. Survey questions on social trust have been validated by correlating answers on with cross-country differences in the frequency with which experimentally dropped wallets were returned (Knack & Keefer, 1997). Responses are available as a 0–10 numeric variable in the European Social Survey (ESS), and as a binary variable in the World Values Survey (WVS) and Gallup World Poll (GWP). There is no trust question in the Gallup-Healthways Well-Being Index. In ESS we estimate linear regressions using OLS. In WVS and GWP we estimate a logit regression.

#### 3.2.2 Worry, stress, and fear

The other well-being determinants we use are yes/no questions on worry and stress in the previous day, and a question on whether the respondent

fears walking alone. These questions are only available in the Gallup World Poll. As these are yes/no questions we use logit regressions. Since they are negatively related to well-being, they are predicted to increase in SWL inequality. The hypotheses in Equations 7 and 8 are therefore reversed, and $\beta_\sigma$ and $\beta'_\sigma$ are predicted to be positive.

### 3.3 Modeling the SWL reporting function

True SWL lies on a continuous range, but SWL reports are restricted to integers in a bounded range, such as 0–10. As we note in the introduction and in Figure 1, the truncation and quantization could, in principle, create a spurious correlation between SWL and SWL inequality that has nothing to do with the causal relationship we are interested in. Regressions of SWL determinants with mean SWL as a regressor (Section 3.2) provide one test of this possibility. Another test is to re-estimate the regressions of Section 3.1 while allowing for the non-linear reporting function. Unfortunately, since different values of true SWL can be mapped into the same value of reported SWL, it is necessary to make restrictive identifying assumptions on the distribution of true SWL.

We use maximum likelihood to estimate a model where the distribution of SWL in each cluster is logistic. The likelihood is estimated on the assumption that SWL values are reported as the closest integer in the reporting range. After estimating the mean $\mu_i^*$ and standard deviation $\sigma_i^*$ in each cluster $i$, we estimate an analogue of Equation 2,

$$\bar{h}_{ij}^* = \alpha^* + \beta_\sigma^* \sigma_i^* + \beta_Y^* Y_i + \sum_k \gamma_k^* x_{ijk} + \epsilon_{ij}^*, \tag{9}$$

where $\bar{h}_{ij}^*$ is the expected value in the distribution of SWL values that are consistent with the SWL report $h_{ij}$.

The coefficient $\beta_\sigma^*$ in Equation 9 can then be compared with the corresponding coefficient $\beta_\sigma$ in Equation 2. If $\beta_\sigma$ is only negative because of the non-linearity in the reporting function, we would expect $\beta_\sigma^*$ to be zero. If, however, $\beta_\sigma$ is negative because of a causal link between SWL and SWL inequality, we would expect $\beta_\sigma^*$ to also be negative.

# 4 Results

## 4.1 Subjective well-being

The results of the regressions relating SWL and SWL inequality are qualitatively similar in all four surveys: SWL inequality is strongly negatively correlated with SWL, and remains so when income inequality and various controls are added; the corresponding correlation with income inequality is consistently weaker; the interaction of concern with inequality and SWL inequality is negative. These results are consistent with the purported causal link. The following sections describe the results for each survey in turn.

### European Social Survey

The results for the European Social Survey are in Table 2. The raw correlation between SWL and SWL inequality is strongly negative, with a standardized beta coefficient of $\hat{\beta}_\sigma = -0.35$ (Column 1). SWL inequality and log GDP are highly (negatively) correlated in this survey. Consequently, the coefficient on SWL inequality is substantially weakened to $\hat{\beta}_\sigma = -0.21$ when log GDP and personal controls are added to the regression (Column 2), but it remains strongly statistically significant ($p \ll 0.001$). The corresponding correlation with the Gini coefficient of income (Column 3) is also statistically significant ($p < 0.001$), but the standardized beta coefficient is only a third in size: $\hat{\beta}_g = -0.07$ as compared with $\hat{\beta}_\sigma = -0.21$. When both measures of inequality are included in the same regression (Column 4), the Gini coefficient drops to insignificance, whereas the coefficient on SWL inequality is hardly changed: $\hat{\beta}_\sigma = -0.20$. Column 5 adds the subjective importance of reducing inequality and its interaction with SWL and income inequality. As expected, the interaction term with SWL inequality is negative: $\hat{\beta}_{e\sigma} = -0.22$ ($p < 0.001$), but the interaction term with income inequality is insignificant and of the wrong sign. The interaction term with SWL inequality remains negative even when country dummies are included (Column 6). In summary, the correlation between SWL and SWL inequality is consistently negative in both the cross-section and across time, is *more* negative than the correlation between SWL and income inequality, and is stronger among those who describe themselves as particularly averse to inequality.

### World Values Survey

The results for the World Value Survey (Table 3) are not as strong, but are otherwise similar to the European Social Survey results. The raw correlation

Table 2: SWL and inequality regressions in the European Social Survey[a]

| | Dependent variable: life satisfaction (0–10) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| SWL inequality[b] | $-0.35^{***}$ | $-0.21^{***}$ | | $-0.20^{***}$ | $-0.16^{***}$ | $-0.11^{***}$ |
| | $(-16.85)$ | $(-9.82)$ | | $(-8.77)$ | $(-8.00)$ | $(-4.35)$ |
| Income inequality[b] | | | $-0.07^{**}$ | $-0.02$ | $-0.02$ | $-0.04^{*}$ |
| | | | $(-3.33)$ | $(-0.85)$ | $(-1.17)$ | $(-2.13)$ |
| GDP per capita in log terms[b] | | $0.18^{***}$ | $0.33^{***}$ | $0.19^{***}$ | $0.17^{***}$ | $0.30^{***}$ |
| | | (9.30) | (19.21) | (9.27) | (8.42) | (4.63) |
| Thinks inequality is too high[c] | | | | | 0.08 | $0.09^{**}$ |
| | | | | | (1.29) | (2.75) |
| × SWL inequality | | | | | $-0.22^{***}$ | $-0.23^{***}$ |
| | | | | | $(-4.73)$ | $(-9.19)$ |
| × income inequality | | | | | 0.05 | 0.06 |
| | | | | | (0.93) | (1.39) |
| Personal controls[d] | | Yes | Yes | Yes | Yes | Yes |
| Country dummies | | | | | | Yes |
| No. of observations | 303853 | 303853 | 301960 | 301960 | 301960 | 301960 |

[a] Standardized beta coefficients; $t$ statistics corrected for clustering in parentheses. Statistical significance indicators: $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$. Clusters defined by country/wave combination.

[b] Cluster level variables: $\sigma_i$, $g_i$, and $Y_i$ in the text.

[c] 1-5 variable indicating individual preference for equality: $e_{ij}$ in the text.

[d] Gender, age, age squared, education (dummies), and marital status (dummies).

with SWL inequality $\hat{\beta}_\sigma = -0.22$ (Column 1) is weakened to $\hat{\beta}_\sigma = -0.17$ when log GDP and personal controls are added (Column 2), but is strongly statistically significant ($p \ll 0.001$). The corresponding correlation with income inequality (Column 3) is also negative ($\hat{\beta}_g = -0.05$), but is not statistically significant ($p < 0.268$). When both forms of inequality are included in the same regression (Column 4), the coefficient on SWL inequality is virtually unchanged: $\hat{\beta}_\sigma = -0.17$ and the coefficient on income inequality remains insignificant. The interaction term with the importance of SWL inequality (Column 5) is negative: $\hat{\beta}_{e\sigma} = -0.17$ ($p < 0.001$), and this remains the case when country dummies are added (Column 6) with $\hat{\beta}_{e\sigma} = -0.13$ ($p < 0.001$).

**Gallup World Poll**

The correlations in the Gallup World Poll (Table 4) are mostly similar to those of the previous two surveys, though income inequality is more significant than in the other two surveys. The raw correlation of SWL with SWL inequality $\hat{\beta}_\sigma = -0.11$ (Column 1) becomes $\hat{\beta}_\sigma = -0.10$ when log GDP and personal controls are added (Column 2). The corresponding correlation with income inequality (Column 3) is also statistically significant, but weaker: $\hat{\beta}_g = -0.06$. When both inequality measures are included in the same regression (Column 4), $\hat{\beta}_g$ drops in magnitude to -0.04 ($p < 0.006$), while $\hat{\beta}_\sigma$ is unchanged: $\hat{\beta}_\sigma = -0.10$ ($p < 0.001$). When country dummies are added (Column 5) $\hat{\beta}_\sigma$ drops to $-0.05$ but remains strongly statistically significant ($p < 0.001$). Interestingly, the coefficient on income inequality becomes stronger: $\hat{\beta}_g = -0.09$.

**Gallup-Healthways Well-Being Index**

Results in the Gallup-Healthways Well-Being Index (Table 5) are also qualitatively similar. The raw correlation with SWL inequality of $\hat{\beta}_\sigma = -0.06$ (Column 1) drops in magnitude to $= -0.05$ when log GDP and personal controls are added (Column 2), but remains strongly statistically significant ($p \ll 0.001$). Income inequality is not statistically significant (Column 3). When both forms of inequality are included (Column 4) the coefficient on SWL inequality is unchanged: $\hat{\beta}_\sigma = -0.06$, while the coefficient on income inequality is statistically significant ($p < 0.005$) but with an unexpected positive sign ($\hat{\beta}_g = 0.02$). Adding state dummies (Column 5) causes a sharp reduction in the coefficient on SWL inequality: $\hat{\beta}_\sigma = -0.13$, but it remains strongly statistically significant.

Table 3: SWL and inequality regressions in the World Values Survey[a]

| | Dependent variable: life satisfaction (1–10) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| SWL | −0.22*** | −0.17*** | | −0.17*** | −0.18*** | −0.11** |
| inequality[b] | (−6.93) | (−5.87) | | (−6.01) | (−6.53) | (−2.85) |
| Income | | | −0.05 | −0.01 | −0.01 | −0.24** |
| inequality[b] | | | (−1.11) | (−0.18) | (−0.17) | (−2.99) |
| GDP per capita | | 0.18*** | 0.28*** | 0.21*** | 0.21*** | 0.23** |
| in log terms[b] | | (5.60) | (8.34) | (5.81) | (6.03) | (2.84) |
| Thinks inequality | | | | | 0.08 | 0.01 |
| is too high[c] | | | | | (1.51) | (0.27) |
| × SWL | | | | | −0.17*** | −0.13** |
| inequality | | | | | (−3.57) | (−3.04) |
| × income | | | | | 0.03 | 0.04 |
| inequality | | | | | (0.84) | (1.28) |
| Personal controls[d] | | Yes | Yes | Yes | Yes | Yes |
| Region dummies | Yes | Yes | Yes | Yes | Yes | |
| Country dummies | | | | | | Yes |
| No. of observations | 314903 | 271667 | 243875 | 243875 | 235587 | 235587 |

[a] Standardized beta coefficients; $t$ statistics corrected for clustering in parentheses. Statistical significance indicators: $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$. Clusters defined by country/wave combination.

[b] Cluster level variables: $\sigma_i$, $g_i$, and $Y_i$ in the text.

[c] 1-5 variable indicating individual preference for equality: $e_{ij}$ in the text.

[d] Gender, age, age squared, education (dummies), and marital status (dummies).

Table 4: SWL and inequality regressions in the Gallup World Poll[a]

| | Dependent variable: Cantril ladder of life (0–10) | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| SWL inequality[b] | $-0.11^{***}$ | $-0.10^{***}$ | | $-0.10^{***}$ | $-0.05^{***}$ |
| | $(-8.37)$ | $(-9.49)$ | | $(-8.81)$ | $(-4.15)$ |
| Income inequality[b] | | | $-0.06^{***}$ | $-0.04^{**}$ | $-0.09^{**}$ |
| | | | $(-3.72)$ | $(-2.76)$ | $(-3.03)$ |
| GDP per capita in log terms[b] | | $0.38^{***}$ | $0.39^{***}$ | $0.39^{***}$ | $0.45^{***}$ |
| | | (31.69) | (26.33) | (27.23) | (4.87) |
| Personal controls[c] | | Yes | Yes | Yes | Yes |
| Region dummies | Yes | Yes | Yes | Yes | |
| Country dummies | | | | | Yes |
| No. of observations | 1341049 | 1256817 | 1133621 | 1133621 | 1133621 |

[a] Standardized beta coefficients; $t$ statistics corrected for clustering in parentheses. Statistical significance indicators: $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$. Clusters defined by country/wave combination.

[b] Cluster level variables: $\sigma_i$, $g_i$, and $Y_i$ in the text.

[c] Gender, age, age squared, education (dummies), and marital status (dummies).

Table 5: SWL and inequality regressions in the Gallup-Healthways Well-Being Index[a]

| | Dependent variable: Cantril ladder of life (0–10) | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| SWL | $-0.06^{***}$ | $-0.05^{***}$ | | $-0.06^{***}$ | $-0.13^{***}$ |
| inequality[b] | $(-11.06)$ | $(-8.38)$ | | $(-9.46)$ | $(-29.22)$ |
| Income | | | 0.01 | $0.02^{**}$ | $-0.01$ |
| inequality[b] | | | (1.12) | (2.87) | $(-1.50)$ |
| GDP per capita | | $-0.00$ | $-0.00$ | $-0.00$ | $-0.02$ |
| in log terms[b] | | $(-0.31)$ | $(-0.36)$ | $(-0.29)$ | $(-1.21)$ |
| Personal controls[c] | | Yes | Yes | Yes | Yes |
| State dummies | | | | | Yes |
| No. of observations | 1404982 | 1363274 | 1363274 | 1363274 | 1363274 |

[a] Standardized beta coefficients; $t$ statistics corrected for clustering in parentheses. Statistical significance indicators: $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$. Clusters defined by state/wave combination.

[b] Cluster level variables: $\sigma_i$, $g_i$, and $Y_i$ in the text.

[c] Gender, age, age squared, education (dummies), and marital status (dummies).

Table 6: Social trust and SWL inequality regressions in the European Social Survey (ESS), the World Values Survey (WVS), and the Gallup World Poll (GWP).[a]

| | Dependent variable: social trust | | | | | |
|---|---|---|---|---|---|---|
| | ESS | | WVS | | GWP | |
| Mean SWL[b] | | 0.09** | | 0.01 | 0.15 | |
| | | (2.94) | | (0.10) | (1.43) | |
| SWL inequality[b] | −0.25*** | −0.21*** | −0.18** | −0.18** | −0.25*** | −0.22*** |
| | (−11.64) | (−7.73) | (−3.24) | (−2.62) | (−3.71) | (−3.29) |
| Income inequality[b] | −0.03 | −0.03 | −0.20* | −0.20* | −0.20* | −0.20* |
| | (−1.88) | (−1.97) | (−2.10) | (−2.09) | (−0.50) | (−0.32) |
| Log GDP per capita[b] | 0.07*** | 0.02 | 0.21*** | 0.21** | 0.29** | 0.18 |
| | (3.55) | (0.95) | (3.96) | (3.03) | (3.17) | (1.38) |
| Observations | 302317 | | 232580 | | 173006 | |

[a] Standardized beta coefficients; $t$ statistics corrected for clustering in parentheses. Statistical significance indicators: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Clusters defined by country/wave combination. All regressions include personal controls (gender, age, age squared, education dummies, and marital status dummies).

[b] Cluster level variables: $\mu_i$, $\sigma_i$, $g_i$, and $Y_i$ in the text.

### 4.2 Well-being determinants

The results for social trust are in Table 6. The six columns are in pairs corresponding to the three surveys that include social trust questions: the European Social Survey (ESS), the World Values Survey (WVS), and the Gallup World Poll (GWP). Consistent with our hypotheses, social trust is strongly negatively correlated with SWL inequality in all three surveys (Columns 1, 3, and 5). Income inequality, by contrast, is borderline statistically significant in the ESS and WVS, and completely insignificant in the GWP. When mean SWL in the cluster is added to the equation (Columns 2, 4, and 6) the coefficient on SWL inequality is only moderately changed, dropping from $-0.25$ to $-0.21$ in the ESS, from $-0.25$ to $-0.22$ in the GWP, and remaining virtually unchanged at $-0.18$ in the WVS. In all three cases the coefficient remains strongly significant ($p < 0.001$ in ESS and GWP, and $p < 0.01$ in WVS).

Table 7 reports the results for worry, stress, and fear walking alone. As

Table 7: Logit regressions relating worry, stress, and fear of walking alone to SWL inequality in the Gallup World Poll.[a]

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Worry | | Stress | | Fear | |
| Mean SWL[b] | | $-0.19^{***}$ | | 0.01 | | $-0.20^{***}$ |
| | | $(-7.06)$ | | (0.14) | | (6.00) |
| SWL inequality[b] | $0.16^{***}$ | $0.12^{***}$ | $0.19^{***}$ | $0.20^{***}$ | $0.12^{***}$ | $0.09^{***}$ |
| | $(-11.64)$ | $(-7.73)$ | $(-3.71)$ | $(-3.29)$ | $(-3.24)$ | $(-2.62)$ |
| Log GDP per capita[b] | $-0.04^{*}$ | $0.10^{***}$ | $0.22^{***}$ | $0.22^{***}$ | $-0.11^{**}$ | 0.03 |
| | $(-2.15)$ | (3.57) | (9.98) | (6.39) | (3.16) | $(-0.72)$ |
| Observations | 1189093 | | 1092930 | | 1102859 | |

[a] Standardized beta coefficients; $t$ statistics corrected for clustering in parentheses. Statistical significance indicators: $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$. Clusters defined by country/wave combination. All regressions also include regional dummies and personal controls (gender, age, age squared, education dummies, and marital status dummies).

[b] Cluster level variables: $\mu_i$, $\sigma_i$, and $Y_i$ in the text.

expected, SWL inequality is positively correlated with worry, stress, and fear of walking alone (Columns 1, 3 and 5). The size of this correlation in these different well-being variables bears no obvious relationship to the correlation between the well-being variable and mean SWL, and remains strongly statistically significant ($p < 0.001$) when mean SWL is added to the regressions (Columns 2, 4, and 6).

Taken together, these results support the causal interpretation of the correlations (Figure 1a) against the mechanical correlation interpretation (Figure 1b).

### 4.3 Modeling the SWL reporting function

Table 8 compares the results of the logistic distribution model of Section 3.3 with the corresponding linear model. The distribution of SWL is a little wider in the logistic model in all the surveys, both across and within clusters (the latter resulting in a higher level of SWL inequality). This result is consistent with some systematic distortion due to the truncation inherent in SWL reports. Consequently, it is not surprising that the regression coefficient on SWL inequality is smaller in size in the logistic model, though it remains

Table 8: Comparison of the logistic and linear models in the distribution of mean SWL in different clusters, SWL inequality in those clusters, and the coefficient in a regression of SWL on SWL inequality.

| | ESS[a] | WVS[a] | GWP[a] | GHWBI[a] |
|---|---|---|---|---|
| Linear model | | | | |
| Mean SWL[b] | $6.85 \pm 0.96$ | $6.58 \pm 1.05$ | $5.45 \pm 1.11$ | $6.81 \pm 0.19$ |
| SWL inequality[b] | $2.10 \pm 0.36$ | $2.19 \pm 0.33$ | $1.94 \pm 0.32$ | $2.03 \pm 0.10$ |
| Regression coefficient $(\hat{\beta}_\sigma)$[c] | -0.21*** (-9.82) | -0.17*** (-5.87) | -0.10*** (-9.49) | -0.05*** (-8.38) |
| Logistic model | | | | |
| Mean SWL[b] | $6.88 \pm 1.04$ | $6.71 \pm 1.19$ | $5.52 \pm 1.12$ | $6.99 \pm 0.18$ |
| SWL inequality[b] | $2.34 \pm 0.43$ | $2.49 \pm 0.53$ | $2.00 \pm 0.42$ | $2.09 \pm 0.11$ |
| Regression coefficient $(\hat{\beta}_\sigma)$[c] | -0.15*** (-5.25) | -0.10** (-3.01) | -0.08*** (-8.03) | -0.03*** (-5.36) |

[a] Section 2.3 explains these acronyms.
[b] The columns report for each of the surveys the mean and standard deviation of the variable in that row. The row variables correspond to $\mu_i$ and $\sigma_i$ in the regression equations.
[c] Standardized beta coefficients; $t$ statistics corrected for clustering in parentheses. Statistical significance indicators: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

strongly statistically significant in all surveys. The greatest decrease is in World Values Survey, with the regression coefficient decreasing in size from $\hat{\beta}_\sigma = -0.17$ to $\hat{\beta}^*_\sigma = -0.10$.

These results suggest that up to a third of the correlation between SWL and SWL inequality may be an artifact of the reporting function. This estimate should be seen as an upper bound. The model assumes that the distribution of true SWL is symmetric. Therefore, the left skew in the distribution of reported SWL in high SWL countries is interpreted as evidence for a truncated right tail. It is also possible, however, that the true distribution is left skewed, in which case there may be no distortion in mean SWL, and no mechanical component to the observed correlation between SWL and SWL inequality.

# 5 Discussion

If subjective well-being provides a more comprehensive measure of the quality of life than does income, it should be expected that whatever negative linkages there may be between income inequality and life evaluations should be even stronger for well-being inequality. In this paper we have provided three sorts of evidence that supports the conjecture that well-being inequality adds to the information provided by income inequality in important ways. Indeed, in each of the types of test, where income inequality and well-being inequality are compared, the evidence favors the latter.

Our first sort of evidence involves direct tests of income inequality and well-being inequality as predictors of subjective life evaluations drawn from several different surveys. In each case, we also repeat the tests controlling for a number of other possibly confounding variables. We also consider the likely risks that well-being inequality in the regions or countries with higher level of well-being may be estimated with a downward bias because of truncation or compression effects affecting the top answer categories. Our various attempts to measure and allow for this possible bias reduce but do not eliminate the negative linkage between well-being inequality and the level of subjective well-being. In cross-national comparisons using three different international surveys (the European Social Survey, the World Values Survey, and the Gallup World Poll), and in cross-state analysis using the Gallup-Healthways Well-Being Index, we find a consistently negative relation between well-being inequality and the average reported level of well-being. In all cases the negative relation is stronger than that for income inequality.

Since the first sort of evidence is drawn from repeated cross-sectional surveys there is no obvious way to sort out the direction of causality between inequality and well-being. Our other two types of evidence attempt to dig deeper into the possible causal structure by testing other relationships that would be expected to hold if, and possibly only if, there is a causal linkage running from inequality to well-being. In both cases we once again compare income inequality and well-being equality to see which is the preferred measure.

If people do not enjoy life as much where there is more inequality, then we would also expect to find that the strength of the negative linkage would be stronger for those who describe themselves as wishing to reduce inequality. We are able to test this in the European Social Survey (ESS) and in the World Values Survey (WVS). As shown in the last two columns of of Table 2 for the ESS and Table 3 for the WVS, the effects of well-being inequality are twice as high for those respondents who favor equality, and this remains

the case where country fixed effects are included, as in the final column of these tables. These results show the consequences of within-country changes of well-being inequality to be three times greater for those prefer equality. These results, which support causal reasoning for the link between inequality and well-being once again apply for well-being inequality but not for income inequality.

Our final tests dig deeper into an area where income inequality has been argued to have a causal link to well-being. Social trust has been argued to provide causal support for well-being, both directly and also indirectly, through its effects on the levels and rates of growth of income. Since this is an area where both theory and empirical evidence have supported a role for inequality, it provides another useful way of assessing the usefulness of well-being inequality as an alternative to income inequality as a predictor of social trust. Our results from all three international surveys show that the data support well-being inequality over income inequality as a predictor of lower social trust. This is to us especially compelling evidence, as the use of social trust as a dependent variable frees the analysis of any risk of being possibly due to a mechanical negative link between well-being inequality and its level. Similar results are obtained for other determinants of well-being, such as worry, stress, and fear of crime. These results hold even when mean well-being is included in the regression—consistent with well-being inequality affecting the determinants well-being, and inconsistent with reverse causality.

Thus all three types of test provide, in our view, independent but mutually supporting evidence that the inequality of subjective well-being has strong claims to be considered superior to income inequality as a single summary measure of inequality. At the very least, our results should encourage others to pay more attention to inequalities beyond that of income—whether they be of opportunities, education, health, justice, or access to supportive social networks.

## References


Becker, G. S. (1974). A theory of social interactions. *Journal of Political Economy*, *82*(61).

Bjørnskov, C. (2007). Determinants of generalized trust: a cross-country comparison. *Public choice*, *130*(1-2), 1–21.

Bolle, F., Okhrin, Y., & Vogel, C. (2009). A note on interdependent happiness. *Journal of Socio-Economics*, *38*(5), 713–721.

Case, A. & Deaton, A. (2015). Rising morbidity and mortality in midlife among white non-hispanic americans in the 21st century. *Proceedings of the National Academy of Sciences*, *112*(49), 15078–15083.

Clark, A., Frijters, P., & Shields, M. (2008). Relative Income, Happiness and Utility: An Explanation for the Easterlin Paradox and Other Puzzles. *Journal of Economic Literature*, *46*(1), 95–144.

Clark, A., Flèche, S., & Senik, C. (2015). The great happiness moderation. In A. Clark & C. Senik (Eds.), *Happiness and economic growth — lessons from developing countries* (Chap. 2, pp. 32–139). Oxford University Press.

Deaton, A. (2010). Price indexes, inequality, and the measurement of world poverty. *American Economic Review*, *100*(1), 5–34.

Di Tella, R. & MacCulloch, R. (2006). Some uses of happiness data in economics. *Journal of Economic Perspectives*, 25–46.

Dutta, I. & Foster, J. (2013). Inequality of Happiness in the US: 1972–2010. *Review of Income and Wealth*.

Easterlin, R. (1974). Does economic growth improve the human lot? some empirical evidence. In P. A. David & M. W. Reder (Eds.), *Nations and households in economic growth: essays in honor of moses abramowitz* (pp. 89–125). New-York: Academic Press.

Fehr, E. & Schmidt, K. M. (1999). A theory of fairness, competition, and cooperation. *Quarterly journal of Economics*, 817–868.

Frey, B., Luechinger, S., & Stutzer, A. (2007). Calculating tragedy: Assessing the costs of terrorism. *Journal of Economic Surveys*, *21*(1), 1–24.

Harsanyi, J. (1955). Cardinal welfare, individualistic ethics, and the interpersonal comparison of utility. *Journal of Political Economy*, *63*, 309–321.

Helliwell, J. F. & Putnam, R. D. (2004). The social context of well-being. *Philosophical Transactions: Biological Sciences*, *359*(1449), 1435–1446.

Helliwell, J. F. & Wang, S. (2011). Trust and wellbeing. *International Journal of Wellbeing*, *1*(1), 42–78.

Jordá, V., López-Noval, B., & Sarabia, J. M. (2015). *Distributional dynamics of life satisfaction in europe*.

Knack, S. & Keefer, P. (1997). Does social capital have an economic payoff? a cross-country investigation. *Quarterly Journal of Economics*, 1251–1288.

Layard, R., Mayraz, G., & Nickell, S. (2008). The marginal utility of income. *Journal of Public Economics*, *92*(8-9), 1846–1857.

Luttmer, E. F. (2005). Neighbours as negatives: relative earnings and well-being. *Quarterly Journal of Economics*, *120*(3), 963–1002.

Neal, D. & Rick, A. (2014). *The prison boom and the lack of black progress after smith and welch*. National Bureau of Economic Research.

Ott, J. (2005). Level and inequality of happiness in nations: Does greater happiness of a greater number imply greater inequality in happiness? *Journal of Happiness Studies*.

Piketty, T. (2014). *Capital in the twenty-first century*. Harvard University Press.

Rothstein, B. & Uslaner, E. M. (2005). All for all: equality, corruption, and social trust. *World Politics*, *58*(01), 41–72.

Stevenson, B. & Wolfers, J. (2008). Economic Growth and Subjective Well-Being: Reassessing the Easterlin Paradox. *Brookings Papers on Economic Activity*.

Van Praag, B. & Baarsma, B. (2005). Using Happiness Surveys to Value Intangibles: The Case of Airport Noise. *Economic Journal*, *115*(500), 224–246.

Wang, W. & Parker, K. (2014). Record share of americans have never married as values, economics and gender patterns change. *Pew Research Center*.

Wike, R., Simmons, K., & Oates, R. (2014). Emerging and developing economies much more optimistic than rich countries about the future. *Pew Research Center*.