Does income inequality really influence subjective wellbeing? Evidence from 21 developing countries

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Abstract Does income inequality matter for subjective wellbeing? Using data from 5945 individuals residing in 182 villages in rural areas of 21 developing countries, we test the relative importance of income inequality measured at different levels (country and village) in subjective wellbeing. Country-level inequality might increase subjective wellbeing because it signals potential upward mobility, whereas village-level inequality might exacerbate negative effects of local peer-group comparisons on subjective wellbeing. The two measures of income inequality are not correlated, supporting the intuition that these variables might capture different aspects of income inequality. Although we observe broad patterns that suggest inequality measured at different levels might have associations with subjective wellbeing, and with potentially differing signs, the low magnitude of these associations and their weak statistical significance do not provide enough evidence to support the argument that the level at which income inequality is measured explains overall patterns of subjective wellbeing. Our results therefore leave open for future research the question of what underlying forces might account for these observed patterns.

1. Introduction

How might income inequality affect an individual's subjective sense of wellbeing?[1] Although intuition suggests that by driving an economic wedge between the "have's" and the "have not's" income inequality could undermine subjective wellbeing (SWB), inequality can be driven by many underlying causes, including opportunities for self-advancement and upward mobility over time. Some studies point to a negative association between income inequality and the reported wellbeing of individuals at a point in time (Alesina, et al., 2004; Biancotti & D'Alessio, 2008; Verme, 2011), while others find positive (Berg & Veenhoven, 2010) or ambiguous patterns (Bjornskov, Dreher, & Fischer, 2008; Blanchflower & Oswald, 2004; Helliwell, 2003; Stevenson & Wolfers, 2008). This paper examines some of these reported differences using data from the developing world, providing further empirical evidence that role of inequality in reported levels of subjective wellbeing remains unclear.

Research on happiness has identified three main mechanisms through which income inequality might negatively influence SWB. The first relates to the marginal utility of income, the second to inequality's deleterious effects on the social fabric, and the third to a comparison effect.

Mainstream economics asserts that an individual's marginal utility diminishes as income rises. To the extent income is a driver of utility or subjective wellbeing (SWB), marginal increases in SWB will be smaller at higher levels of income. In short, an extra dollar has greater value in terms of SWB to a poor person than to her rich neighbor

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[1] In this text we use the terms "happiness," "subjective wellbeing," and "life satisfaction" interchangeably, although we acknowledge that their meanings may differ accross cultures and contexts.

(Helliwell, Layard, & Sachs, 2012). This diminishing marginal return to income implies that, for a given overall amount of income in a group, or GDP in a society, a more equal distribution will result in higher average SWB. In other words, when comparing two groups of individuals, the group with a more equal distribution of income will report a higher average level of wellbeing.

The second mechanism at work may be purely social: if individuals perceive income inequality as unfair, then income inequality might undermine SWB by producing greater social tensions (Graham & Felton, 2006; Grosfeld & Senik, 2010; Wilkinson & Pickett, 2009). Under this view, income inequality might damage the social capital of a community through numerous channels, including the erosion of trust, or through the reduction in generosity and reciprocity, thereby dividing societies and groups (Egolf, Lasker, Wolf, & Potvin, 1992; Kawachi & Kennedy, 1999; Wilkinson & Pickett, 2009). The implication, again, is that groups with more equal distributions of income will report higher levels of satisfaction, on average.

The third mechanism through which income inequality might reduce SWB is through comparisons with relevant others (Ferrer-i-Carbonell, 2005; Larrea & Kawachi, 2005). Social comparisons might produce a sense of relative deprivation that could unleash negative emotions, including envy, shame, guilt, anger, depression, hostility, cynicism, or insecurity. These, in turn, might reduce average SWB within the group, even as some members gain in material wellbeing and status (Kawachi & Kennedy, 2002; Macinko, Shi, Starfield, & Wulu, 2003; Marmot & Wilkinson, 2001; Wilkinson, 1997).

Of these three mechanisms, the third has received the most research attention. Some have argued that, while social comparisons might produce a sense of relative

deprivation, such feelings will depend on the individual's relative position, especially as compared to a reference group. For example, someone's reported wellbeing might depend on whether that individual is above or below the group mean income (Clark & D'Ambrosio 2014). In laboratory settings, for example, manipulated levels of "social distance" have been found to exert influence over divisions in a dictator game (Hoffman et al. 1996). To date, most empirical findings provide somewhat inconclusive evidence regarding how comparisons among relevant members of a group influence the effect of income inequality on SWB (see Clark *et al*. 2008 for a review). Using data from the British Household Panel Study, Clark and Oswald (1996) show that the estimated coefficients on own and others' income in a job-satisfaction equation are statistically equal and opposite. In a similar study using the German Socio-Economic Panel, Ferrer-i-Carbonell (2005) finds that the reference group's income is as important for individual happiness as own income, that individuals are happier the larger their income is in comparison with the income of the reference group, and that for West Germany this comparison effect is asymmetric, i.e., mostly upwards. Using the US National Survey of Families and Households to examine data defined at the local area, Luttmer (2005) shows that life satisfaction is negatively correlated with average income. In contrast, several studies have found a positive association between reported life satisfaction and the income of close neighbors (Barrington-Leigh and Helliwell, 2008; Kingdon and Knight, 2007; Clark *et al*., 2009*a*). The argument for this may be that in certain contexts people display empathy or concern regarding others' material wellbeing.

Finally, some research suggests that the effect of income inequality on SWB might differ depending on whether people compare themselves with a group to which they belong (as in the examples above) or whether they compare themselves with a

group to which they *aspire* to belong, but of which they are not yet members (Clark & D'Ambrosio 2014). Indeed, some evidence suggests that individual well-being is *positively* correlated with higher income in the group to which the individual aspires to join, even if this translates in higher inequality at present. The explanation is that, in such contexts, income inequality might signal the potential for upward mobility, and that income inequality may increase present satisfaction by providing hope for a better future (Alesina, Di Tella, & MacCulloch, 2004). This "information tunnel effect" allows others' earnings to provide information about one's own future prospects (Ravallion & Lokshin, 2002; Senik, 2004). Empirical evidence on this is, however, inconclusive. For example, using data from Latin America Graham and Felton (2006) find a negative correlation between income inequality and happiness, especially among the poor. They interpret this as evidence that the poor perceive income inequality as a signal of persistent disadvantage rather than as a signal of opportunity and mobility. Viewing the findings broadly, Clark *et al*. (2009*b*) make the point that empirical estimates of the association between income inequality and SWB likely mix two underlying drivers. The first is the role of the individual in relation to the reference group, i.e., whether an individual is above or below the mean income for his or her comparison group. The second is the role of membership status in the group, i.e., whether an individual already belongs to the reference group or merely aspires to join it.

   To help disentangle some of the factors that might mediate the association between income inequality and SWB, we examine whether income inequality with respect to different reference groups (countries and villages) relate systematically and in the same way to reported levels of SWB. We argue that the relation between income inequality and SWB depends critically on the reference group used for comparison. For

example, income inequality measured at the country level may signal something different from income inequality measured at the village level: country-level income inequality might reflect regional and rural-urban differences, whereas village-level income inequality might measure levels of local differentiation that do not necessarily appear in country aggregates.

Do both forms of income inequality matter for SWB? Do they matter equally? In what ways? To answer these questions, we employ data from a large, cross-country sample of individuals residing in low-income rural areas of the world. As a whole, the individuals in our sample have relatively low levels of cash and non-cash income. But, while the sample might be biased since the poor might disproportionally "look up" at their relatively wealthy neighbors, not all respondents are poor. The data cover a wide range of situations, including those that reflect high disparities in local and national income, large differences in underlying economic growth and opportunity, and wide-ranging opportunities for rural-urban migration. The overall heterogeneity – both within groups and between groups and national comparison populations –provides an opportunity to test our hypotheses regarding the role of comparison or reference populations in SWB.

We organize our work in two parts. In part one, we use approach the inequality-happiness hypothesis at a "macro" level, relying on variables summarized at country- and village-levels (i.e., country- and village-level income inequality and aggregated measures of country- and village-level SWB). In part two, we employ a "micro" approach, conducting our analysis at the level of the individual and using measures of SWB as reported by individual respondents. The micro approach allows us to control for individual characteristics that might affect SWB, thereby providing a more robust

estimation of the association between income inequality and SWB. Specifically, in part two we test the association between individual levels of SWB and indices of village- and country-level income inequality whilst controlling for a set of individual-, household- and country-level variables that have become standard controls in studies of SWB (Easterlin, 2003; Easterlin, et al., 2010; Helliwell, et al., 2012; Myers & Diener, 1995).

2. Data and methods

Our data were collected over the period 2005-2010 by the Poverty Environment Network (PEN), the largest quantitative, global-comparative research project on forests and rural livelihoods to date (for details, see Angelsen, et al., 2014; Angelsen, Larsen, Lund, Smith-Hall, & Wunder, 2011; Reyes-García, et al., 2015). A network of about 45 researchers used the same research protocol and questionnaire to collect individual-, household-, and village-level data. In each survey location, the PEN survey covered a 12-month period. Household data were collected by two surveys at the beginning and the end of the survey period, and quarterly income surveys (with one- or three-month recall periods). Village surveys at the beginning and end of the survey period were used to collect contextual information common to all sample households in a group.

2.1 Site selection and sampling

Three criteria determined PEN site selection: (i) location within tropical or sub-tropical regions of Asia, Africa, or Latin America; (ii) close proximity to forests; and (iii) contribution to overall country- or site-level variation of the PEN global data set. The sample is representative of smallholder-dominated tropical and sub-tropical landscapes with moderate-to-good access to forest resources (Angelsen, et al., 2014). Moreover,

the sample includes societies with a wide range of customs, norms, religious beliefs, and livelihoods, in other words, with a wide range of factors that one might reasonably expect to affect notions of the relative importance of income, income inequality, and SWB (Diener, Oishi, & Lucas, 2003; Myers, 1993; Selin & Davey, 2012).

Within each site, villages were chosen with considerations given to variation in distance to market, vegetation type, land tenure and local institutions, population density, ethnic composition, sources of risk, and poverty levels (Cavendish, 2003). Within villages, households were randomly sampled based on household rosters or pre-existing censuses. In each household either the male or the female household head was interviewed. The sample we use here includes 5,945 respondent-households residing in 182 villages in 21 countries.

2.2 Dependent variable: SWB

Data on individual SWB were collected in the last round of the household survey, after enumerators had established good rapport with the respondents. We followed one of the two standard approaches used by psychologists and economists to measure SWB, and measured individual life satisfaction, or the *overall appreciation of one's life* (Diener, Suh, Lucas, & Smith, 1999; Easterlin, McVey, Switek, Sawangfa, & Zweig, 2010). We used survey questions that have proved useful in similar cross-country comparisons. Specifically, we asked: "*All things considered together, how satisfied are you with your life over the past 12 months?*" We framed the question on a 12-month period to allow for comparison with the detailed socioeconomic information collected in our surveys. We allowed respondents to give answers on a five-point scale ranging from 1 (very unsatisfied) to 5 (very satisfied).

2.3 Explanatory variables

The two main explanatory variables of interest in this paper are country-level and village-level Gini coefficients of income inequality. *Country-level Gini coefficients* were used to measure national income inequality. Specifically, we used the year- and country-specific *Gini-coefficient* index for income distribution reported in the World Income Inequality Database (WIID, https://www.wider.unu.edu/project/wiid-world-income-inequality-database). The WIID database is regarded as the most reliable and comparable data source on income inequality currently available (Rozer & Kraaykamp 2013, Jenkins 2015). In several cases, the database lacked Gini values for some year-country combinations. We replaced these missing data with observations for the closest year available. When WIID data were unavailable, we used data reported by the World Bank (http://data.worldbank.org/indicator).[2]

We calculated *village-level Gini coefficients* using total annual household income from the survey. Our measure included cash income and the value of direct household consumption of own-provisioned goods and services. Household income data were collected through four quarterly surveys supplemented by additional household surveys at the beginning and at the end of year-long fieldwork. Respondents derived income from a wide range of activities, including farming, livestock husbandry, extraction of natural resources, and various off-farm activities. To assign a cash value to products, we used local market prices.[3] For self-employment (e.g., in agriculture and extractive

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[2] GINI data used in the analysis, along with sources and years, are available from the authors upon request.

[3] When products are consumed directly without market exchange, imputing values can be a challenge (Wunder, Luckert, & Smith-Hall, 2011). We assigned values as follows (in order of

activities), income was defined as the gross value (quantity produced multiplied by price) minus the costs of purchased inputs (e.g., fertilizers, seeds, tools, hired labor, and marketing costs). To compare across households, we divided total household income by adult equivalent units (AEU) of households.[4] To compare across countries and years, we further converted all local AEU values to USD using the average purchasing power parity (PPP) exchange rate prevailing in the survey year.

To measure village-level income inequality, we first dropped all villages with fewer than 15 interviewed households. We then computed village-level Gini coefficients using the Stata 13 command `ginidesc`. The average number of households per village was of 207 (±265.5), of which we interviewed an average of 33 (±31) households or 31% households in a village. Only in 25 of the sample villages did we interview less than 10% of village households.

2.4 Control variables

We selected control variables based on the literature on the determinants of SWB (Easterlin, 2003; Easterlin, et al., 2010; Helliwell, et al., 2012; Myers & Diener, 1995) and our previous work with the same dataset (Reyes-García, et al., 2015). We included the following individual-level variables: (i) *absolute income* (in PPP adjusted US$ per AEU, and entered as natural logarithms in regression) and *relative income* (or the household's

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priority): using the local market price; reported barter values; the price of a substitute; reported willingness to pay; prices in other markets adjusted by transport costs; and the opportunity cost of time. Any remaining missing values were replaced by average village prices, adjusting for any seasonal variation.

[4] We follow the World Bank formula (a variant of the OECD scale; see Atkinson, Rainwater & Smeeding, 1995): children below 15 and adults above 65 receive a weight of 0.5 and all other household members (15-65 years) receive a weight of 1.0.

income position relative to the average in the village of residence);[5] (ii) sex (*female*=1); (iii) *age* and *age squared*; (iv) *household size*; (v) marital status (differentiating between respondents who were *married* or in marriage-like arrangements at the time of the interview (*married*=1) and respondents who were single, divorced, and widowed (*married*=0)); (vi) *education* (maximum school level); (vii) *illness* (capturing whether or not a household member died or was seriously ill during the past 12 months); (viii) *shock* (capturing whether the household suffered any major crop, livestock, or other assets loss in the previous year); and (ix) social capital and support measured using two standard questions, one corresponding to *help:* "*Can you get help from other people in the village if you are in need, for example, if you need extra money because someone in your family is sick?*" (1=yes, 0=no or sometimes); and another corresponding to *trust:* "*In general, do you trust people in the village?*" (1=yes, 0=no or "I trust some people but not others"). Village-level information includes the number of households in a village. Country-level information includes *GDP per capita* (in constant 2005 PPP US$). Country-level data come from the PENN World Tables (Heston, Summers, & Aten, 2012).

2.5 Data analysis

Our macro approach measures the association between aggregated measures of SWB and the income inequality variables constructed at the country and village levels. Our micro approach aims to test the association between individual levels of SWB and indices of village- and country-level income inequality while controlling for a set of individual-, household- and country-level variables that have become standard controls

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[5] *Relative income* is centered, scaled, and defined on the unit interval: for each household we subtracted the average village income from the household's income and divided the result by the standard deviation of village income.

in studies of SWB. Drawing on the work of Alesina et al. (2004), we estimate regressions

based on the following expression:

[1] $SWB_{ivc} = \alpha + \beta VGini_{vc} + \gamma CGini_c + \delta MICRO_{ivc} + \varepsilon MACRO_{vc} + \theta_{ivc}$

where SWB_{ivc} denotes the level of subjective wellbeing reported by individual i, who

lives in village v and country c. $VGini_v$ measures village-level income inequality and

$CGini_c$ measures country-level income inequality. The vector $MICRO_{ivc}$ includes

individual- and household-level characteristics that may directly affect wellbeing, as

discussed above. The vector $MACRO_{vc}$ includes a set of village- and country-level

variables. θ_{ivc} is the error term.

Our indicator of SWB is a discrete ordered categorical variable, thus we use an

Ordered Logit regression model for multivariate analysis. Conceptually, individuals who

answered our surveys are nested within villages, and villages are nested within

countries. This nesting could influence the variance structure of the data. At an

empirical level, we test the fit of three alternative models: (1) a two-level model in

which individuals are nested within countries; (2) a two-level model in which individuals

are nested within villages; and (3) a three-level model in which individuals are nested in

villages which are, in turn, nested within countries. We take into account the multilevel

structure of model variance by fitting a mixed-effects logistic model for ordered

responses (using the Stata 13 command `meologit`). We begin by fitting these three

models in a set of multilevel ordered logit regressions with individual SWB as our

dependent variable and standard correlates of SWB as our controls. We compare the

results using a likelihood-ratio test. We then include our main explanatory variables

(country- and village-level income inequality) and additional village- (population) and country- level (GDP) control variables for the variance structure in the corresponding upper-level nests. Finally, to test the robustness of our findings we run two different types of analyses. In one we use the same models, but run separate regressions for the samples of men and women and the samples of people in the first and fifth income quintiles. In our second check, we alternatively omit three key regressors from our models: absolute income, relative income, and trust.

3   Results

The average individual SWB was slightly above the midpoint of our 5-point scale (mean=3.21; SD=1.03). About half of the respondents reported being satisfied (45%) or very satisfied (5%) with their lives in the 12 months prior to the survey. The percentage of respondents reporting to be unsatisfied (23%) or very unsatisfied (6%) with their lives was lower. The remaining 22% reported to be neither satisfied nor dissatisfied. When aggregating the SWB data, the country-average level of satisfaction in our sample ranged from 2.50 to 3.77, with an average 3.2 (SD=0.39). The highest national averages of SWB were reported in India and Guatemala (both 3.8) and the lowest national averages were reported in Ethiopia (2.5), Nigeria (2.6) and Uganda (2.7).

For some locations, data across all five response categories were sparse, raising challenges for the econometric estimation. We therefore recoded the SWB variable in three levels 1 (dissatisfied), 2 (neither satisfied nor dissatisfied) and 3 (satisfied). After transformation, the average SWB of the sample was 2.21 (0.86). Not surprisingly, when aggregating SWB at the village (mean=2.14, SD=0.45) and country levels (mean=2.24, SD=0.31) we find a somewhat lower dispersion (Figure 1).
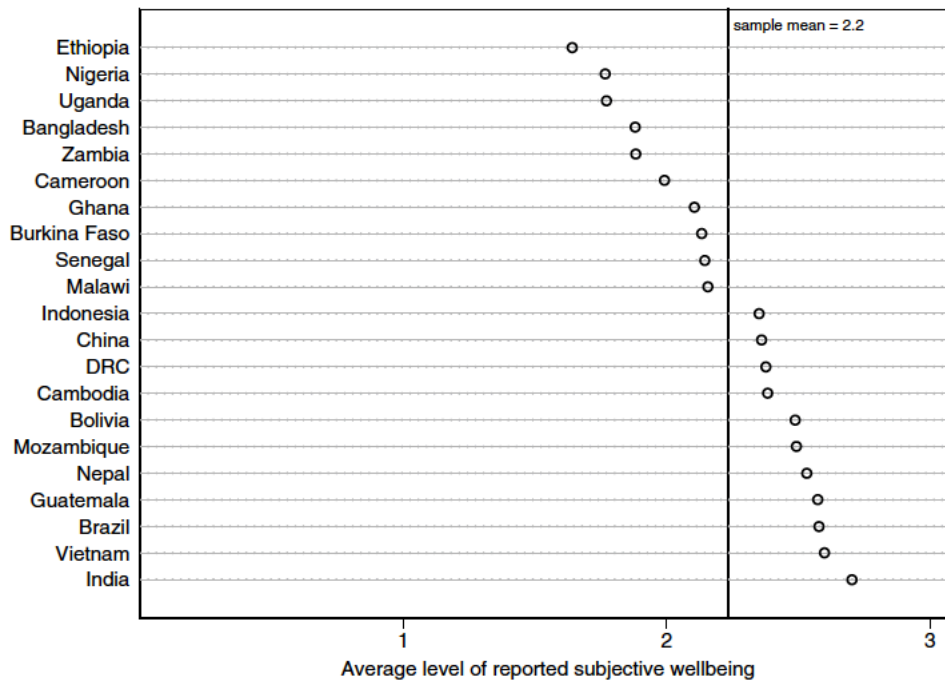
Figure 1. Average level of reported subjective wellbeing, by country

3.1 Macro-level analysis

We begin by considering the association between our two measures of income

inequality: country- and village-level Gini coefficients. The average country-level Gini

coefficient in the 21 countries studied is 43.6 (SD=6.2, min=29.8, max=54.0). The

average Gini coefficient in the 182 villages included in our sample is 45.6 (SD=10.8,

min=21.0, max=76.2). The correlation between the country and the village Gini

coefficients is not statistically significant (ρ= -0.08, p=0.29, n=182), suggesting that the

two variables capture different aspects of income inequality.

Figures 2 and 3 are scatter plots that allow us to inspect the bivariate relations

between the measures of SWB aggregated up to the country- and village-levels and

indicators of income inequality measured at the same levels. We consider first the

association between our measure of wellbeing (aggregated at the country level) and the

country's Gini coefficient. The correlation coefficient between the country-level average

SWB (among the sampled households) and the country's income inequality is of 0.38

(p=.09, n=21). The sign of the coefficient suggests that country income inequality is

positively associated with the reported SWB of people in the sample, although the

association is statistically weak (Figure 2). If we remove Ethiopia, the country with the

lowest average values of SWB and income inequality, from the analysis, the relation

becomes statistically insignificant, although the sign remains positive.
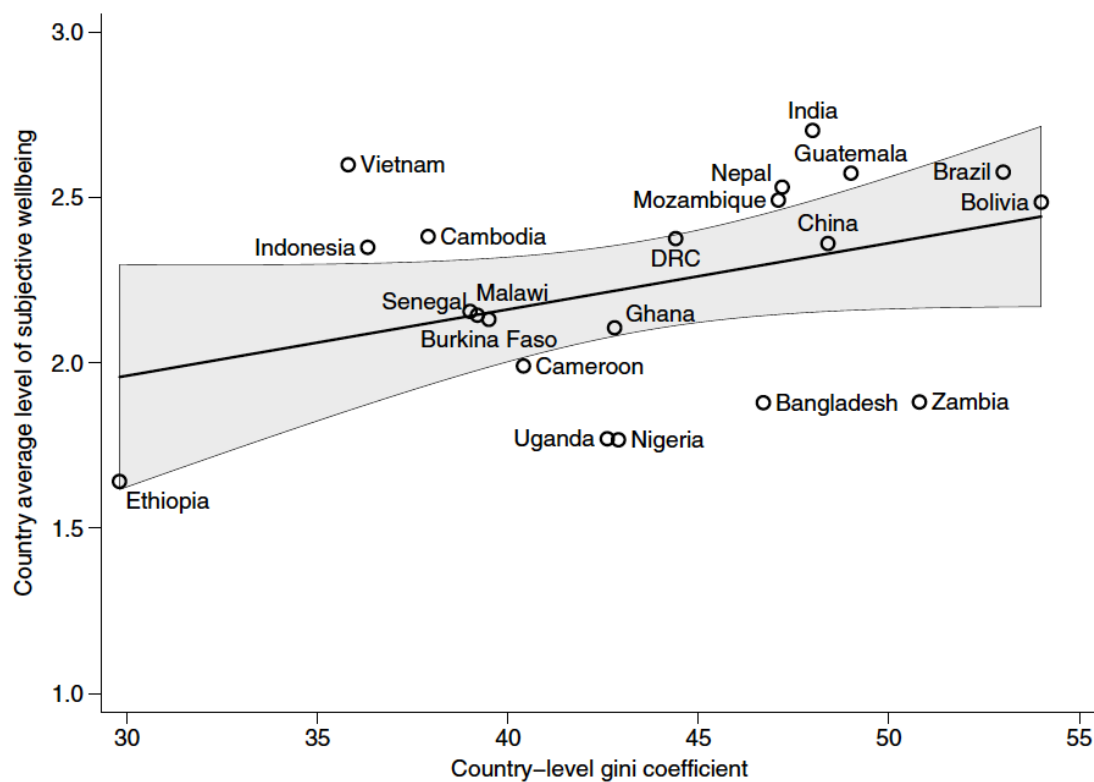

Figure 2. Country average subjective wellbeing and country-level income inequality

Figure 3 resembles Figure 2, except that in Figure 3 we plot village income

inequality and village average SWB. The correlation between the village average SWB

and the village Gini coefficient of income inequality is *negative* and statistically different

from zero (ρ= -0.15, p=.05, n=182). However, since measures of village income

inequality are not independent within a country, we further test the robustness of the association illustrated in Figure 3 by running a regression incorporating country-level fixed-effects, using SWB as the outcome and village inequality as an explanatory variable. Results from this regression (not shown) suggest that these country-level fixed effects account for much of the observed variation in outcome. In other words, once we control for time-invariant characteristics of the country, village income inequality is not associated in a statistically significant way with a village average subjective wellbeing.
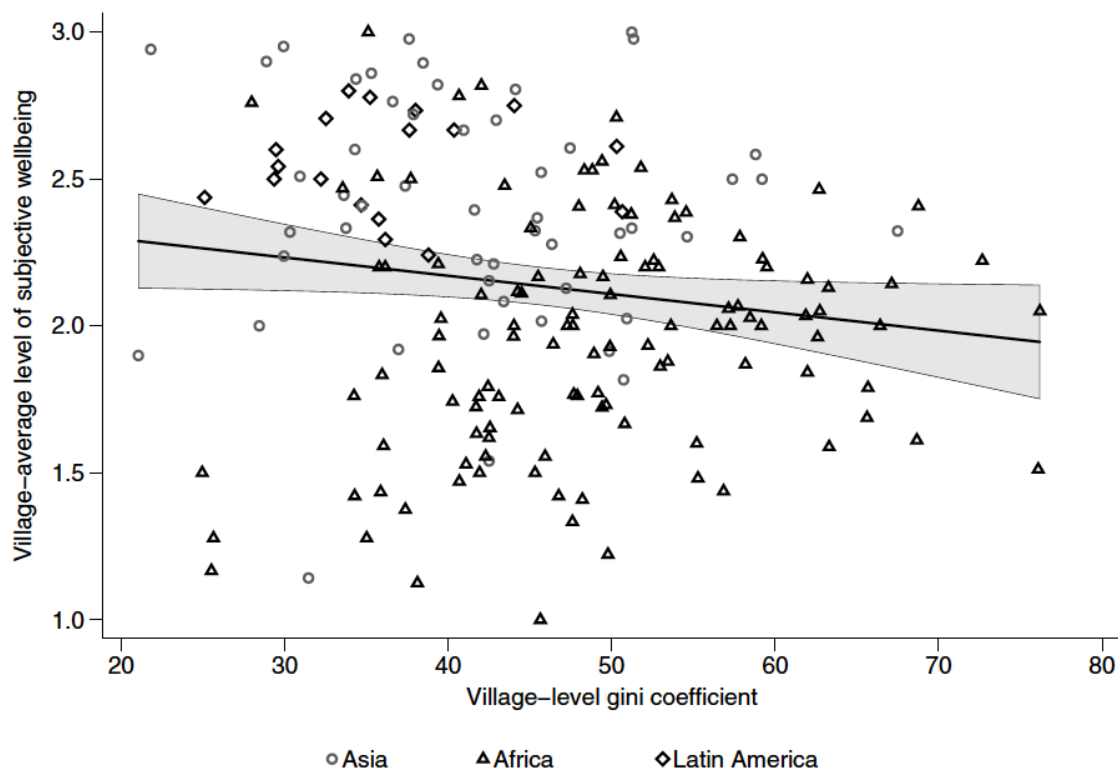

Figure 3. Village-level subjective wellbeing and village-level income inequality

To gauge the importance of the association between income and SWB, we conduct a bivariate analysis to measure the association between GDP and two variables of interest: country-aggregated SWB and country-level income inequality. GDP correlates in a positive and statistically significant way with country average SWB (ρ=

0.50, p=.02, n=21) (Figure 4) and with country income inequality (ρ= 0.49, p=.03, n=21).

Brazil has a considerably larger GDP than other countries in the sample. When we

remove Brazil from the sample the correlation between GDP and country income

inequality loses its statistical significance (p=.12), but the correlation between GDP and

SWB remains significant (ρ= 0.46, p=.04, n=20). As Figure 4 illustrates, SWB appears to

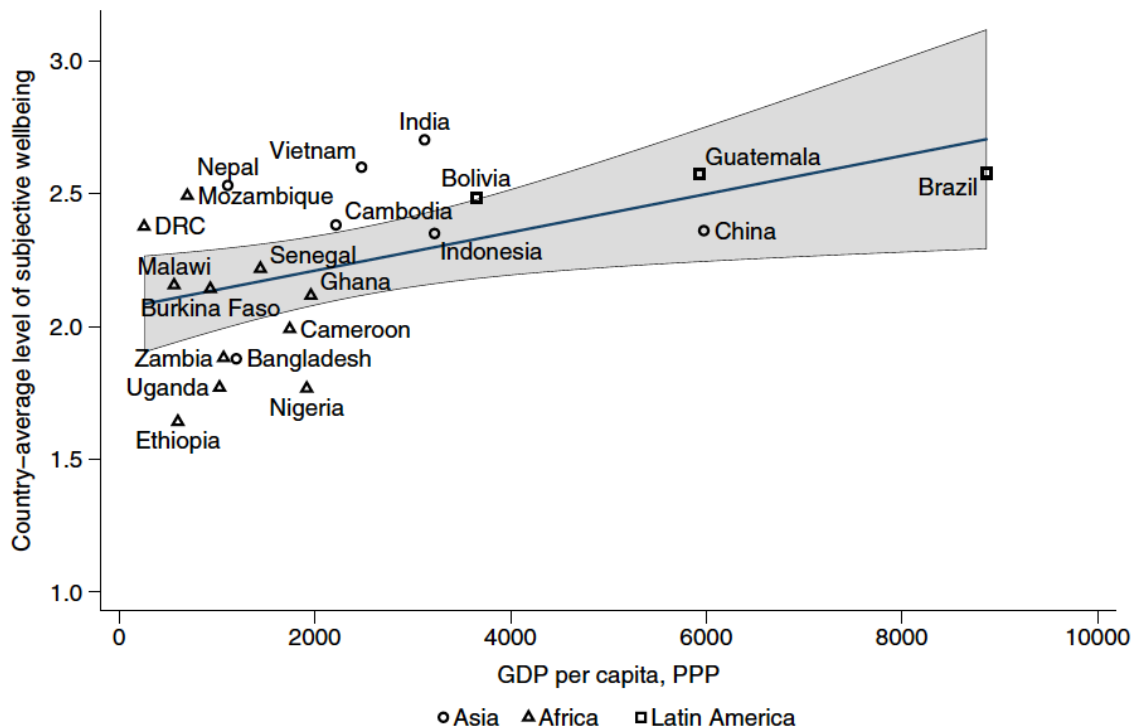be an increasing function of GDP/capita.

Figure 4. Country-average subjective wellbeing and PPP-converted GDP per capita

3.2 Micro-level analysis

In part two of the analysis we shift from measures aggregated at the country- and

village-levels to individual-level measures of SWB. We use multivariate analysis, which

allows us to control for standard covariates of SWB. Table 1 presents the descriptive

statistics of individual-, village-, and country-level variables used in multivariate

regression analysis. The average respondent in our sample was a married (88%) man

(74%) of 44 years of age, living in a household with 6.2 persons. This average

respondent had relatively little education (36% of the sample had no schooling). About

one third (30%) of the households had suffered a death or a major illness the year

before the interview, and 45% had suffered a major loss of crops or livestock during the

same period. [6] Only 36% of respondents were certain they could obtain help if needed

and about half (47%) of the sample generally trusted people in their village of residency.

The average total PPP income per AEU was US$ 1,438. The average population in the

study villages was 1,300 and the average GDP of countries in the sample was US$ 2,379

(SD=2176.6, min=253.7, max=8867.0) in constant 2005 dollars. In about three quarters

of the households, absolute income (measured in PPP adjusted US$ per AEU) was below

the GDP of their country at the time of the survey[7].

INSERT TABLE 1

Some of the variables typically used as controls in standard analyses of SWB

might display multicollinearity with our measures of income inequality. For example,

relative income captures some aspects of inequality.[8] So, we first test for

multicollinearity by computing the variance inflation factors (VIF) of explanatory and

control variables. With the exception of age and age squared, none of the variables

used in the analysis has a VIF> 2. Accordingly, we see no support for concerns regarding

multicollinearity in these data.

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[6] Börner, Shively, Wunder & Wyman (2015) explore how households weathered these shocks.

[7] The two measures are not directly comparable, as AEU is ca. 50% higher than per capita income used in GDP, potentially overestimating the share below the national average. Additionally our measure of absolute income includes environmental income, typically underestimated in national surveys.

[8] Note that the dependence of both relative and absolute income on household size introduces correlation. In absolute terms the correlation between relative and absolute income is rho=0.598 p<0.001.

Results from the first two-level ordered logit regressions (individuals in countries) suggest that the total variance in the population attributable to country differences is 0.44 (SE=0.14) (Table 2, Model 1). The variance component associated with village differences is larger (var=1.06, SE=0.14) (Table 2, Model 2). The reported likelihood-ratio test suggests that variability observed between countries or between villages favors a mixed-effects ordered logistic regression over a standard ordered logistic regression. Using the same model structure, we can also fit a three-level model (individuals, villages, countries). Compared with Model 1 (individuals in countries), the variance component attributable to the country level is slightly larger (0.44 vs. 0.45). Compared with Model 2 (individuals in villages), the component of variance in the SWB variable attributable to random variations in villages is lower (0.60 vs. 1.06). A likelihood-ratio test comparing results from models (1) and (3) suggests that Model 3 provides a somewhat better fit of the data than the other approaches.[9]

INSERT TABLE 2

Table 3 presents the main results from the micro-level analysis. In Model 1 (individuals nested within countries), we find a negative and statistically significant association between village-level income inequality and individual SWB. That is, individuals who live in villages with higher levels of village income inequality report lower levels of SWB than individuals who live in villages with lower levels of income equality. The estimated coefficient is statistically significant (p=.018), but small: a ten-unit increase in village-level income inequality (e.g. a change in the Gini from 0.45 to 0.55) would result in a 0.08-unit decrease in the log-odds of reporting one higher level

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[9] Not all models could be reliably estimated for all variance structures.

of SWB. Additionally, in this model we do not find any statistically significant association between country-level income inequality and individual SWB (Table 3, Model 1).

INSERT TABLE 3

Results are different for Model 2 (individuals nested in villages). In this model, we find a positive and statistically significant association between country-level income inequality and individual SWB. That is, once we take into account the variance attributable to village differences, results show that individuals living in countries with higher income inequality report higher levels of SWB. The coefficient on the association is double the coefficient found in Model 1 and the association is statistically significant (0.045, p<.0001). In this model village-level income inequality is not associated in a statistically significant way (p=.12) with individual SWB (Table 3, Model 2).

Finally, Model 3 nests individuals within villages and villages within countries. In this model, neither of the two income inequality variables bears a positive association with individual SWB, although the signs of the association remain the same as in previous models (Table 3, Model 3).

In the three models, the variance components of the group level variables (village and country) are statistically significant, which justifies our mixed-model approach. For example, in Model 1 (individual nested in countries), the total variance in the SWB of the sample attributable to country differences is 0.40 (SE=0.13), slightly lower than the variance component found in the corresponding model without the income inequality variables. We see a similar pattern for the variance component associated with village (var=0.97, SE=0.13), which is also slightly lower than found in Model 2 (Table 2). When fitting the three-level model, we find that although the variance component attributable to country is roughly the same as in the two-level

model, the component of variance attributable to random variations at the village level is lower than in Model 2 (0.59 vs. 0.97).

Some of our control variables are consistently associated with SWB. First, across the three models, individuals living in households with higher absolute and higher relative income consistently report higher levels of SWB than individuals living in households with lower levels of absolute and relative household income. Second, individuals married and living in larger households also report higher levels of SWB than those who are not married or who live in smaller households. Third, individuals living in households having experienced a death or severe illness or a major loss (i.e., crop loss, robbery) over the 12 month of data collection display lower levels of SWB than their counterparts. And fourth, respondents who could obtain help from friends and neighbours and individuals who generally trusted people in their villages report higher levels of SWB than individuals displaying lower levels of social capital.

Results from our robustness checks (not shown) generally resemble results in Table 3 with some noteworthy exceptions. First, village inequality bears a negative and statistically significant association to SWB in Models 1 and 2 for the sample of men but not for the sample of women. Second, country inequality bears a positive and statistically significant association to SWB in Models 1-3 for the 20% sample of people with lower income, but not for the 20% sample of people with higher income. Third, when we omit absolute income from the analysis, the two measures of income inequality become statistically significant in the three models; but the results remain unchanged when omitting relative income. Finally, when reestimating our models omitting the trust variable, the sign, magnitude and significance of the inequality coefficient are unchanged.

4   Discussion and conclusion

In this work we use data from a large sample of individuals residing in 182 low-income rural villages from 21 countries to analyze whether the associations between country- and village-income inequality and aggregated and individual measures of SWB. Before discussing the main results, we comment on three main limitations that call for caution when interpreting our findings.

First, the sample used includes individuals from many different countries. Previous findings point to the effects of comparison income at different geographical levels. Knight et al. (2009) find relative income within a village to be correlated with current happiness in China; Barrington-Leigh and Helliwell (2008) find evidence of significant effects of others' income at different scales for Canada; and Brodeur and Fleche (2012) find a positive relationship between median county income and SWB for an Eastern city in the US. Because our sample includes many different geographical areas, our results might not be able to pick a general trend.

Second, our data might also be biased because it includes only individuals residing in low-income rural areas, and income is typically under-reported in poor settings. Although the income recording in the PEN project was more comprehensive than in typical national poverty or household income surveys (Angelsen, et al., 2014), welfare might be more accurately measured using an expenditure-based method (Meyer and Sullivan 2003). Unfortunately, the PEN survey did not collect data on expenditures, precluding us from testing whether our results are robust to alternative measures of income.

Third, because to conduct our micro-level analysis we work with cross-sectional rather than with panel data, we cannot control for potential endogeneity or unobserved factors (such as personality) that might partially explain SWB (DeNeve & Cooper, 1998; Steel, Schmidt, & Shultz, 2008). In other words, it is possible that—for unobserved reasons—communities that display higher life satisfaction are less unequal. Our dataset did not include any candidate variables that one might use to reliably serve as instruments to test and correct for the endogeneity of SWB and other factors.

With these caveats in mind, we now discuss the three most important findings of our work. The first important finding of this work is that the two measures of income inequality constructed (country- and village-income inequality) are uncorrelated. The finding is not surprising since it is possible to observe equally poor (or rich) villages in a country with overall high levels of income inequality and to find highly unequal villages in a country that otherwise exhibits low levels of overall income inequality. Country level inequality captures income disparities between rural and urban areas. In the countries included in this study, such disparities could plausibly contribute to overall inequality.

The second important finding relates to the undisputed association between measures of income and our measure of SWB. Thus, in bivariate analysis using aggregated data we found confirmation that SWB presents an increasing function of GDP per capita. Similarly, results from the micro-level analysis also suggest that among the multiple correlates of SWB both absolute and relative income exert a positive effect on SWB. While the finding has been largely reported in the literature (see Frey & Stutzer, 2002; Stevenson & Wolfers, Reyes-García et al. 2015), it is important to confirm

that our data dovetails previous findings in correlates of SWB literature before discussing the main finding in relation to our research question.

Our third important finding is that the empirical evidence to support the idea that country and village income inequality are associated to SWB in opposite directions is weak. Correlations observed in our macro-level analysis suggest that a high degree of country-level income inequality is associated with *higher* average SWB, whereas higher village-level income inequality is associated with *lower* average SWB. However, the statistical significance of the first association is low, and the statistical significance of the second disappears once we control for country fixed-effects, which absorb much of the observed variation in between-country differences in SWB. Similarly, findings from our micro-level analysis provide weak evidence to support our hypothesis. That is, the analysis confirms the signs of the association between individual SWB and country- and village-level income coefficients found in the macro-level analysis, but the effects found are also weak and, in some specifications, the association entirely disappears.

Researchers have advanced several theoretical arguments to explain why income inequality might negatively affect the SWB of individuals, especially when inequality is perceived as unfair (Graham & Felton, 2006; Grosfeld & Senik, 2010; Wilkinson & Pickett, 2009). Despite such arguments, findings from empirical work have provided inconclusive and contradictory evidence on the effects of income inequality on SWB (Verme, 2011). Previous authors explain such contradictory evidence by the argument that income inequality does not affect all people in the same way: richer people might be more insulated from income inequality than poor people (Graham & Felton, 2006) or there may be different cultural views regarding inequality (Alesina, et al., 2004).

In this work we explored an alternative explanation. Based on the idea that when people compare themselves to a distant group, they project themselves into a *better future*, with consequent positive effects on SWB (Alesina, et al., 2004; Clark, 2003; Verme, 2011), whereas when people compare themselves to a nearby reference group, they focus on *present deprivation*, with consequent negative implications for SWB (Marmot & Wilkinson, 2001; Reyes-García et al. 2015), we tested whether income inequality measured at different levels (country and village) may have different implications for SWB. Although the associations studied had the expected sign, we did not find enough evidence to argue that measuring income inequality at different levels helps decipher the potential effect of income inequality in SWB. Thus, although 73% of the households in our sample had average individual absolute income levels below the GDP per capita in their countries' at the time of the survey, seeing higher levels of income in distant cities or richer areas of their country do not seem to increase their SWB. Similarly, local income inequality does not seem to affect the SWB of the sample (for example through the generation of negative emotions), not even when removing from the analysis the variable relative income. Moreover, even in the models in which we found significant associations, the magnitude of the coefficients is low. Thus, the magnitude of positive associations between SWB and absolute and relative income, marriage, help, and trust, as well as the magnitude of negative associations between SWB and illness or major economic losses are larger than the magnitude of the association between SWB and our two measures of income inequality.

One additional finding emerges from our micro-level analysis. Results from multilevel model analysis suggest that a large part of the component of variance in the SWB variable is attributable to random variations in countries and – especially – villages.

There is an extended discussion on whether happiness is context-dependent or not. Some authors argue that happiness is an affective experience linked to universal human needs, which suggests that the conditions of happiness are similar across the world, even if different countries and cultures give different meanings to the concept of happiness (Eid & Diener, 2001; Selin & Davey, 2012). Other authors, however, argue that contextual and cultural factors can affect whether emotions are considered valuable and appropriate across cultures, thus suggesting that some correlates of SWB can be culture-specific (Diener & Oishi, 2005; Diener, et al., 2003). The significance of group variables in our hierarchical models lends support to the argument that different social groups might have different notions of SWB. It might also be the case, of course, that important but unobserved local-level variables (e.g., quality of environment, incidence of crime) drive the relation, a promising area in which to focus future work.

In sum, although we observe broad patterns that suggest inequality measured at different levels might have associations with subjective wellbeing, and with potentially differing signs, the low magnitude of these associations and their weak statistical significance do not provide enough evidence to support the argument that the level at which income inequality is measured explains overall patterns of subjective wellbeing. Our results therefore leave open for future research the question of what underlying forces might account for these observed patterns.

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Figure Captions

Figure 1: Country average level of reported subjective wellbeing

Figure 2: Country average subjective wellbeing and country income inequality

Figure 3: Village average subjective wellbeing and village income inequality

Figure 4: Country average subjective wellbeing and PPP-converted GDP per capita

Table 1: Definitions and descriptive statistics for variables used in the analysis

		Mean (or %)	SD
Dependent variable (n=5945)			
Subjective wellbeing	% people who felt unsatisfied with life in the past 12 months	28.4	
	% people neither satisfied nor unsatisfied in past 12 months	21.8	
	% people who felt satisfied with life in the past 12 months	49.8	
Individual-level factors (n=5945)			
Absolute income	Household annual cash and subsistence income, in PPP adjusted US$ per AEU (entered as logarithm).	1438	2561
Relative income	Household's income position relative to the average in the village of residence. The measure was constructed by subtracting the mean income at the site level from the household income, and dividing the result by the standard error.	-.001	.99
Female	% women answering the survey	26%	
Age	Age of the person, in years	44.2	14.6
Household size	Number of adult-equivalents living in the household	6.2	3.3
Married	% married or in marriage-like situation at time of survey (=1)	88%	
Education	No schooling	36%	
	Primary school	29%	
	Secondary school	33%	
	Higher education	2%	
Illness	% of HHs experiencing serious illness or death in past year	30%	
Shock	% of HHs experiencing major loss of crop/livestock past year	45%	
Social capital	*Help:* Households that can get help when in need	36%	
	Trust: Respondents generally trusting village people	47%	
Village-level factors (n=182)			
Population	Number of people living in the village at time of survey	1300	1751
Village income inequality	Gini index of village-level income inequality	45.6	10.8
Country-level factors (n=21)			
GDP	Gross Domestic Product per capita (constant 2005 dollars);	2379	2177
Country income inequality	Country level Gini-coefficients; (http://data.worldbank.org/indicator)	43.6	6.2

Table 2: Multi-Level Ordered Logit Regressions: dependent variable is SWB

	(1)	(2)	(3)
Absolute income	0.4058***	0.3571***	0.3124***
	(0.0535)	(0.0602)	(0.0629)
Relative income	0.1220***	0.1611***	0.1966***
	(0.0460)	(0.0507)	(0.0526)
Female	-0.0571	0.0206	-0.0045
	(0.0721)	(0.0749)	(0.0758)
Age	0.0004	-0.0070	-0.0087
	(0.0099)	(0.0103)	(0.0103)
Age squared	-0.0000	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)
Household size	0.0579***	0.0595***	0.0640***
	(0.0099)	(0.0103)	(0.0104)
Married	0.2253**	0.1871**	0.1787*
	(0.0883)	(0.0919)	(0.0919)
Primary school	0.0011	0.0199	-0.0119
	(0.0729)	(0.0766)	(0.0772)
Secondary school	0.0853	0.0886	0.0548
	(0.0769)	(0.0812)	(0.0821)
Higher education	0.1304	0.0727	0.0767
	(0.1898)	(0.2085)	(0.2086)
Illness	-0.4552***	-0.4631***	-0.4576***
	(0.0590)	(0.0627)	(0.0628)
Shock	-0.3389***	-0.2339***	-0.2226***
	(0.0553)	(0.0635)	(0.0633)
Social capital: help	0.3267***	0.2808***	0.2823***
	(0.0644)	(0.0692)	(0.0691)
Social capital: trust	0.4563***	0.5076***	0.4808***
	(0.0621)	(0.0664)	(0.0665)
Variance terms for upper-level component of model			
Country (intercept only)	0.4426*** (0.1429)		0.4546** (0.1778)
Village (intercept only)		1.0643*** (0.1442)	
Country and village (intercept only)			0.5970*** (0.0936)
N	5945	5945	5945

Note: (1) Two-level model: individuals nested in countries; (2) Two-level model: individuals nested in villages; (3) Three-level model: individuals nested in villages nested in countries;

Standard errors in parentheses; *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table 3: Multi-Level Ordered Logit Regressions: dependent variable is SWB

	(1)	(2)	(3)
Country income inequality	0.0236	0.0451***	0.0319
	(0.0234)	(0.0128)	(0.0256)
Village income inequality	-0.0080*	-0.0116	-0.0091
	(0.0034)	(0.0075)	(0.0076)
Absolute income	0.3789***	0.3040***	0.2974***
	(0.0544)	(0.0612)	(0.0632)
Relative income	0.1416***	0.1990***	0.2072***
	(0.0467)	(0.0517)	(0.0529)
Female	-0.0560	0.0164	-0.0047
	(0.0721)	(0.0749)	(0.0757)
Age	0.0004	-0.0070	-0.0086
	(0.0099)	(0.0103)	(0.0103)
Age squared	-0.0000	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)
Household size	0.0569***	0.0609***	0.0639***
	(0.0099)	(0.0103)	(0.0104)
Married	0.2235**	0.1924**	0.1796*
	(0.0883)	(0.0919)	(0.0920)
Primary school	0.0004	0.0004	-0.0140
	(0.0728)	(0.0766)	(0.0771)
Secondary school	0.0820	0.0751	0.0545
	(0.0769)	(0.0811)	(0.0821)
Higher education	0.1275	0.0645	0.0759
	(0.1895)	(0.2085)	(0.2085)
Illness	-0.4560***	-0.4646***	-0.4579***
	(0.0590)	(0.0627)	(0.0628)
Shock	-0.3348***	-0.2255***	-0.2222***
	(0.0553)	(0.0635)	(0.0633)
Social capital: help	0.3242***	0.2710***	0.2800***
	(0.0644)	(0.0692)	(0.0691)
Social capital: trust	0.4568***	0.5105***	0.4826***
	(0.0621)	(0.0663)	(0.0666)
Variance terms for upper-level component of model			
Country	0.3964***		
(as function of GDP)	(0.1298)		
Village		0.9729***	
(intercept only)		(0.1322)	
Country			0.3907**
(intercept only)			(0.1596)
Country and village			0.5931***
(village as function of population)			(0.0932)
N	5945	5945	5945

Note: (1) Two-level model: individuals nested in countries; (2) Two-level model: individuals nested in villages; (3) Three-level model: individuals nested in villages nested in countries; Standard errors in parentheses; *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.