Quantity or quantile? A global study of income, status, and happiness

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Abstract

When respondents provide their own subjective evaluation of life quality, or satisfaction, on a zero-to-ten scale, the global country-weighted average is almost precisely 5.0. Is this perfectly-middling value a coincidence? In this study I assess competing theories of cardinal and ordinal income position for explaining life satisfaction around the world, both within and across countries. Life satisfaction is now well-established as a proxy for well-being that is complementary to revealed preference methods. Much has been learned with this happiness metric, in diverse fields of economics spanning both microeconomic and macroeconomic approaches, since Easterlin brought it to economists' attention by asking whether economic growth was leading to increased well-being (1974). Nevertheless, the answer to this momentous question is still after forty years in need of further evidence. Theoretically, two formulations of utility functions incorporating others' contemporary consumption have been treated. In one, a peer group provides a reference consumption level used in evaluating one's own consumption. This structure has been estimated extensively in the empirical literature. However, in another formulation, utility is sensitive only to own rank, via the cumulative distribution function, rather than to cardinal differences. Theoretical insights into such economies are arguably more developed than those based on cardinal comparisons. However, empirical treatments, especially in multi-country studies, are absent. Using Gallup World Poll data, I show that worldwide, a pure-rank model is as successful as one based on a classical utility function, and that within countries, especially richer ones, rank is preferred to cardinal income in explaining life satisfaction.

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1 Introduction

What would the global distribution of subjective well-being (SWB) have looked like 100 years ago? Increasing attention is being paid by economists, national statistical agencies, and government policy makers at all levels to the merit of complementing existing, implicit welfare measures with direct, subjective assessments of life quality or experienced affective (emotional) states.[1] One unparalleled tool in this regard is the >150–country survey, run annually by Gallup corporation since 2006, that includes questions on subjective well-being. This survey facilitates a truly global-scale assessment of the relationship between various life conditions, including material income, and the actual experienced well-being of respondents. Consider the answer to the "Cantril ladder" question[2], which solicits a cognitive evaluation of life on a scale from zero to ten. It turns out that the mean reponse is almost exactly the midpoint of the scale. For years 2006 to 2012, the Gallup World Poll globally-weighted mean response to the this question ranges from 5.19±.02 to 5.41±.02 out of 10, with no significant trend ($N = 827303$).[3]

Life evaluation questions are timeless, so is it a coincidence that in the early 21st Century, the average response to a life evaluation question is middling? It is not for lack of variation, since country means range from 3.0 to nearly 8. A natural hypothesis is that people's satisfaction with their lives is influenced by an evolving standard that rises in pace with *global* consumption levels. This question is fundamental to one or both of (a) the ubiquitous consumption growth-oriented approach in economic policy, and (b) the growing study of subjective well-being (SWB) in economics, which often treats SWB as a proxy measure of welfare. Prominent economists of every generation[4] have considered it likely or self-evident that both human

[1] For example, see U.K. Prime Minister Cameron's initiative in the U.K (Cameron, 2010; UK Office of National Statistics, 2011); Stiglitz, Sen, and Fitoussi's report commissioned by President Sarkozy of France (2009); the OECD's "Better Life" initiative (OECD, 2011, and http://www.oecd.org/progress); the U.N.'s 2012 World Happiness Report (U.N. 2012); and U.S. Federal Reserve chair Bernanke's speech on well-being (Bernanke, 2010),

[2] See Section 2.1 on page 7 for detailed wording.

[3] The minimum is in 2009 during the Global Financial Crisis. The World Poll takes nearly equally sized samples of households from each country. Giving instead equal weight to each nation (i.e., rather than weighting by population), the annual means range from 5.36±.01 to 5.48±.01. The standard deviation in a typical year is ∼2.2.

[4] For instance, for explicit examples in early modern economics, see Smith (1806, p.238), Smith (1774, pp.83–84), Rae (1834), and Marx (1933, p.33), Mill (1907), Pigou (1920). Such obvious observations may have become relatively obscure within academic economics on account of being intentionally omitted in elementary textbooks by Marshall and then Samuelson, whose influence dominated in the first and second halves of the 20th century.

behavior and human welfare are deeply driven by social considerations, including status comparisons, emulation, and so on, rather than something which is most sensibly modeled as an absolute, cardinally-calibrated, and constant utility function. However, if such effects are significant, they are likely to have enormous implications for the welfare associated with consumption growth in economic development, macroeconomic policy generally, and in the context of environment–growth tradeoffs.

One body of research estimates the contribution of relative consumption effects at the local level (e.g., Luttmer, 2005; Dynan and Ravina, 2007; Barrington-Leigh and Helliwell, 2008); however, a fundamental problem faces any effort to measure the role of *international* standards in setting expectations. When reference levels are set on a sufficiently broad geographical scale, there is no source of variation by which to estimate their effect.

The aim of this paper is to demonstrate two features of the relationship between spending power and "happiness" around the world. The first is that relative consumption effects appear to be strong. This finding has already been made for individual countries and regions in numerous studies which seek evidence of explicit cardinal income comparison levels. In the present case, the evidence is simpler, conceptually. Rather than looking for a relevant reference level, I simply allow the cumulative distribution function to enter into a model of well-being, and find that it captures much of the variation in SWB, even when allowing for conventional level effects.

The second feature, using the same evidence, is that these relative consumption effects may be best described as fundamentally social evaluations rather than cardinal comparisons. That is, not only is relative position important for SWB (arguably, well established), but it may be the position itself, rather than quantitative differences or scales, which matter to self-evaluations of experienced well-being.

Many researchers have emphasized the importance of using a logarithmic transformation of income before relating it to life evaluations; in fact, such a functional form is now canonical. For instance, Kahneman and Deaton (2010) write, "In accordance with Weber's Law, average national life evaluation is linear when appropriately plotted against log GDP." Layard, Clark, and Senik (2012) state "It is well described by a logarithmic form where the absolute level of life satisfaction varies linearly with the logarithm of income."

However, while a logarithm of income is ubiquitous in econometric models explaining subjective well-being, and was presaged by decades of theoretical utility functions, I show that in any of a range of multi-level specifica-

tions, a simple rank-oriented description matches or outperforms one based on the logarithm of the absolute level of consumption.

Consumption externalities

Consumption externalities are differentiated from production externalities by the existence of intrinsic interest in the fact of others consumption, as opposed to its material effects through prices, byproducts, instrumental effects, and so on (Barrington-Leigh, 2013). Such intrinsic effects on utility are natural if human behavior has a deep status-seeking component or if our expectations, aspirations, or standards are set in part by what we see as normal or achievable.

In non-solipsist models, two broad classes of specification have been examined in the theoretical literature on consumption externalities. In some, a particular consumption reference level enters the utility function as a comparison standard. In others, the individual is only concerned with her position in the cumulative distribution, without further dependence on the cardinal difference between own and others' incomes.

Both literatures emphasize the overall decline in well-being that can accompany increases in wealth or technological productivity, as everyone allocates more time to production and less to leisure or to other consumption goods with cardinal and mutual benefits (e.g., Eaton and Eswaran, 2009; Hopkins and Kornienko, 2010, and references therein).

In contrast to the theoretical literature, more empirical work has been done to test the cardinal comparison model. Clark, Frijters, and Shields (2008) review the large and rapidly growing body of studies using longitudinal and cross-sectional subjective well-being data which assess, primarily within individual countries, the strength of relative income effects. Typically, findings are consistent with the hypothesis that negative consumption externalities (where consumption is usually proxied by income) at the local or regional level within a country, possibly combined with adaptation effects over time, are sufficient to fully negate the individual benefits of income increases. Lab experiments using fMRI to assess the effect of relative material rewards on neural reward centers support such survey findings and have also focused on cardinal comparisons (e.g., Fliessbach et al., 2007).

Some studies have used income or wage rank to explain income satisfaction (Brown et al., 2008); however, so far no one has compared the empirical strength of cardinal comparison and ordinal ranking specifications. Moreover, it is difficult to investigate the geographic scale of consumption reference effects beyond the sub-national level due to the limited number of

countries.

In this work I show that a simpler way to characterise the relative income relationship between household income and SWB within countries and even globally emerges when ordinal status effects are tested against the more canonical cardinal effects. The empirical evidence from over 140 countries provides no reason to embrace an individualistic (solipsist) model or even a reference-framed, cardinal consumption benefit model for explaining welfare, over a purely ordinal one.

2 Data

I use individual and household data from the first seven waves of Gallup's World Poll, an annual cross-sectional survey sampling $\geq$1000 respondents aged 15 and over in each of more than 140 countries, each year since 2006.[5] In addition, country data come from the World Bank's World Development Indicators. I describe subjective well-being and income data, separately, below.

2.1 Measures of subjective well-being

SWB reports encompass a variety of self-assessed measures in which respondents or participants must project their internal state or cognitive evaluation onto a quantitative scale. For the purposes of this study, it is useful to consider three kinds of SWB. The first is the cognitive evaluation of life (CLE), in which the quality of overall life experience is assessed, using whatever criteria and evidence seem salient to the respondent. Two kinds of CLE are collected in the GWP. In all countries and waves, the World Poll has asked respondents to evaluate their life in all-encompassing terms, using a measure known as the Cantril self-anchoring striving scale, or "Cantril's ladder" (Cantril, 1965). In English, this question is:

> "Please imagine a ladder with steps numbered zero at the bottom to ten at the top. Suppose we say that the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible. If the top step is 10 and the bottom step is 0, on which step of the ladder do you feel you personally stand at the present time?"

[5] Details of the methodology are available from Gallup Organization (2012).

In addition, for a smaller set of countries and waves, the survey has included a second life evaluation question referred to as *satisfaction with life*, posed to the same respondents:

> All things considered, how satisfied are you with your life as a whole these days? Use a 0 to 10 scale, where 0 is dissatisfied and 10 is satisfied.

While the distributions of responses to these two questions exhibit some qualitative differences, earlier work by Helliwell et al. (2010) found that in reduced form estimates they quite similarly capture the influence of various observable aspects of life, and that averaging them together tends to reduce confidence intervals without changing estimated coefficients. Accordingly, as a cognitive evaluation of life, I take their average when both are available. Gallup also provides its own "index of life evaluation," which takes into account the Cantril Ladder answer and a related question about future expectations.

A second class of SWB measures available in the GWP focuses more on the incidence of affective (emotional) states during the day prior to the interview. I classify these into positive and negative affect and define an index giving the balance (difference) between mean positive and negative affect responses. These questions include dichotomous reports of the incidence of smiling/laughing, enjoyment, worry, sadness, depression, and anger.

A third subjective measure complements these unframed (overall) cognitive and affective SWB questions. The Gallup World Poll asks for a dichotomous ("Yes" / "No") response to the question, "Are you satisfied or dissatisfied with your standard of living, all the things you can buy and do?" Lastly, another question asks about the adequacy of respondents' incomes, rather than their satisfaction with them. These questions specifically address the way respondents perceive their standards of living and are thus particularly salient to the present study's focus on material living standards.

These various SWB questions are summarized in Table 1. The cognitive life evaluation questions are appealing because they provide eleven points of resolution and in principle encompass everything that a measure of general welfare ought to. A dichotomous satisfaction question, on the other hand, is valuable because it avoids (or reduces) the interpretation difficulties of the 11-point response scale, which cannot be assumed, *a priori*, to represent well-being in a cardinal way. Lastly, the affect questions may relate most closely to some researchers' concept of a hedometer (Kahneman, Wakker,

and Sarin, 1997; Kahneman and Krueger, 2006) and are not likely to suffer from the possible problems of constrained aspirations that a more cognitive measure might. The estimates to follow use all three, and I consider the mean CLE, affect balance, and standard of living questions to be the core measures in this study.

2.2 Measures of income

The household incomes used in this work are self-reported. Self-reported income suffers from many measurement problems. A preferred measure of income would be based not only on *objective* data but would also include numerous components of imputed income from home and subsistence production, black and informal markets, consumer durables and other forms of non-financial wealth. Even better for the purpose of testing theory would be a measure of *consumption* which incorporated all these domains and, above all, public goods (Jenkins and Van Kerm, 2009).

It may be that an income measure which included these imputed values could perform better in predicting SWB than the self-reported measure from the Gallup World Poll featured in this study. However, note that the income ranks used in this study are not self-reported, and it seems unlikely that a subjective bias would produce a *stronger* correlation between the derived rank variable and subjective well-being than it produced between the original cardinal income and subjective well-being.[6]

In addition, many of the measurement problems suffered by a cardinal measure of consumption are likely to disappear when converting it to an ordinal measure. This is because correction for taxation and transfers, for imputed goods, and even for the relationship between income and consumption, are likely to be monotonic and thus order-preserving, regardless of their magnitudes.

The World Poll asks respondents about their household income, using a continuous scale in local currency. These values are converted to internationally and intertemporally comparable incomes using World Bank data on purchasing power parity (Gallup Organization, 2012). Incomes in this work are expressed in 2005 US dollar purchasing power. Figure 1 shows the distribution and large variation in these incomes, overall across the World Poll. National variation accounts for much of the total variance, as can be seen from the nearly-non-overlapping distributions of the USA and Mozambique.

[6] Deaton (2010) has recently argued that, given the ongoing challenges in comparing cardinal incomes and assessing inequality across poor and rich countries, more attention should be given to qualitative self-reports about income and poverty.

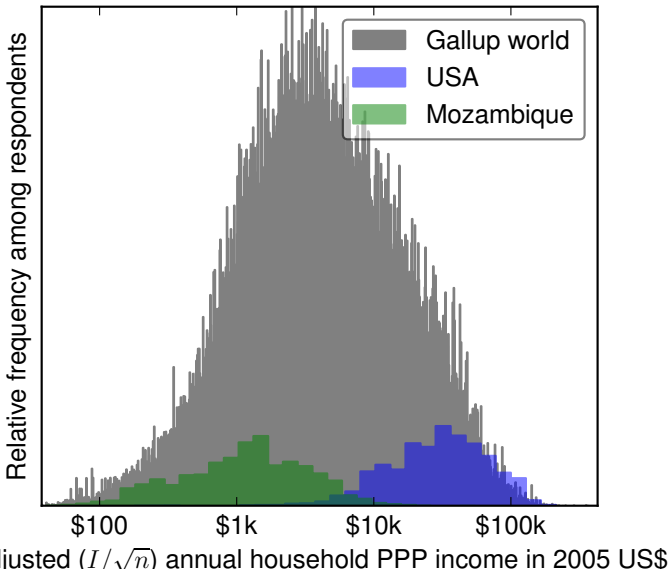

Figure 1: Global distribution of household incomes. Household incomes are self-reported in the GWP survey and are shown after conversion to individual-equivalence based on household-size.

Variable	Mean	Std.Dev.	min	max	Obs.	Description
ladder	5.3	2.2	0	10	716126	Cantril's ladder from Gallup World Poll
SWL	5.8	2.4	0	10	94813	satisfaction with life from Gallup World Poll
$\frac{1}{2}$(ladder+SWL)	5.4	2.2	0	10	716126	(ladder+SWL)/2 or ladder
affect balance	.54	.55	-1	1	351474	$\frac{1}{2}$(smileLaugh+enjoyment) $-\frac{1}{3}$(sadness+depression+anger)
incomeAdequate	.53	.32	0	1	688964	"Which one of these phrases comes closest to your own feelings about your household's income these days: living comfortably on present income, getting by on present income, finding it difficult on present income, or finding it very difficult on present income?" (coded numerically)
indexLifeEval	.56	.30	0	1	664742	GWP index: a three-level index using *ladder* and a similar question about expectations in 5 years
satisfiedStandardOfLiving	.59	.49	0	1	658441	"Are you satisfied or dissatisfied with your standard of living, all the things you can buy and do?"
$\log(\text{income}_{\text{HH}})$	8.9	1.30	4.8	15.3	716126	$\log_e$ annual household income in international dollars
I_i=$\log(\text{income}_{\text{HH,adj}})$	8.3	1.36	3.8	15.3	716126	$\log_e$ annual household income $\times(\text{HHsize})^{-\frac{1}{2}}$ in international dollars
$Q_{i(n)}$	.50	.29	2e-05	1.00	716126	within-country quantile of adjusted household income, $I_{i(n)}$

Table 1: Individual subjective well-being and income variables: summary statistics.

3 Empirical approach and findings

The objective is to select empirically between two possible models of the relationship between subjectively-reported welfare and material affluence. Conceptually, experienced well-being U of individuals may be thought to depend on their private consumption c, their peers' consumption distribution $F(c')$, their use of public goods g, their other social circumstances x, and intrinsic life-cycle effects that vary with age a:

$$U = f\left(c, F(\cdot), g, x, a\right), \tag{1}$$

In standard solipsist models, the dependence on $F(c')$ is absent. Even in models accounting for psychological reference levels, others' affluence often has its effect through a single (local) measure of central tendency, $\overline{c}$. In many theoretical and empirical accounts, the dependence on own consumption c is captured by a $\log(c)$ term. In these cases, $\overline{c}$ comes in separably, for instance in a $\log(\overline{c})$ term, or in the more constrained form of a ratio, $c/\overline{c}$ (e.g., Luttmer, 2005; Easterlin and Plagnol, 2008). That is, in these models, relative income effects may be very important, but they come about through comparison to some *reference level* set by others.

I compare such a model with one in which the dependence on own consumption comes only through its interaction with the cumulative distribution function $F(c')$ of peers' consumption: $U = f\left(F(c), g, x, a\right)$. That is, in this model, own consumption affects well-being *purely* through its positional value. The dependence of U on both own consumption c and others consumption $F(c')$ appears solely as the individual's consumption rank $Q = F(c)$.

To summarize, the estimates to follow compare a model with a classical/canonical, cardinal effect of consumption in log form, albeit allowing for a non-solipsist reference level $\overline{c}$, to the starkly different case with a pure ordinal dependence on consumption:

$$\begin{aligned} U =& f\left(\log(c), \overline{c}, g, x, a\right) && \text{(cardinal model)} \\ U =& f\left(F(c), g, x, a\right) && \text{(ordinal model)} \end{aligned}$$

To implement this, I test additively separable specifications for $U(\cdot)$ in which SWB is used to measure well-being, and size-adjusted household income is used as a proxy for consumption or affluence. While reference level and comparison effects may exist at a number of social and spatial scales, I focus on national-level effects in order to get at globally-relevant relationships

and to be able to treat the problem of unmeasured national public goods g together with income reference levels.

A particularly strong test for the preferred functional form is to nest the two models in a single estimate and to test for either the cardinal effect β_C or ordinal effect β_O to be zero. We can represent this empirical strategy as follows:

$$\text{SWB}_i = a + \beta_C \log(c_i) + \beta_O \, Q^n(c_i) + \delta_n + \boldsymbol{\gamma} \cdot \boldsymbol{D}_i + \eta_n + \varepsilon_i \qquad (2)$$

Here, individual i living in country n has consumption c_i and within-country income quantile $Q^n(c_i)$. I will use adjusted household income as a measure of c_i, and denote this ordinal position by $Q_{i(n)}$. The vector D_i captures demographic variables such as age and gender. Country-level fixed effects are absorbed by δ_n. These coefficients capture not only country-level consumption reference levels $\bar{c}_n$, but also uniform public goods g_n. A more comprehensive set of controls for other individual circumstances x is explored in numerous other studies. For the present purposes we can assume such circumstances have similar effects across countries (Helliwell et al., 2010). Within-country correlations in the error structure are accommodated by disturbance clusters η_n.

When the dependent variable is an integer subjective response on a zero to ten scale, it can sensibly be modelled as an ordinal value using a latent variable model. However, OLS coefficients for SWB estimates turn out to be nearly identical to those from an ordered logit estimator (Carbonell and Frijters, 2004). For ease of interpretation the former are shown here, and for reasons explained earlier I use the (continuous variable) individual mean of life satisfaction and the Cantril ladder as a measure of cognitive life evaluation. A dummy is included to accommodate the cases when SWL is absent from that mean.

3.1 Within-country income and rank

Table 2 shows estimates of Equation 2 for each measure of SWB using a weighted OLS estimator. Weights represent inverse sampling probabilities within each country. Thus, while estimated quantities are measured at the individual level, each country is given roughly equal weight in the regression, in accordance with the objective of leveraging international variation to estimate globally-valid relationships. Each estimate includes country fixed effects and country-level error clustering to account for fixed differences among nations. As mentioned above, gender and age controls are included to ab-

	½(ladder+SWL)		satisfiedStandardOfLiving		affect balance		incomeAdequate		indexLifeEval	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Q_{i(n)}$	**.21**†	**.29**†	**.19**†	**.25**†	**.12**†	**.098**†	**.37**†	**.47**†	**.23**†	**.26**†
	(.012)	(.025)	(.012)	(.017)	(.012)	(.019)	(.018)	(.030)	(.012)	(.021)
I_i	.020	*−.050*$^{+}$	.006	*−.036*$^{+}$	.026	***.044***	.026	−.054	*−.038*$^{+}$	***−.047***
	(.022)	(.030)	(.019)	(.020)	(.016)	(.021)	(.028)	(.038)	(.020)	(.020)
age/100	**−1.04**†	**−1.61**†	**−.89**†	**−1.50**†	**−1.03**†	−.36	**−.34***	**−1.85**†	**−.89**†	−.48
	(.12)	(.26)	(.12)	(.23)	(.15)	(.30)	(.11)	(.33)	(.11)	(.30)
$(\text{age}/100)^2$	**2.2**†	**3.2**†	**1.77**†	**2.8**†	**2.3**†	−.28	.091	**3.5**†	**2.1**†	.31
	(.35)	(.83)	(.34)	(.70)	(.46)	(1.05)	(.34)	(1.02)	(.33)	(.95)
$(\text{age}/100)^3$	**−1.81**†	***−2.1***	**−1.29**†	***−1.54***	**−2.1**†	1.39	.58	−1.78	**−2.1**†	.078
	(.38)	(.96)	(.35)	(.77)	(.51)	(1.24)	(.37)	(1.09)	(.35)	(1.05)
$(\text{age}/100)^4$	**.54**†	.43	**.37***	.25	**.65**†	*−.83*$^{+}$	***−.35***	.17	**.74**†	−.095
	(.15)	(.38)	(.13)	(.30)	(.20)	(.49)	(.14)	(.41)	(.13)	(.40)
male	**−.022**†	**−.043**†	*−.006*$^{+}$	−.004	**.014**†	.012	**.013**†	***.007***	**−.020**†	**−.041**†
	(.003)	(.006)	(.004)	(.006)	(.003)	(.009)	(.002)	(.003)	(.004)	(.006)
Ladder only (SWL n/a)	**−.046**†	**−.070**†								
	(.007)	(.008)								
OECD only		✓		✓		✓		✓		✓
country f.e.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
obs.	714034	151281	664124	123136	352830	75354	695498	139105	662810	142455
R^2(adj)	.285	.222	.169	.160	.095	.063	.300	.333	.221	.235
$\text{N}_{\text{clusters}}$	159	34	159	34	152	34	159	34	159	34
log likelihood	−893344	−195693	−880742	−163943	−482993	−104443	−862738	−169235	−857849	−183037

Significance: **0.1%**† **1%*** ***5%*** *10%*$^{+}$

Table 2: Within-country income quantile predicts SWB better than cardinal income. For explaining differences in life evaluations, subjective income evaluations, and reports of affective states, income position $Q_{i(n)}$ dominates cardinal income $I_i = \log(\text{HH}_{\text{inc}} \cdot \text{HHsize}^{-\frac{1}{2}})$ within 152–159 countries from the Gallup World Poll. Coefficients are standardized (β). Standard errors are shown in parentheses. The log(income) variable is adjusted for household size, and the income quantile variable is based on adjusted household incomes. Each model includes country fixed effects.

sorb life-course patterns; however, inclusion of these variables or a richer set of individual and household controls has little impact on the estimates.

For clarity of interpretation and ease of comparison, all coefficients in Table 2 and those to follow are shown as standardized "β" coefficients.[7] The first column shows the estimated β coefficients from a quarter of a million respondents between 2006 and 2012 who reported a household income and household size. From these, the adjusted household income was calculated as the real purchasing power divided by the square root of the household size.[8]

Individuals' household income quantiles are then estimated from the distribution of respondents' adjusted household incomes I in each country n:

$$Q_{i(n)} = \left[\sum_{j} w_{j(n)}\right]^{-1} \sum_{I_j<I_i} w_{j(n)} \tag{3}$$

where $w_{j(n)}$ represents the population weight of individual j in country n and year y.

In column 1, as for each model in Table 2, the estimated coefficient on Q_i is statistically significant with $p < 10^{-6}$. The magnitude of .21 indicates that the entire within-country income quantile range accounts for $0.21\times\sqrt{12} \approx 0.73$ standard deviations of SWB, or $\sim$1.6 units of the 10-point scale. By contrast, the cardinal value of the same affluence metric is not estimated to have any distinguishable effect. In fact, both for the full sample and for the OECD subsample in column 2, any cardinal income effect that might exist is statistically constrained to be less than a fifth as important as that of the ordinal term. As is normal in estimates of life evaluations, the raw coefficients on age variables demonstrate a $\cup$-shaped progression over the life course, and males tend to report slightly lower life evaluations.

For the analogous model of satisfaction with standard of living, the cardinal income effect is again rejected for both the entire sample and the OECD subset (columns 3 and 4). Similarly, for adequacy of income, Gallup's life

[7] These are best for emphasizing the explanatory power of each regressor. The coefficients indicate the change (in standard deviations) of SWB per change (in standard deviations) of each predictor variable.

[8] In order to account for economies of scale in household consumption, single-parameter income equivalence scales are typically of the form I/n^{ϵ}, where I is household income and n is the number of household members. I use the common convention of $\epsilon = \frac{1}{2}$ (Buhmann et al., 1988). None of the results change significantly if unadjusted household incomes are used in place of household equivalent incomes, or if dummies for individual household size are included. The household size in the Gallup questionnaires is the number of residents of age 15 or older. For use in calculating equivalent incomes, this size is truncated to 7.

evaluation index, and even for the affective index, ordinal position explains most or all of the income effect on SWB (columns 5–10).

This simple and robust finding is our main result. Despite the widespread use of cardinal income measures to account for SWL, an alternative and equally concise model may be preferred over the $\log(c)$ form, which has in turn numerous times been empirically selected amongst other cardinal forms. Moreover, this ordinal model demands a substantially different theoretical interpretation, in which social position, rather than some form of expectations or aspiration about consumption amounts, is key in the psychology of well-being.

3.2 Individual countries

However, several other related tests give the finding further significance. One obvious approach is to test the candidate functional forms between SWB and income for a single nation. This can be expected to have less power (and weaker constraints on coefficients) but, carried out over multiple countries, to be a more stringent test of a robust empirical preference for one form over another.

Table 3 shows a similar set of estimates of Equation 2 but within a single country — the USA. The first two columns in each dependent variable group show non-nested models and in each case using the ordinal income measure explains more variation of SWB than does the cardinal. As may be expected, the β coefficients for the more income-specific SWB measures — income adequacy and satisfaction with standard of living — are higher than for the more general well-being measures. For both all-encompassing satisfaction and for the specific measures, ordinal income is the more successful predictor, even though in the case of the life evaluations, other factors not included in the models here tend to be as or more important than income (Layard, Clark, and Senik, 2012; Helliwell and Barrington-Leigh, 2010). When both income measures are included in the third column of each group, a non-negative effect of the cardinal one is mostly rejected, while the ordinal effect is strongly and significantly positive in every case, explaining 1–1.5 standard deviations of the variation in SWB.

In estimates of the competing power of cardinal and ordinal income to explain SWB, carried out separately for each of 151 countries, the income rank proves to be the predominantly preferred measure. Figure 2 shows standardized β coefficients for these two measures of income, estimated for 152 countries from an equation like that shown for the USA in Table 3.

Cardinal and ordinal measures of income tend to be closely correlated

	$\frac{1}{2}$(ladder+SWL)			affect balance			incomeAdequate			indexLifeEval			satisfiedStandardOfLiving		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
$Q_{i(n)}$		**.27**†	**.47**†		**.22**†	**.26**†		**.44**†	**.52**†		**.28**†	**.41**†		**.31**†	**.40**†
		(.019)	(.073)		(.026)	(.065)		(.018)	(.042)		(.017)	(.042)		(.019)	(.042)
I_i	**.21**†		**−.21***	**.20**†		−.039	**.39**†		***−.090***	**.23**†		**−.15**†	**.27**†		***−.095***
	(.042)		(.080)	(.026)		(.065)	(.036)		(.042)	(.031)		(.043)	(.030)		(.041)
age/100	*−1.88*$^{+}$	***−1.99***	***−2.0***	1.25	1.46	1.51	**−2.8***	**−3.0***	**−3.0**†	−1.06	−1.21	−1.24	**−2.9***	**−3.1**†	**−3.1**†
	(1.09)	(.97)	(.89)	(1.34)	(1.33)	(1.33)	(1.04)	(.92)	(.92)	(1.02)	(.94)	(.91)	(.95)	(.87)	(.88)
$(\text{age}/100)^2$	3.1	3.2	3.3	*−7.0*$^{+}$	*−7.7*$^{+}$	*−7.8*$^{+}$	*5.7*$^{+}$	***6.2***	***6.4***	1.97	2.3	2.4	***6.5***	***6.9***	***7.1***
	(3.4)	(3.1)	(2.9)	(4.2)	(4.2)	(4.2)	(3.2)	(2.9)	(2.9)	(3.2)	(3.0)	(2.9)	(3.0)	(2.8)	(2.8)
$(\text{age}/100)^3$	−.99	−.97	−1.09	***10.2***	***11.0***	***11.1***	−3.9	−4.3	−4.4	−1.40	−1.60	−1.72	−5.3	*−5.6*$^{+}$	*−5.7*$^{+}$
	(3.7)	(3.5)	(3.3)	(4.7)	(4.7)	(4.7)	(3.6)	(3.2)	(3.2)	(3.6)	(3.4)	(3.3)	(3.4)	(3.2)	(3.2)
$(\text{age}/100)^4$	−.21	−.24	−.19	***−4.5***	**−4.7***	**−4.8***	.90	1.05	1.10	.37	.42	.48	1.61	1.71	1.77
	(1.42)	(1.34)	(1.27)	(1.79)	(1.78)	(1.78)	(1.34)	(1.24)	(1.24)	(1.38)	(1.32)	(1.30)	(1.29)	(1.23)	(1.23)
male	**−.050***	**−.056**†	**−.055**†	.018	.017	.017	**.045***	***.038***	***.039***	**−.050***	**−.055**†	**−.055**†	.024	.019	.020
	(.016)	(.016)	(.016)	(.022)	(.022)	(.022)	(.017)	(.017)	(.017)	(.017)	(.016)	(.016)	(.018)	(.018)	(.018)
Ladder only (SWL n/a)	**−.080**†	**−.073**†	**−.073**†												
	(.018)	(.017)	(.017)												
$\text{N}_{\text{clusters}}$	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA
obs.	6000	6000	6000	3508	3508	3508	5093	5093	5093	5862	5862	5862	5017	5017	5017
R^2(adj)	.077	.102	.109	.056	.061	.061	.174	.217	.218	.062	.084	.087	.091	.112	.114
log likelihood	−8268	−8186	−8164	−4873	−4863	−4863	−6737	−6601	−6597	−8127	−8058	−8048	−6877	−6816	−6812

Significance: **0.1%**† **1%*** ***5%*** *10%*$^{+}$

Table 3: SWB and cardinal versus ordinal income in the USA. For each subjective dependent variable, a model using an ordinal income measure explains more than a model with log income. When both are included, the cardinal income effect is nonpositive.

within each country. Therefore, using both at once in a model of SWB introduces some multicollinearity. An inverse relationship between β_C (the coefficient on ln(HH inc_{adj})) and β_O (the coefficient on income quantile) is evident across countries; however for the bulk of countries, the ordinal coefficient has more explanatory power than the cardinal one, and indeed, the cardinal one often drops out, i.e., is insignificant. Similar results obtain for the other life evaluation and income adequacy measures.

Colors in Figure 2 represent country average incomes and reveal a further pattern. In wealthier countries, β coefficients tend to be higher for income rank and lower for log income.

Figure 3 depicts this observation more explicitly: there is a coherent and statistically significant trend for each coefficient as a function of national income levels. Coefficients for β_O and β_C from country-level estimates are plotted separately, each as a function of country GDP per capita in constant PPP terms. For the lowest national incomes, β_C tends to be larger and sometimes significant while β_O is insignificant. For countries with higher average incomes, β_O becomes increasingly positive with income and β_C is generally insignificant.[9]

These estimates suggest that a subtlety underlies the broader empirical strength of ordinal income effects in evidence in Table 2. In wealthier economies, pure status benefits from incomes appear to become more important. This could be due either to diminishing marginal utility of material consumption (for its own sake), i.e., of log income in Equation 2, (see Eaton and Eswaran, 2009) or to the increasing component of public goods in overall household consumption in wealthier economies. That is, if public goods substitute for private goods (either more or less efficiently), and if goods provided publicly tend to be the ones through which cardinal benefits accrue, then for (wealthier) countries in which the state provides more, variation in individual income should account for less of the differences in SWB.

3.3 Global income and rank

Because of the inclusion of country fixed effects, estimates in the previous section serve as tests between models in which relative income effects come about in part based on a *national reference level*, and models in which those effects come about through purely *ordinal positional* concerns. Between these two models, they strongly favor the ordinal one for within-country comparisons. While other higher-resolution data sets provide opportunities

[9]These properties are also revealed in a single pooled estimate in which interaction terms between domestic household rank and national affluence are introduced.

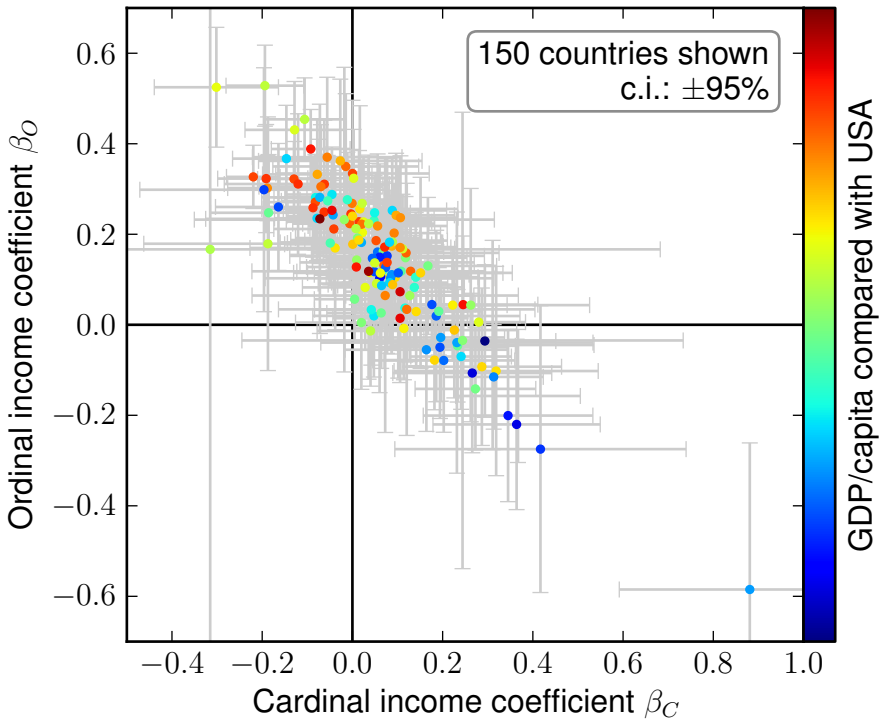

Figure 2: Standardized regression coefficients of ordinal *vs* cardinal income measures explaining within-country variation in satisfaction with standard of living. Each point represents an estimate for one country, controlling for age and gender. Colours show the mean income levels of countries. The overall pattern is that for all national income levels, socioeconomic rank accounts for variation in life evaluations, while purchasing power (cardinal income) tends to drop out.

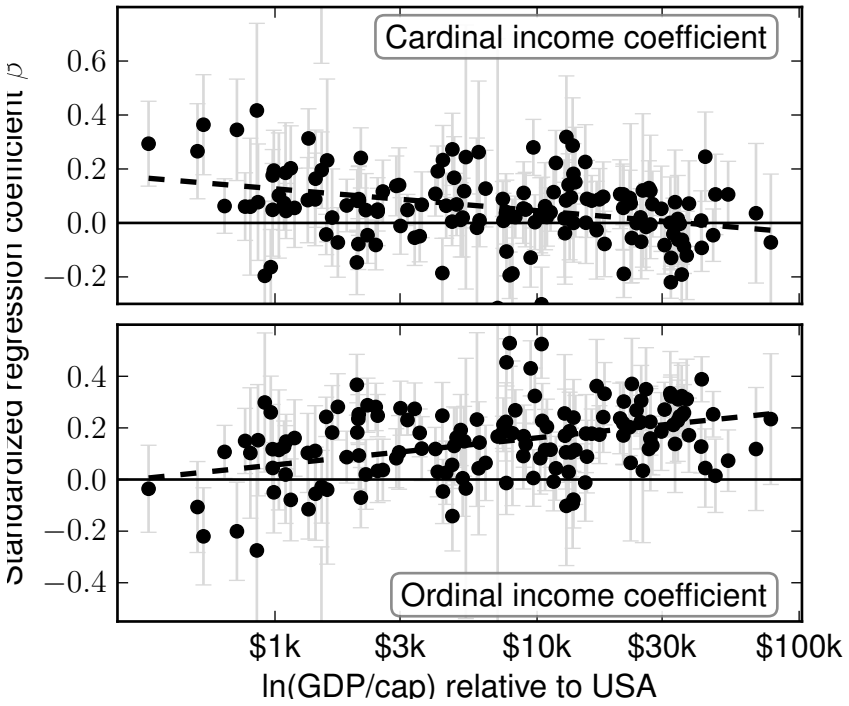

Figure 3: Relative explanatory power of ordinal and cardinal income in explaining satisfaction with standard of living: variation by national affluence. In wealthier countries, the dominance of ordinal concerns over cardinal ones becomes stronger.

to measure comparison effects on smaller spatial scales (e.g., Barrington-Leigh and Helliwell, 2008; Luttmer, 2005; Dynan and Ravina, 2007), the existence of international comparison effects is in principle harder to measure.

In the previous section, both the country-level estimates and the global-level estimates with country fixed effects are consistent with unmeasured cardinal income benefits acting in proportion to national mean incomes. In addition, the benefit of any public goods provided at the national level would be invisible in the income coefficients of the regressions carried out so far. Even if comparison effects within a country completely absorbed all apparent benefits to higher individual (household) incomes, benefits of higher incomes or of economic growth could still come about through collectively-financed public goods.

Therefore, an even more discriminating model than Equation 2 would be one in which fixed effects δ_n are dropped and local ranks $Q_{i(n)}$ are replaced by Q_i, the *global* rank of individual household incomes amongst all (adjusted) household incomes reported in the World Poll.[10] In order to account for federal-level public goods enabled by higher incomes, a cardinal or ordinal measure of per-capita income by nation can be included:

$$\text{SWB}_i = a + \beta_C \log(c_i) + \nu_C \ \log\left(\text{GDP}_{\text{pc}}\right)_n + \boldsymbol{\gamma} \cdot \boldsymbol{D}_i + \eta_n + \varepsilon_i \tag{4a}$$

$$\text{SWB}_i = a + \beta_O Q_i + \nu_O \ Q_n + \boldsymbol{\gamma} \cdot \boldsymbol{D}_i + \eta_n + \varepsilon_i \tag{4b}$$

Here Q_n is the ranking amongst *countries* of individual i's country income per capita.

Table 4 compares, therefore, estimates of models in which life evaluations are explained by either (a) household PPP adjusted incomes and national mean PPP incomes or (b) household quantiles in the annual global income distribution amongst all respondents to the World Poll, along with nations' quantiles in the distribution of per capita PPP income. That is, for each dependent subjective well-being variable, a model of ordinal income measures at two scales is compared with a model using cardinal income measures at two scales.

One remarkable observation is a pretext for these estimates: the correlation between the cardinal and ordinal national per capita income measures is 0.994. This means that a fully nested version of the model — i.e., in which

[10]This ranking reflects the Gallup World Poll's sample; i.e., it has a natural country-orientation in that each country is sampled approximately equally, and the ranking is among respondents.

	$\frac{1}{2}$(ladder+SWL)		affect balance		incomeAdequate		indexLifeEval		satisfiedStandardOfLiving	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Q_i		**.35**†		**.17**†		**.57**†		**.31**†		**.28**†
		(.019)		(.022)		(.027)		(.018)		(.019)
Q_n		**.15**†		−.028		**−.13**†		**.093**†		.029
		(.025)		(.022)		(.029)		(.024)		(.027)
I_i	**.35**†		**.17**†		**.55**†		**.31**†		**.27**†	
	(.019)		(.023)		(.027)		(.019)		(.019)	
I_n	**.16**†		−.020		**−.11**†		**.092**†		.038	
	(.024)		(.024)		(.030)		(.023)		(.027)	
age/100	**−1.25**†	**−1.27**†	**−1.15**†	**−1.17**†	**−.49**†	**−.54**†	**−1.12**†	**−1.14**†	**−1.11**†	**−1.12**†
	(.14)	(.14)	(.17)	(.17)	(.14)	(.14)	(.13)	(.14)	(.14)	(.14)
$(\text{age}/100)^2$	**3.0**†	**3.0**†	**2.8**†	**2.9**†	*.74*$^{+}$	***.92***	**2.9**†	**2.9**†	**2.6**†	**2.7**†
	(.41)	(.41)	(.53)	(.53)	(.43)	(.43)	(.40)	(.40)	(.40)	(.41)
$(\text{age}/100)^3$	**−2.7**†	**−2.8**†	**−2.7**†	**−2.8**†	−.31	−.51	**−3.0**†	**−3.1**†	**−2.4**†	**−2.4**†
	(.45)	(.44)	(.60)	(.59)	(.47)	(.46)	(.44)	(.43)	(.42)	(.43)
$(\text{age}/100)^4$	**.87**†	**.90**†	**.92**†	**.95**†	.002	.074	**1.10**†	**1.13**†	**.79**†	**.81**†
	(.18)	(.17)	(.23)	(.23)	(.18)	(.17)	(.17)	(.17)	(.16)	(.16)
male	**−.016**†	**−.015**†	**.018**†	**.018**†	**.020**†	**.021**†	**−.014**†	**−.013**†	.003	.003
	(.004)	(.004)	(.004)	(.004)	(.003)	(.003)	(.004)	(.004)	(.004)	(.004)
Ladder only (SWL n/a)	**−.044**†	**−.044**†								
	(.012)	(.012)								
obs.	646357	646357	326100	326100	628388	628388	601681	601681	599618	599618
R^2(adj)	.222	.223	.032	.032	.224	.224	.153	.154	.091	.089
$N_{clusters}$	148	148	141	141	147	147	148	148	148	148
log likelihood	−835988	−835460	−457372	−457443	−812076	−812112	−803886	−803418	−822190	−822964

Significance: **0.1%**† **1%*** ***5%*** *10%*$^{+}$

Table 4: Global income quantile predicts SWB as well as cardinal income. Odd-numbered columns show estimates of individual SWB in terms of household (adjusted) PPP log income (I_i) and national log GDP/capita (I_n), while even-numbered columns include only international ranks Q_i and Q_n of these variables amongst Gallup World Poll respondents and countries, respectively.

both national income measures appear together — is not appropriate due to collinearity. It also suggests that there is no simple *empirical* justification for preferring the cardinal measure of national wealth over the ordinal one. This seems surprising; however, were one to arrive at the data with more social/psychologically-oriented priors than the modern economic ones, one might assume the ordinal formulation would be the right starting point, even for comparisons amongst nations. I continue to address this question of "nations as tribes" in the subsequent sections.

Returning to Table 4, the second remarkable observation is analogous in implication but applies to household income rather than national incomes. It is the finding that, despite household incomes spanning several orders of magnitude, reducing the household income purchasing power data to a simple ranking across the globe explains just as much of individual subjective well-being as does the canonical cardinal measure.

Once again, standardized β coefficients are shown in the table. The relative contributions of household versus national income measures vary across the different well-being measures, but are consistent within each pair of ordinal versus cardinal models. The overall fraction explained or closeness of fit of the models (measured by adjusted R^2 or log likelihood) are as high or higher for the ordinal models as for the cardinal ones.

3.3.1 Non-parametric estimates

In order to understand the success of a global income ranking over conventional cardinal income measures, Figure 4 shows nonparametric regressions for the *Cantril Ladder* life evaluation, predicted by each of the two measures of household income amongst all Gallup respondents. The upper local polynomial regression shows nearly imperceptible 95% confidence intervals around a nearly-linear, monotonic relationship between the ordinal metric and subjective well-being. The lower trace, by contrast, shows a more curvilinear (somewhat sigmoid) relationship for cardinal income and, not surprisingly, larger uncertainty for the highest and lowest incomes. This uncertainty comes about due to the smaller number of respondents at these extremes. In linear regression models estimating mean outcomes, these low-incidence cases do not carry much weight, and in the ordinal fit of the upper panel, they are compressed into the top and bottom of the ranking, with no "tails" possible for the abscissa when it is measuring quantiles.

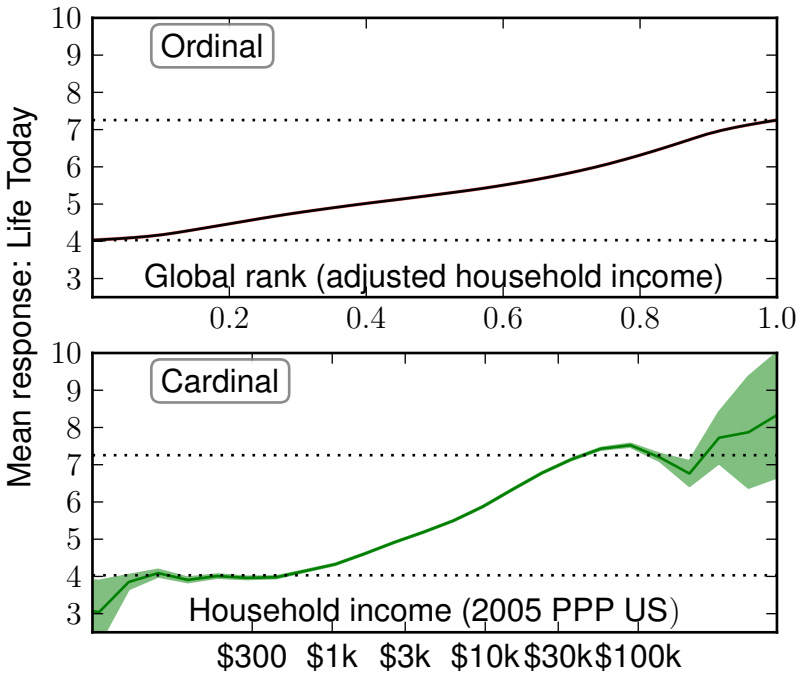

Figure 4: Local polynomial estimates of Cantril Ladder responses. Nonparametric estimates of the variation of SWB with rank among all GWP respondents of the same year (upper panel) and the variation of SWB with internationally-comparable household incomes (lower panel). Shaded region shows confidence intervals.

3.4 National-level income and rank

Ranking individual incomes amongst all Gallup World Poll respondents strongly reflects the positions of countries, since they are nearly equally represented in the Poll. It therefore makes sense to investigate the relationship between income and well-being at the national level. As was already mentioned, GDP per capita rank is closely correlated to log of GDP per capita; nevertheless, in this section I conduct a race between these macroeconomic measures outside of the context of individual responses. Modeling national means directly also has the additional advantage of avoiding any sensitivity to the high and low tails of the individual income distribution.

	pooled						fixed effects		
	ladder			affect			affect	ladder	st'd of living
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
I_{nt}	**.69**†		−.27	**.037**†		−.045	.19	.61	−.012
	(.036)		(.31)	(.008)		(.089)	(.12)	(.56)	(.072)
Q_{nt}		**3.1**†	**4.2***		**.16**†	.35	−.004	3.5	**1.30***
		(.15)	(1.40)		(.033)	(.39)	(.41)	(2.4)	(.42)
affluent							✓	✓	✓
obs.	816	799	799	551	545	545	285	418	420
R^2(adj)	.614	.626	.627	.093	.091	.091	.042	.068	.115
$N_{clusters}$	149	148	148	144	142	142	73	78	79

Significance: **0.1%**† **1%*** ***5%*** *10%*$^{+}$

Table 5: Country incomes and ranks. Pooled and fixed-effect models of life evaluation (ladder) and satisfaction with standard of living

To implement this, I consider each wave (calendar year) of the Gallup World Poll separately, using the World Bank's World Development Indicators to assign comparable national incomes to each country for each year. Price parity data often come with an important warning for time series analysis: the yearly changes in GDP/capita are unreliable for developing countries, whose incomes must be averaged over several years (Heston, Summers, and Aten, 2011). With this caution, I conduct pooled estimates for all countries, but restrict the sample to the wealthiest half for analysing changes in national incomes and SWB. The fixed effects model of these changes, nesting both cardinal and ordinal income measures, takes the form:

$$\text{SWB}_{nt} = \alpha + \beta_I \log(I_{nt}) + \beta_Q Q_{nt} + \mu_n + \varepsilon_{nt} \tag{5}$$

for country n and year t.

Table 5 shows raw coefficients from the estimates. The first three columns show a pooled estimate for the Cantril ladder question in 149 countries between 2006 and 2012. In column (3), the international income ranking proves to be a better linear predictor of mean life evaluation than the logarithm of income. Columns (4) to (6) are analogous models of *affect balance*. The fraction of cross-country variance in *affect balance* that is explained by income is, as expected, much smaller than that of the Cantril ladder. When both international rank Q_{nt} and cardinal income $I_{nt} = \log(\text{GDP/capita})$ are included at once (column 6), neither is significant.

Similarly, in fixed effects models (columns 7–8) in which national-level yearly changes in SWB are explained in terms of corresponding changes in both measures of mean income, neither form of income has a significant effect on the Cantril Ladder or affect balance. The Gallup World Poll has, however, one more specific satisfaction measure related to income. The dichotomous *standard of living* variable (see Table 1) does significantly and positively respond to the international rank of mean income when both income measures are introduced as predictors. Any effect from cardinal changes in GDP per capita in this case is rejected.

4 Discussion

This paper offers something akin to circumstantial evidence on a question that cannot easily be addressed by natural experiments. What is to be made of the finding that SWB relates more simply to a social ordering than to a best-available measure of material choice, especially when the former measure is derived from the latter?

An ordinal functional form implies that a more explicitly social mechanism is in play in any comparison effects, as opposed to a consumption-oriented one in which respondents form cognitive aspirations about consumption levels using available evidence. With maximal extrapolation, the evidence based on subjective well-being brings into question the assumption that economic progress comes about fundamentally through material means (cardinal income) rather than social channels (for instance, ordinal income). According to the simple demonstrations in this paper, our "new" measures of well-being give us a picture that is consistent with the strongest possible interpretation of a materialist "rat-race," in which gains to well-being by one person or group always come at the cost of others if they are made through conspicuous material gain.

One cannot properly pose questions about consumption reference level externalities without specifying spatial and temporal scales over which the reference-shifting adaptation or reframing occurs. The present work considers the case of the largest possible among such spatial scales — in which reference groups include all others in one's country or all countries in the world. If, in an age of truly global information flows, people worldwide are generally aware of and influenced by consumption levels of others around the world, then on some timescale, the informational externalities of consumption levels also act on an international scale. This would result in middling mean responses, worldwide, to cognitive life evaluation questions as posed

recently but also, by implication, if they were posed long ago or far in the future.

Intra-national comparisons

If, in some form, a cardinal consumption reference level influences SWB and is built from comparisons across an individual's country, then country fixed effects (Tables 2 and 3) should capture reference level effects (in addition to unmeasured national characteristics, public goods, and price measurement errors in PPP calculations), and a cardinal measure of individual purchasing power should account for the individual benefits accruing in such a "rat race". Such a model has explanatory power, but is rejected against one in which the individual benefits are captured by social standing alone.[11]

Secondly, a model in which income affects SWB through cardinal purchasing power[12] is rejected by the same estimates. In Table 3, there is *no role* for cardinal income, even as a measure of income benefits within countries, after income rank is accounted for.

Together, these implications constitute a stark indictment of the canonical preference for using logarithmically-scaled income as a measure of consumption contributions to well-being. I have not attempted in this work to tailor a cardinal functional form to improve on log(income). Rather, I have used a single, naive, and intuitive measure of social position — the rank — and found that it has strong power in comparison with the well-validated and established log(income) form.

International comparisons

Empirically, a harder question to address is the possibility of an *international* income reference level which negatively affects individuals' satisfaction. Such a level may change over time but, if truly global, could never be identified empirically. Instead I address the question of international comparisons in light of, once again, the suspicion that human well-being is largely determined through social standing and social interactions. It seems highly unlikely that international comparisons are truly and uniformly global, yet Table 4 shows the astonishing fact that a purely ordinal model of income,

[11] Notably, if there are measurement errors or biases in the self-reported income, the social standing measure inherits these because it is derived directly therefrom; see Section 2.2.

[12] That is, in which there is a limited or nonexistent role for relative income effects of any kind, in particular through *either* rank or reference levels.

with no allowance for country fixed effects, does as well in explaining SWB as one accounting for individual and national income levels.

Table 5 separates out the national-level relationships and finds that the best evidence in cross-section and time series again favors a *ranking* of nations as the salient variable in the psychology of SWB.

Social beings and priors

I point out above that across nations, log(GDP/capita) is very closely correlated with its own rank order. By itself, this would not be particularly interesting given that we have a purely theoretical basis to prefer the cardinal measure. However, in light of the associated SWB data, which has an interpretation as a proxy for welfare, it becomes more necessary to justify the use of cardinal income measures in accounting for SWB.

Indeed, if one came at this question with the prior belief that social considerations tend to trump material preferences for determining psychological well-being, one would naturally use an ordinal measure of income in accounting for within-country differences across individuals. Figure 3 shows that this approach would do better than what we have been doing for decades.[13]

Extending this thinking to social comparisons beyond national borders might also be natural if one is concerned with social identities and "tribal" affiliation as an important part of human motivation and reward. Being part of a high-status country or nationality may be good for well-being due to the status, rather than just the material affluence that is likely to be associated with it. A natural extension to the evidence in this paper would be to examine the influence on SWB of income shocks in *other* countries that are relatively close in geographic or trade terms to respondents' own.

Instrumental concern versus rank orientation

On the other hand, a superficial interest in status can come about for instrumental reasons. This means that some material reward is allocated in a non-market context on the basis of conspicuous signals related to consumption or other market performance (e.g., Rege, 2008). In this case, even though my measure of income rank is based only on reported income, the increased SWB associated with a high income rank may reflect a higher anticipated (or current) unmeasured "income," for instance in the marriage market or another matching process such as future employment.

[13] Once again, it is worth mentioning that this starting point was intuitive to the founders of economics — see footnote 4 on page 4.

However, if there is reason to believe in socially-oriented preferences, Occam's razor suggests that the simpler explanation for rank explaining SWB is that humans are directly sensitive to their social pecking order. In this case, income, or its associated conspicuous trappings, are perceived as cogent markers of such status. In addition, some indirect non-market rewards to income rank, such as the marriage market, are drawn from a fixed pool, so that Pareto gains are no more possible than when rank is its own objective.

Any economist working with figures of merit for political jurisdictions' economic or policy performance knows that the press, and therefore its audience, loves rankings. Moreover, other bodies — including cities, universities, and academic departments — frequently communicate their characteristics in rank order, with cardinal metrics playing a secondary, explanatory role. In some cases, like among universities, that makes sense if there are instrumental reasons for which a superficial interest in rank relates to a material benefit in quality. For instance, a limited pool of funding or of excellent students or of excellent hires could be assortatively matched to universities. One might go so far as to say that a government might be playing a similar game in trying to attract businesses or even excellent immigrants to its borders.

However, for individual survey responses to SWB questions, it is harder, using an instrumental model, to rationalize the fact that one's country's ranking trumps material affluence levels in predicting individual happiness. Similarly, the nationwide benefit obtained from winning football matches or Olympic medals is surely in the form of a direct "glow" relating to one's identity as a national, rather than in the form of an expected material gain.

Interpreting SWB

A natural question is whether after finding that SWB reflects ranks in cross-sections and time series, and after noticing that the mean life evaluation response in the 21st Century is coincidentally in the middle of its range, we should dismiss SWB as irrelevant to material progress. One might initially believe that the cognitive life evaluation questions used here may elicit an explicitly rank-oriented assessment, and not correspond closely enough to economists' concept of experienced well-being.

To address this, one may appeal to the broader literature on SWB, including neurological evidence on the relativity of reward responses. More generally, not only does SWB show that material goods provide benefits through social comparisons; it also shows that non-pecuniary and explicitly

social aspects of life (e.g., social contact, freedom, fairness) account for more of life evaluation differences around the world than do income levels, whether the latter are measured cardinally (Layard, Clark, and Senik, 2012, p. 64) or by rank. The former fact makes the latter one less surprising: we are highly social beings, and social effects likely come in to most explanations of welfare and behavior.

Conclusion

If SWB is on average properly reflecting respondents' experiences, then not only can one not reject the possibility that the majority of the welfare gains from higher incomes arise in a zero-sum game, before accounting for public goods, but it appears that to some degree even those public goods could bestow benefits in accordance with their global rank. Interpreted conservatively, this empirical result has only modest theoretical selectivity but suggests more care be taken in assumptions on functional form in SWB research, and in conceptions of human welfare more generally. Interpreted liberally, this suggests the possibility of a global consumption race in which nations are not just seeking material gain, not just competing in terms of trade, but are competing for a symbolic status. Were this to be the case, it would represent an inefficiency at least as important as the largest production externalities on the planet.

The findings here suggest that a continued reexamination of the strong material consumption-oriented view of welfare, which is prevalent in policy, is needed in order to treat properly the global collective action problems faced in a finite world.[14]

At the same time, especially for the international comparisons, the findings here cannot reject a relatively classical account of the benefits to economic growth, even if they put them in doubt. Rejecting the importance of material benefits, or declaring that such benefits completely dissipate at a given consumption level, should be done with caution and careful empirical work. Evidence from affective states, as complementary SWB measures to the more cognitive life assessments, provide remarkable evidence that the systematic variation of SWB around the world is not just due to asking the wrong question.

[14] In this context, one may note that social standing is a zero-sum game, but numerous aspects of positive social interactions are not.

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