Economic inequality and subjective well-being: is inequality good for the rich?

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Abstract

I investigate the role of income inequality in accounting for differences in subjective well-being ("happiness") across countries, using Gallup's annual global household survey, the World Poll. First, in order to motivate a focus on (ordinal) income quantile rather than cardinal income, I show that, globally, income quantile within countries (and even amongst) is a more powerful predictor of individual subjective well-being than cardinal income. Secondly, I calculate for each country the "economic gradient of well-being," the strength of the relationship between income quantile and subjective well-being, as a reduced form regression coefficient. Thirdly, I use rolling regressions carried out by domestic income quantile, but pooled across nations, to explain subjective well-being in terms of national income and the aforementioned national economic gradient coefficient. The main finding is that in countries where subjective well-being depends more strongly on one's rank in the income distribution, people are less happy across the entire income distribution. This finding differs from what one would expect if the deleterious effects (or productive incentives) of inequality played out solely through relatively impoverished households. Robustness tests and possible interpretations are supplied.

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1 Introduction

Subjective well-being (SWB), or "happiness," assessments are increasingly being incorporated into major household surveys by national statistical agencies, with economic applications and policy discussions growing apace with the confidence in and understanding of the method. These data have for decades been used by economists as an empirical measure of experienced utility, and their increased availability makes possible the new but natural approach for investigating economic inequality, explored here, in which disparity in well-being forms a core measure of inequality.

Long-standing interest in summary measures of economic inequality has been motivated by the belief that a wider distribution of income may have implications for welfare and economic growth. For instance, impoverishment associated with economic inequality may lead to inefficient human capital investment or, if inequality is mitigated too much, insufficient incentives for investment and innovation (e.g., Benabou, 1996; Barro, 1991, 2000).

For these largely theoretical ideas, summary measures such as the income Gini are not closely related to the mechanism of interest but are merely available and calculable indices. Empirical studies testing the relationship between growth and inequality tend to suffer from a surfeit of feasible causal pathways that could work to enhance or retard growth, along with other challenges of cross-country studies (see Voitchovsky, 2009, for a recent review).

My objectives are to (1) measure the effects of economic inequality at the country level by the strength of the relationship between income rank and well-being, and (2) assess whether the entire income distribution is affected negatively when this relationship, the economic gradient of well-being, is strong. In order for economic policies that reduce this gradient to be Pareto improvements, at least statically, it must be the case that even the wealthy prefer a reduction.

Motivation

This work is motivated by the existence of several literatures on the relationship between welfare and inequality in which the causative channel does not act through insufficient investment in the poor, leading to an aggregate productivity gap, but rather through mechanisms that directly affect individuals across the entire income distribution.

The present work is preliminary in the sense that I am not able to select between several conceptual models of how these effects are transmitted; rather, the objective is to differentiate the findings only from models in which negative effects of inequality occur through the relatively standard poverty, productivity, and aggregate income channel. For motivation, I mention a few classes of models that are consistent with the empirical results to come.

Akerlof (1976) describes economies in which structural and institutional factors make it difficult to observe individuals' productivity-related type, resulting in inefficient allocation of labor towards signalling oneself into a high-productivity group. The individual returns to working harder are more than the increase in productivity from the extra effort, and labor is misallocated in a "rat race" for class status.

Similar literatures on the consumption side relate to the importance of conspicuous consumption or to preferences that depend on relative income. For instance, Eaton and Eswaran (2006) describe the welfare losses that occur for everyone with increasing strength of a "Veblen" effect or with increasing productivity in the production of "Veblen" goods. Barrington-Leigh (2008) does this also for a heterogeneous population.

If the parameters describing the importance of consumption or production-based signals in these classes of model were to vary across countries, then one would predict that, controlling for productivity or income, welfare would be lower in countries that exhibit a tighter link between welfare and observable income or consumption. Frank (e.g., 2000; 2007) provides a deeper description of how such cultural and institutional parameters may play out in equilibrium and lead to higher real costs for middle income earners in the presence of high-income spenders.

There is other pertinent work from the psychology and epidemiology literatures that suggests how the strength of an income – well-being gradient may relate to overall welfare. One channel is through cultural differences in the degree of materialism, as measured by the aggregate relative emphasis placed on extrinsic versus intrinsic motivations. Evidence for an association of extrinsic and materialist values with lower well-being exists in numerous studies (e.g., Roberts and Clement, 2007; and Kasser, 2004, for a review). Again, according to this idea, economies with more emphasis on material consumption may perform well economically but suffer due to reduced consumption of non-market goods.

Lastly, Wilkinson, and more recently Wilkinson and Pickett (2007, 2009) demonstrate a relationship between inequality and welfare outcomes and have

in mind a mechanism that does not go through a consumption or investment channel. Their studies focus on the relationship between a host of health and social outcomes and the ratio of top 20% to bottom 20% incomes in a set of 23 wealthy countries and across the fifty states of the USA. Finding strong pairwise correlations, they argue that the mechanism is not through income *per se* but a result of social stratification, essentially the increased *social evaluative stress* and decreased empathy for others resulting from making and receiving continuous superficial judgements related to one's socioeconomic standing. Wilkinson and Pickett's book summarises the psychological literature that supports such a connection, and argues that the deleterious effects act on everyone, both rich and poor.

Outline

How can this claim be framed in a testable way? I address the following: Would households in the upper income brackets prefer to increase or decrease the well-being gradient between rich and poor in their country, holding their nation's mean income constant?[1] In this context, a society with low economic inequality is one in which the economic heirarchy does not strongly separate people out in terms of wellbeing, while in one with high economic inequality, the relatively wealthy are more heavily rewarded and the relatively poor are more heavily disadvantaged in terms of overall conditions of life. This conceptually new approach addresses economic inequality along a dimension that matters for well-being.[2]

All the arguments for why SWB, when and where it is sufficiently sampled, is a valuable measure of welfare with advantages over indirect measures like income per capita, also apply to a well-being-based measure of economic inequality. For instance, if income disparities are thought to matter because they lead to differences in political influence, it can be argued that the political influence, in turn, matters ultimately because it is likely to lead to

[1]Being based on cross-national comparisons, the implicit policy space in this hypothetical choice is defined by the distribution of mean incomes and income inequalities in the set of observed countries.

[2]Is such a gradient a measure of inequality? In a broad sense, the dispersion of subjective well-being in a country is a measure of overall economic inequality, because it measures the spread in overall consumption benefits, due to all directly beneficial goods, status and comparison goods, social goods, and so on. The index I define, then, measures the income-mediated or at least income-related component of this inequality — thus, the income inequality.

differences in experienced well-being. Similarly, if income disparities are inefficient in that they lead to credit constraints and other reduced opportunities for lower socioeconomic classes, a welfarist point of view argues that these differences in opportunity matter in part because they lead to differences in the ultimate outcome of experienced utility.[3]

The paper proceeds as follows. Section 2 describes the subjective response questions and other data used. Section 3 motivates the central definition given in Section 4 by demonstrating how the SWB and income distributions are related across countries. Section 5 outlines some favourable properties of the definition, and Section 6 answers the central question, "Is inequality good for the rich?" Section 7 provides some further theoretical discussion of the findings, and Section 8 concludes.

2 Data

I use data from the first five waves of Gallup's World Poll, an annual survey sampling ∼1000 respondents aged 15 and over in each of more than 140 countries, every year since 2006.[4]

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." 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?"

[3]Though not only for the poor, as there are likely to be productivity spillovers. Stated as I have above, this point of view constrasts fairly explicitly with the approach of Sen (1999), in which the subjective well-being is not to be trusted as much as the "objective" capability captured by spending power. The recent wealth of international SWB data can put largely to rest worries about the existence of the "happy poor" whose limited perspective leads them to report high subjective evaluations of life despite unarguably objectionable conditions. The world's poor do not, generally, report high SWB and in the latest data, mean income remains very highly correlated with SWB cross-nationally (Deaton, 2008; Stevenson and Wolfers, 2008; Helliwell et al., 2010).

[4]Details of the methodology are available from Gallup Organization (2010).

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 various observable aspects of life, and that averaging them together tends to decrease noise but not change coefficients.

The World Poll asks respondents about their income, using a continuous response in local currency. In order to calculate comparable incomes across many countries, I scale each country's survey responses by a constant factor in order that their mean matches the purchasing power parity GDP/capita calculated as part of version 6.2 of the Penn World Table.

Descriptive statistics for the main variables used are listed in Tables A.3 to A.6 in the Appendix.

3 Distributions of well-being and income

Incorporating SWB into a measure of inequality is in principle not an easy task. Satisfaction with life (SWL) and other cognitive life evaluations do not provide cardinal measures of strictly transferable quantities, making a comparison of income and well-being distributions difficult. On the other hand, considerable progress has been made and confidence gained in comparing SWB reports as though they were cardinal (albeit noisy) measures. This confidence relies, for example, on finding consistent patterns across countries (Helliwell et al., 2010) and on comparing estimation methods which relax the cardinality assumption with those that rely on it (Frey and Stutzer, 2002; Ferrer-i Carbonell and Frijters, 2004; Krueger and Schkade, 2008). In constructing a measure of the economic dimension of disparity in well-being, I will normalize differences in SWB reports and use ranked rather than cardinal incomes. To motivate what follows, it is worthwhile considering two preliminary pieces of evidence.

3.1 Cardinal and ordinal income

First, there is a more empirical reason to focus on ordinal income than the theoretical arguments championed by Wilkinson and Pickett. Table 1 shows that a positional income variable dominates cardinal income as a predictor of individual SWB. Adding the household-size-adjusted[5] income (column 2) into an equation already accounting for mean national incomes (column 1) adds significantly to the explained variance of individual SWB across 136 countries. However, adding the respondent's income quantile instead (column 3) explains even more. When both measures of household income are included at once (columns 4 and 5), the cardinal one drops out. Columns 6–8 show a similar test within a single country, the USA, and present a similar pattern. In this case when both income quantile and cardinal income are included, the latter attracts a negative coefficient, again indicating that, in mediating income effects on well-being, material deprivation may be a weaker channel than status-related interactions.[6]

3.2 Well-being – income gradients

Next, before defining an inequality metric, I present some graphical examples of the SWB distributions and how they relate to income quantile. The left panel of Figure 1 shows sample distributions of responses to the two life evaluation questions, in this case for Portugal. Two evident features of the histograms are common across most countries. For both questions, the lowest, highest, and middle response values are focal points and receive extra responses above the smoother, background distribution. Also, responses for Cantril's ladder question tend to be more centrally distributed than for life satisfaction (Helliwell et al., 2010).

[5]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 claims in this paper change qualitatively if unadjusted household incomes are used in place of household equivalent incomes.

[6]Still more remarkably, and as shown in Table A.7 on page 44 of the Appendix, the same pattern holds using a *global* ranking of all (adjusted) household incomes reported in the World Poll. When both individual global income rank and individual cardinal income are included, the latter drops out of estimates for SWB. For more details, see Barrington-Leigh (2010). 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.

	$\frac{1}{2}$(ladder+SWL)							
	world					USA		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(GDP/capita)	**.75**†	**.19**†	**.74**†	**.60**†				
	(.045)	(.055)	(.046)	(.090)				
ln(HH inc$_{\text{adj}}$)		**.49**†		*.12*$^{+}$	.030	**.54**†		−.18
		(.024)		(.069)	(.026)	(.060)		(.23)
income quantile			**1.62**†	**1.28**†	**1.54**†		**1.82**†	**2.4**†
			(.058)	(.19)	(.079)		(.17)	(.66)
age/100	**−2.9**†	**−3.6**†	**−3.8**†	**−3.8**†	**−3.5**†	**−9.6**†	**−9.8**†	**−9.8**†
	(.53)	(.51)	(.51)	(.50)	(.34)	(1.26)	(1.25)	(1.24)
(age/100)^2	**1.84***	**2.8**†	**3.2**†	**3.2**†	**3.0**†	**10.8**†	**11.1**†	**11.1**†
	(.61)	(.60)	(.59)	(.59)	(.39)	(1.27)	(1.26)	(1.26)
male	−.013	**−.043***	**−.055**†	**−.053**†	**−.073**†	***−.17***	***−.18***	***−.17***
	(.016)	(.016)	(.016)	(.016)	(.014)	(.086)	(.085)	(.085)
constant	**7.8**†	**8.2**†	**7.1**†	**7.3**†	**4.4**†	**9.8**†	**8.5**†	**8.1**†
	(.15)	(.16)	(.16)	(.22)	(.17)	(.31)	(.29)	(.57)
Ladder only	**−.34**†	**−.33**†	**−.34**†	**−.33**†	**−.27**†	**−.36**†	**−.35**†	**−.35**†
(SWL n/a)	(.061)	(.060)	(.060)	(.060)	(.041)	(.099)	(.098)	(.098)
country f.e.					✓			
obs.	325776	325776	325776	325776	325776	3525	3525	3525
R^2(adj)	.159	.203	.208	.208	.299	.094	.105	.105
N$_{\text{clusters}}$	136	136	136	136	136			

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

Table 1: SWB and cardinal versus ordinal income. *For explaining differences in life evaluations, income position dominates cardinal income within 136 countries from the Gallup World Poll. The log(income) variable is adjusted for household size, and the income quantile variable is based on adjusted household incomes.*

As a means to represent graphically the relationship between the distribution of income and the distribution of SWB, the right panel of Figure 1 shows kernel-smoothed plots of Cantril's ladder and SWL responses as a function of income quantile within Portugal. It is evident that individuals' rank in the income heirarchy is a powerful predictor of their SWB, at least for this nation. Conditional only on income, those at the bottom of the income distribution report on average a SWL of ∼4.5 out of 10, while those at the top report ∼7. By casting the well-being difference in terms of income rank rather than monetary quantities, one can easily compare the strength of this relationship across countries (or other population groups).

For instance, Figure 2 shows a similar plot for Thailand, where the mean SWB is similar but the relationship between income and well-being is weaker. Similarly, Sweden and the United States, characterised in Figures 3 and 4, have very similar levels of mean SWB according to both the SWL (∼7.9) and the ladder (∼7.3) measures. In studies analysing or modeling cross-country differences in life satisfaction, these countries have therefore typically been represented by equivalent satisfaction. Moreover, they have very similar unconditional distributions of responses to the ladder question and — except for slightly enhanced preferences for the focal values of 5 and 10 in the USA — to the SWL question. However, the profile of SWB versus income position shows that the similar variances in SWB in the two countries are not distributed in the same way across income quantiles. In the United States, the difference between the top and bottom of the income distribution is a full 1.5 points out of 10, while in Sweden it is less than one point. That is, the richest strata in the USA are happier than the richest in Sweden, while the poorest are less happy than their corresponding quantile in Sweden. In Sweden, as compared with the USA, more of the variation in reported well-being is orthogonal to income rank.

4 Definition of β_q, the economic gradient of well-being

I now proceed by defining a scalar parameter to quantify this coupling of income rank and SWB. The *economic (or social) gradient of well-being*, de-

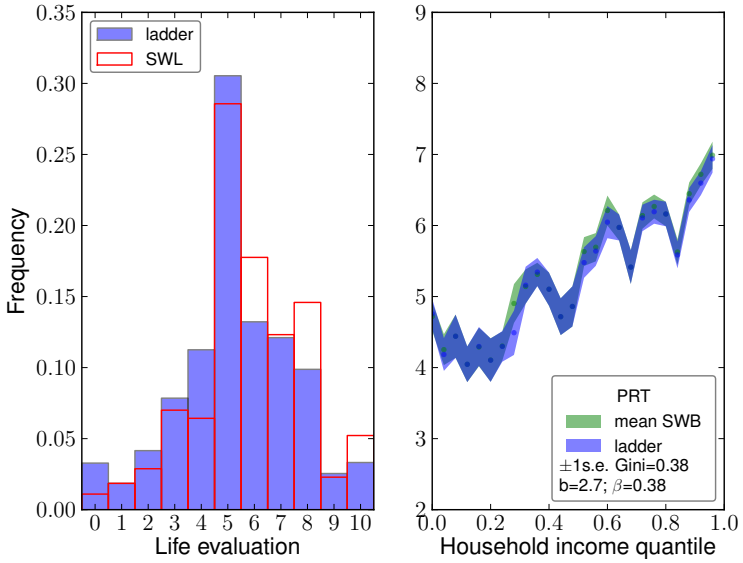

Figure 1: Portugal: distributions of SWB (left) and relationship between income quantile and SWB (right).

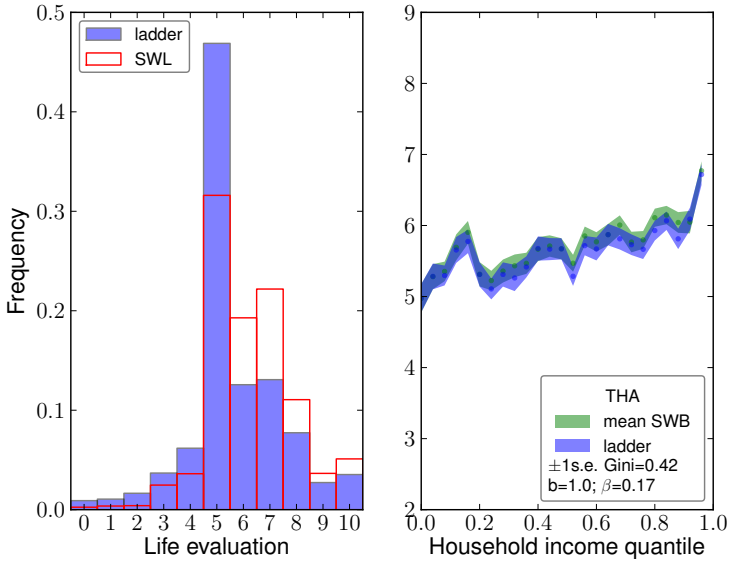

Figure 2: Thailand: distributions of SWB (left) and relationship between income quantile and SWB (right).

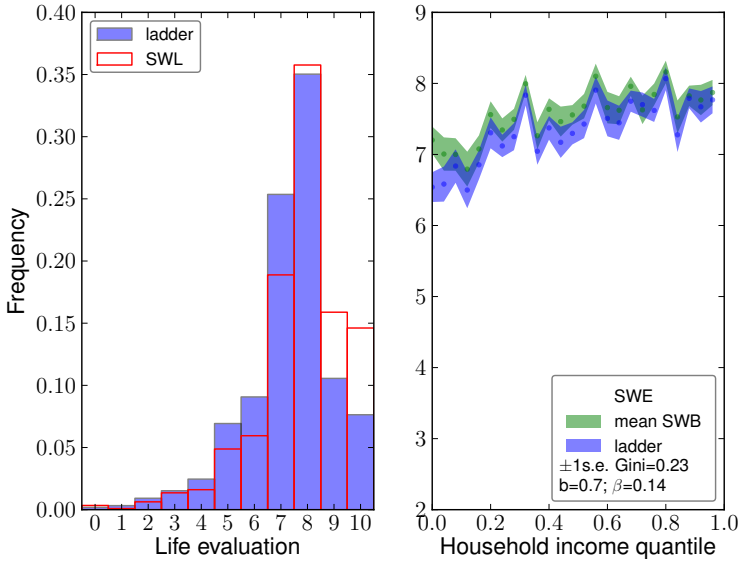

Figure 3: Sweden: distributions of SWB (left) and relationship between income quantile and SWB (right).

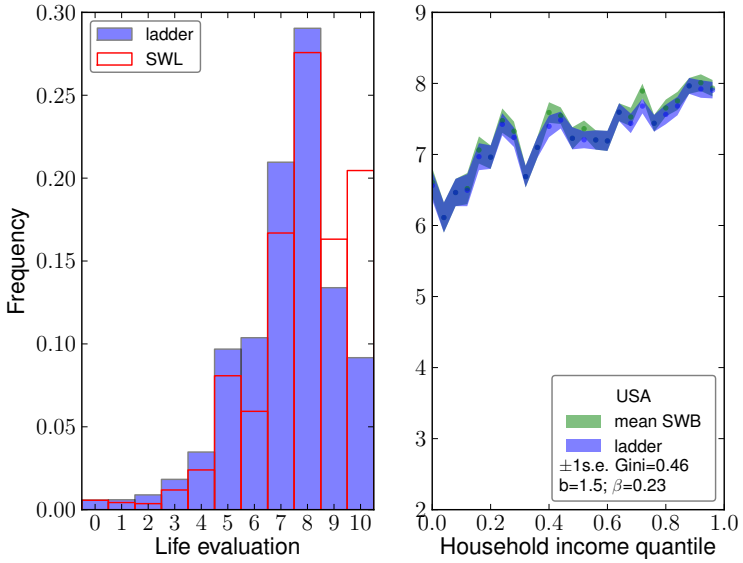

Figure 4: U.S.A.: distributions of SWB (left) and relationship between income quantile and SWB (right).

noted β_q, is the standardized beta coefficient[7] estimated over individuals i in one country, according to:

$$\text{SWB}_i = a + \beta_q \, Q_i^{\text{income}} + X_i + \sum_w d_w \text{wave}_w + \delta D_i^{SWL} + \varepsilon_i \qquad (2)$$

where $\text{SWB}_i = \left(\frac{\text{SWL}_\text{i}+\text{ladder}_i}{2}\right)$ for respondents who answered both questions ($D_i^{SWL} = 1$) and $\text{SWB}_i = \text{ladder}_i$ for respondents who answered only the ladder question ($D_i^{SWL} = 0$). Q_i^{income} is the within-country income quantile of respondent i, using household-size adjusted incomes $\left(\frac{\text{income}}{\sqrt{\text{HHsize}}}\right)$, X_i may optionally control for age and gender, and the wave_w are a set of year dummies.

In the legends of Figures 1 to 4 are shown values of β_q and the Gini coefficient of income reported by the World Income Inequality Database (WIID) for 2006. The stronger relationship between income rank and well-being in the USA is represented by a value of β_q that is over 60% higher than Sweden's.

Table A.6 in the Appendix shows correlations between key national-level variables, including some variations on β_q. Notably, β_q is not correlated with mean responses to the SWB questions. Across 151 countries with data for both indices, β_q is also not significantly correlated with the Gini index from WIID. The same is true amongst only the wealthiest 32 countries with populations greater than two million, hereafter referred to as the "rich and big" countries.[8] Similarly, β_q is not significantly correlated with the income inequality measure used by Wilkinson and Pickett (2007, 2009) for the 23 rich

[7] That is, β_q is the weighted OLS coefficient on income quantile after normalizing all variables in equation (2). Because the variance of a continuously distributed quantile variable is always 1/12, the relationship between β_q and the raw coefficient b_q is relatively simple. If σ^2_{SWB} is the variance of the SWB response within a given country,

$$\beta_q = \frac{b_q}{2\sqrt{3}\,\sigma_{\text{SWB}}} \qquad (1)$$

For most countries $\sigma_{\text{SWB}} \approx 2$, thus the two measures are nearly linearly related. The correlation between b_q and β_q across 136 countries is 0.93 ($p < 10^{-4}$) and amongst the set of wealthy countries defined below it is 0.96 ($p < 10^{-4}$).

[8] These countries are: Australia, Austria, Belarus, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Kuwait, Netherlands, New Zealand, Norway, Oman, Puerto Rico, Republic of Korea, Singapore, Slovenia, Spain, Sweden, Switzerland, Taiwan, United Arab Emirates, United

countries they examine. This suggests that the economic gradient of well-being is capturing something different than traditional inequality measures. I next discuss some favourable properties of β_q, before embarking on the main estimates. Later, Section 7 provides some discussion of the factors likely to determine β_q.

5 Properties of β_q

One way to measure inequality of outcomes in a population would be to estimate the dispersion of life satisfaction (or other life evaluation) itself, for instance as the variance of SWL or a measure of the difference between top and bottom deciles or quintiles of SWL. This might complement the use of mean life satisfaction to provide a natural second parameter describing the distribution. A large variety of factors could be expected to affect the distribution of SWL. However, the economic dimension of welfare inequality is especially interesting; thus rather than treating the *unconditional* dispersion of experienced utility, β_q focuses on the income-related component. This may be thought of as a "social gradient", a term typically used to describe correlations between health or education outcomes and socioeconomic status. The parameter β_q captures the key intuitive idea of how much being lower in the economic heirarchy is associated with a worse life, and *vice versa*. Because this measures the degree to which economic dispersion relates to inequality of SWB, it can be seen as a conceptually new measure of the consequences of income inequality.

A desirable feature of SWB measures is that they reflect whatever matters to the respondent. Although β_q does not reflect all sources of dispersion in SWL, it should reflect whatever ways income position is related to what ultimately bears on respondents' experienced well-being. As discussed below (in Section 7), such channels may include many aspects of economic policy and institutions as well as culture; β_q measures how a society, culture, political system, and economic system translate income stratification into well-being inequality. The β_q metric has several desirable properties, discussed next, which distinguish it from existing inequality indices.

Kingdom, and United States of America. These are the "wealthiest" large countries based on the PPP GDP per capita given by PWT 6.2 for 2007.

Comparing real consumption within countries and across countries

Self-reported incomes like those obtained in the Gallup World Poll suffer from certain drawbacks for economic analysis. Three problems are typical: (1) Reported incomes reflect earnings before taxes, transfers, and both private and public benefit provision and therefore cannot be compared in cardinal terms within a country. (2) Spending and consumption may not be proportionate to income, while for some purposes it is consumption inequality rather than income inequality that is central to economic and policy analyses. (3) The functional relationship between earned income and effective income or consumption varies across countries, making international comparisons of real income even harder.

A measure of real income with cardinal comparability within a nation and between nations must adjust for differential income tax rates and explicit transfers that are part of any government monetary redistribution policy. In addition, the importance of non-monetary income varies substantially from one country to another, and for several quite different reasons. For instance, there are differences in the structure of fringe benefits for employees and differences in the provision of public goods through public expenditure programs, including major items like education and healthcare. There are also large differences across sectors and countries in the importance of subsistence agriculture and home production in contributing to total household income.[9] While some adjustments accounting for public good consumption are imputed for some countries, even this component is difficult to calculate and coverage is incomplete. An alternative approach of pursuing consumption expenditure information in detail at the household level is expensive and requires dedicated surveys.[10]

Jenkins and Van Kerm (2009) provide further discussion of the challenges of collecting comparable income and consumption measurements. A number of these problems are likely within a given national sample to be relatively uniform or monotonically dependent on reported income. In this case the problems are substantially smaller for income rank. Because β_q relies only on income rank, it does not suffer from these measurement challenges. Within countries, one requires only an assumption of *monotonicity*

[9] According to Jenkins and Van Kerm (2009), this is now a serious consideration for cross-national comparability even within the European Union.

[10] See Browning et al. (2003) for advice on minimalist sets of survey questions for consumption assessment.

between reported income and net income after taxes and transfers in order to avoid bias in β_q. Similarly, one requires only an assumption of *monotonicity between income and consumption* in order for β_q to correctly reflect consumption, rather than income, rank. Furthermore, and unlike other indices like the Gini and ratio-based indices, comparisons of β_q across countries do not rely on any comparability or functional form assumptions regarding absolute income levels.

Dimensionless parameter

Use of a standardized regression coefficient also avoids some of the pitfalls of comparing cardinal utility when investigating happiness and inequality (e.g., Van Praag and Ferrer-i Carbonell, 2009). As mentioned above, one might appeal to the variance or coefficient of variation of SWB in constructing a measure of inequality of well-being, but there is no obvious way to correctly scale the variance in order to account for the magnitude of the mean. Using a standardized regression coefficient measures the strength of the relationship between the stratifying factor, income, and the well-being outcome without assuming a strict equivalence of the relative value of cardinal variance at different mean SWB levels.

A measure of economic incentive

In one class of models treating economic growth and inequality, the increased redistribution that is politically favoured when economic inequality is high tends to decrease the incentive for investment (Benabou, 1996).

A similar but distinct channel may exist in which the incentive for (market) labor itself is affected by the extent of inequality. Because β_q is nearly in the form of a marginal utility, it may capture this incentive channel better than income dispersion itself. As will be argued in Section 7, the motivational effect of income disparities is likely to involve, and vary amongst countries based on, more than the extent of redistribution. The net effect of these factors ought in principle to be reflected by the economic gradient of well-being.

In any case, the empirical literature on growth is in need of an expanded battery of measures of inequality and its proximate causes and consequences in order to discriminate empirically amongst the multitude of plausible theoretical channels relating inequality and growth (Voitchovsky, 2009).

Optional controls for demographic variables

While β_q is designed to capture the overall relationship between income stratification and utility (as measured by SWB), its form as a regression coefficient makes it possible to control for other individual-level variables in addition to income quantile. For instance, because the demographic structure varies across countries and because income increases during much of the adult portion of the lifecycle, it makes sense to control for age and gender. Such conditionalities are not possible with other inequality measures. However, for 136 countries for which I can calculate a significant β_q, the correlation between coefficients calculated with and without controls for gender, age, and age squared in equation (2) is 0.97, indicating a robustness of this measure to demographic differences. In what follows, I use the version which includes demographic controls.

6 Are the rich worse off in a country with a steep well-being gradient?

I now turn to address a main question arising from the idea that economic inequality harms the entire population, rather than primarily the impoverished. As advertised in the Introduction, in order to make this claim more specific and testable, I frame it as follows: Would households in the upper income brackets of their country prefer to increase or decrease the well-being gradient between rich and poor in their country, holding their nation's mean income constant?

As a baseline model for considering the regressions to come, consider the case in which utility is solely determined by income, y, or a monotonically-related measure of consumption. Then, a Taylor expansion for an individual i's utility around the median income $\bar{Y}_c$ in her country, c, gives

$$
\begin{aligned}
U(y_i) &= U\left(\bar{Y}_c\right) + \left.\frac{dU}{dy}\right|_{\bar{Y}_c} \left[y_i - \bar{Y}_c\right] + \mathcal{O}(\left[y_i - \bar{Y}_c\right]^2) && (3)\\
&= U\left(\bar{Y}_c\right) + \left.\frac{dU}{dy}\right|_{\bar{Y}_c} \gamma_c \left[Q_{ic}^{\text{income}} - \frac{1}{2}\right] + \dots && (4)\\
&\approx U\left(\bar{Y}_c\right) + b_q \left[Q_{ic}^{\text{income}} - \frac{1}{2}\right] && (5)
\end{aligned}
$$

Here γ_c is a measure (another first order approximation) of the income dispersion in country c, and b_q is used for $\frac{dU}{dy}\big|_{\bar{Y}_c}\gamma_c$ in order to emphasize the connection with equation (2).

Equation (5) suggests that a global estimate can be carried out for individual SWB in which national incomes are used to account for the constant terms in the country-by-country estimates of equation (2).[11] For respondent i in country c, this global equation is:

$$\text{SWB}_i = a + mX_i + d\log(\bar{Y}_c) + nZ_c + s\beta_{q,c} + \sum_w d_w \text{wave}_w + \delta D_i^{SWL} + \eta_c + \varepsilon_i \quad (6)$$

Here X_i and Z_c are additional individual and national characteristics, which may be included as extra controls to test the robustness of the relationship in equation (5). $\beta_{q,c}$ is the coefficient[12] from equation (2) for country c, and η_c is an error component clustered at the country level. Income is included in logarithmic form, based on numerous studies finding this to be an empirically preferred functional form.

Now consider what can be predicted for the coefficient s. If purchasing power is the primary channel by which the distribution of income within a country affects well-being, then the coefficient on β_q can be expected to be zero when equal populations of individuals above and below the median are included in the sample. This is explicit in equation (5), in which the mean of $\left[Q_{ic}^{\text{income}} - \frac{1}{2}\right]$ is zero.

To start with, then, I carry out an individual-level estimate for SWB of all respondents, worldwide, controlling for individual demographic characteristics, national income per capita, and the dependence of well-being on income quantile β_q for each respondent's country. Table 2 shows the estimated parameters for variants of this equation. Columns 2–4 are estimated on a common sample, while column 1 includes respondents for whom no income was reported.

[11] Equations (2) and (6) can also be estimated simultaneously. In the regressions to follow, real GDP per capita (PPP) is used in place of median income in order to rely on standard international income metrics. However, the correlation between these mean per capita values and median incomes calculated from the GWP distributions is 0.98. In addition, in what follows I include individual household incomes as a further control.

[12] In equation (6), β_q is substituted for the b_q in (5), based on the conceptual preference for the dimensionless measure of dependence of well-being on income quantile. As discussed in a footnote on page 15, the two coefficients are highly correlated.

	$\frac{1}{2}$(ladder+SWL)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Nation: log(income)			**.76**†	**.15***		**.77**†	***.14***
			(.042)	(.051)		(.052)	(.064)
HH: log($\text{income}_{\text{adj}}$)				**.53**†			**.54**†
				(.024)			(.027)
$\beta_{q_{ad}}$	−.85	***−2.5***	**−3.3**†	**−3.3**†			
	(.96)	(1.05)	(.71)	(.67)			
Gini					***−2.1***	−.090	.24
					(1.05)	(.73)	(.71)
constant	**6.4**†	**6.9**†	**8.7**†	**9.1**†	**7.1**†	**7.9**†	**8.2**†
	(.31)	(.46)	(.30)	(.29)	(.49)	(.33)	(.32)
R^2(adj)	.012	.022	.174	.220	.022	.154	.202
obs.	561194	340681	340681	340681	321458	321458	321458
$\text{N}_{\text{clusters}}$	139	136	136	136	128	128	128

All estimates include year (wave) fixed effects, D_i^{SWL}, and controls for gender, age, and age squared. Significance: **0.1%**† **1%*** ***5%*** *10%*$^{+}$

Table 2: Global estimate of individual SWB: β_q and Gini. *Columns 3 and 4 show estimates of equation (5). Individual household-size-adjusted income and an indicator for zero income are included in column 4. See text for further discussion.*

Several features are notable. With no income measures included in the model of column (1), the mean effect for β_q is insignificant. Column (2) shows an estimate of the same equation but for the restricted sample of respondents who reported their income, and for this group the coefficient on β_q is significantly negative, an especially surprising result which I revisit below. When national income per capita is included, in column (3), the coefficient on β_q becomes highly significant. Finally, in column (4), extra controls for the respondent's adjusted household income are incorporated into the model, again resulting in a strong negative coefficient for national dependence of well-being on income quantile. The economic significance of the coefficient of −3.3 in column (3) can be expressed as a compensating differential; a one standard deviation (∼0.09) increase in β_q would require a compensating increase of national income of 41% to restore the original level of SWB.

For comparison, the remaining columns show a similar sequence of esti-

mates using an income Gini coefficient in place of β_q, for the 128 countries for which the WIID reports an estimated Gini. SWB is negatively associated with higher Gini (higher income inequality) only until income is controlled for.[13]

Thus, a consistent finding is that holding national and individual income[14] constant, living in a country with a higher β_q is a predictor of lower SWB, averaged over all income quantiles.

To put the magnitude of this correlation into further context, the interquartile range for β_q across countries is $\sim$0.13, corresponding to a difference in national mean SWB of $\sim$0.42 according to columns (3) and (4) of Table 2. For comparison, the mean response to the Cantril ladder question in Colombia, Argentina, and Chile is $\sim$1.0–1.26 below that in the USA, while the average of means in Norway, Finland, and Denmark (the top three nordic countries) is $\sim$0.42 above the mean in the USA.

Back to zero: a rat race for status differentiation?

Coefficients shown in Table 2 give the average effects over the entire population in all countries. In order to assess how the positive and negative effects of the economic gradient of well-being are distributed across the income distribution, the sample in equation (6) could, for instance, be restricted to all those respondents in the top or bottom decile of incomes in their own country. Figure 5 shows the results of a rolling regression in which the estimate is carried out for a full sequence of quantile bands, and it presents a result much starker than that of Table 2.

The wide, green band shows the estimated coefficient and its 95% confidence range for β_q, calculated for a range of quantile windows. The narrower bands show those for national and household incomes. The remaining controls used for column (4) of Table 2 are included but their estimates are not graphed. A key aspect of these estimates is that individuals are pooled across countries based on their income quantile within their own country.

[13]However, when estimated on the restricted set of the 32 rich and big countries, a significant negative coefficient remains on the Gini for the models in columns 6 and 7. See Table A.9 in the Appendix.

[14]Adding individual household income as a more detailed income control does not have a particularly large effect because the variance in national incomes captures over 60% of the overall variance in individual incomes, and national incomes explain 91% of the variation in the ladder measure that individual incomes do.

For comparison with theory, the diagonal dashed line shows the expected finding from a model like equation (5), in which the implications for well-being of higher inequality come through the income channel alone.[15] The predicted curve lies above zero for the top half of the income distribution and below zero for the bottom, with a slope reflecting the normalisations of SWB and income quantiles.

By contrast, the estimated value lies below zero for all income quantiles, and significantly so for all but the top ∼15%. In the interpretation given thus far, this suggests that unmeasured negative channels connecting high social stratification to well-being affect the entire society and eliminate the benefits that higher income-related stratification brings to those who achieve high income status. One might say that the social returns to status differentiation constitute a Pareto loss and therefore a strong form of rat race.

If the effects of strong economic stratification of well-being reflected a mechanism that acted primarily through the poor end of the distribution, for instance through inefficiently low investments in health and education by the poor, the productivity loss could certainly affect everyone in the economy through macroeconomic spillovers. However, macroeconomic spillovers are accounted for by controlling for mean (and households') income, suggesting that the correlation between β_q and SWB reflects, instead, social processes acting outside the income channel.

Robustness checks and allied outcome measures

The cross-country analysis of Wilkinson and Pickett (2007, 2009) is restricted to a set of 23 wealthy countries. The findings just described hold when estimates are made separately for the "rich and big"[16] subset of countries, for the 106 countries with relatively central mean values of SWB ($4 \leq$ ladder ≤ 7), or for the countres not included in the rich and big set.

Some researchers have advocated giving priority to measures of short-term SWB, such as reports of positive and negative affect, for measuring and aggregating human welfare, while others champion cognitive life evaluations like those used above as the closest proxies we have for the kind of utility that relates to social welfare (Kahneman and Krueger, 2006; Kahneman and Riis, 2005; Kahneman and Deaton, 2010; Helliwell and Barrington-Leigh,

[15] Substituting equation (1) into (5) and using $\sigma_{WB} \approx 2$ yields an expected coefficient $s \approx 6.9 \left[Q_{ic}^{\text{income}} - \frac{1}{2}\right]$ on β_q.

[16] See note on page 15 for the list.

2010a,b). The distinction turns out not to be crucial for interpretation of the present results. If a measure of net affect constructed from Gallup World Poll questions[17] is used for SWB_i in equation (6), a similar pattern is obtained to that shown for the life evaluation case.

Interestingly, and as shown in Figure 7, the same qualitative pattern obtains for the answer to a question on the freedom of choice, "In (*respondent's country*) are you satisfied or dissatisfied with: your freedom to choose what you do with your life?" On the other hand, the same is not clearly true of experienced stress. The World Poll asks "Did you experience the following feelings during a lot of the day yesterday? How about Stress? (Yes/No)". If social evaluative stress of the kind described by Wilkinson and Pickett is higher for both rich and poor in highly unequal societies, one might expect a weakly downsloping coefficient on β_q which crosses the horizontal axis right of the median. While the finding in Figure 8 is not inconsistent with this prediction, the coefficient on the economic gradient of well-being is only significantly different from zero for the lowest income quantiles. It could be that this measure of stress is not tapping into the social evaluative stress that is the root of many social problems in Wilkinson and Pickett's account, or that the measure is weak, or that the theory is wrong. Clearly, to unravel the complex and subtle social effects at play, much more work including creative use of extant data is needed.

A particularly remarkable feature of the results presented above is that adding the individual-level controls for household income does not significantly change the result of the by-quantile rolling regressions, shown with

[17]This "affect balance" measure is a weighted mean of binary responses to two positive affect questions and two negative affect questions. In English, the positive affect questions are:

> "Now, please think about yesterday, from the morning until the end of the day. Think about where you were, what you were doing, who you were with, and how you felt. Did you smile or laugh a lot yesterday? (Yes/No)"
>
> "Did you experience the following feelings during a lot of the day yesterday? How about Enjoyment? (Yes/No)"

The negative affects questions are in the form of the latter question, but regarding feelings of "Sadness", "Depression", and "Anger." These represent remembered affective states, rather than the instantaneously-sampled ones preferred by Kahneman, but they are nevertheless a distinct measure of affect rather than a cognitive evaluation of life. The raw correlation between this net affect measure and mean life evaluation is 0.25 ($p < 10^{-4}$) amongst ∼540,000 respondents.

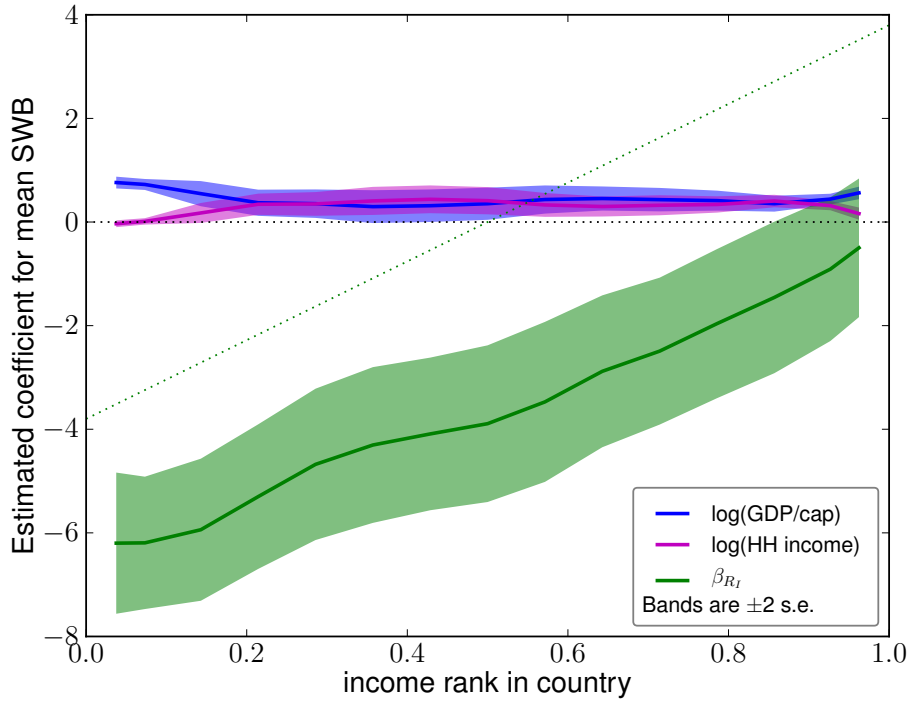

Figure 5: Global rolling regression for SWB by income quantile. *The vertical scale is in units of raw coefficients; thus the magnitudes shown for incomes are not directly comparable with those for β_q. The plot shows that even in the top of the income distribution, individuals are worse off if they live in a country with high β_q.*

these controls included in Figures 5 to 8. In fact, incorporation of national incomes also has only a weak effect on the coefficient for β_q, as was previously noted on examining the second and third columns of Table 2. Combined, these facts appear to constitute evidence that (1) controlling for income quantile within a respondent's country, as is done implicitly in the rolling regressions, accounts for most of the effect of the intra-national distribution of income (see also Table 1), and (2) that the linear approximation of $\beta_q \times Q_{ic}^{\text{income}}$ accounts for most of this effect.

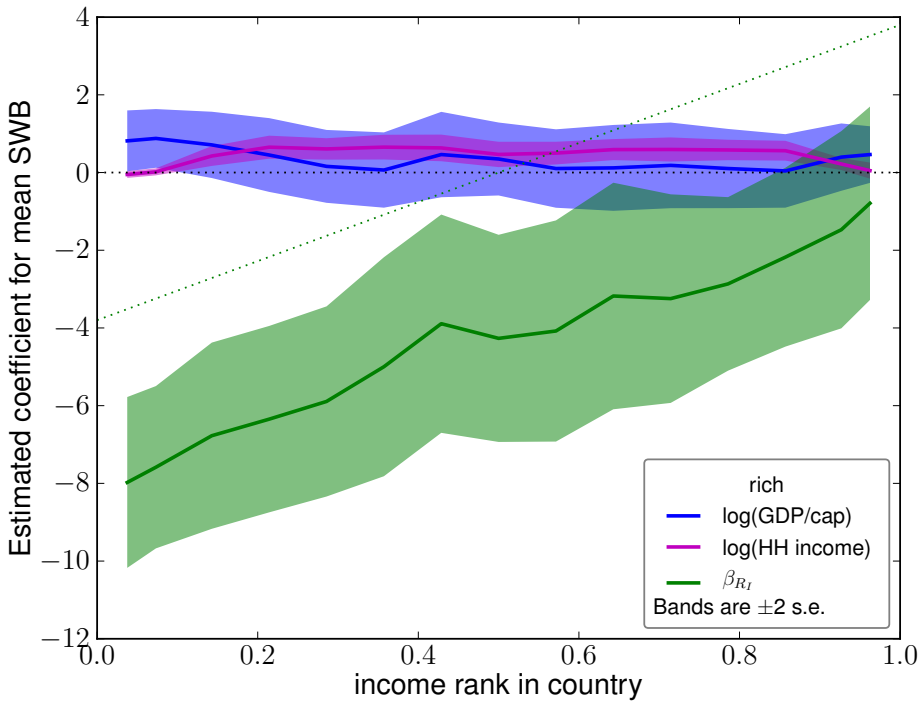

Figure 6: Global rolling regression for SWB by income quantile: richer countries. *As Figure 5 but with a sample restricted to the "rich and big" countries.*

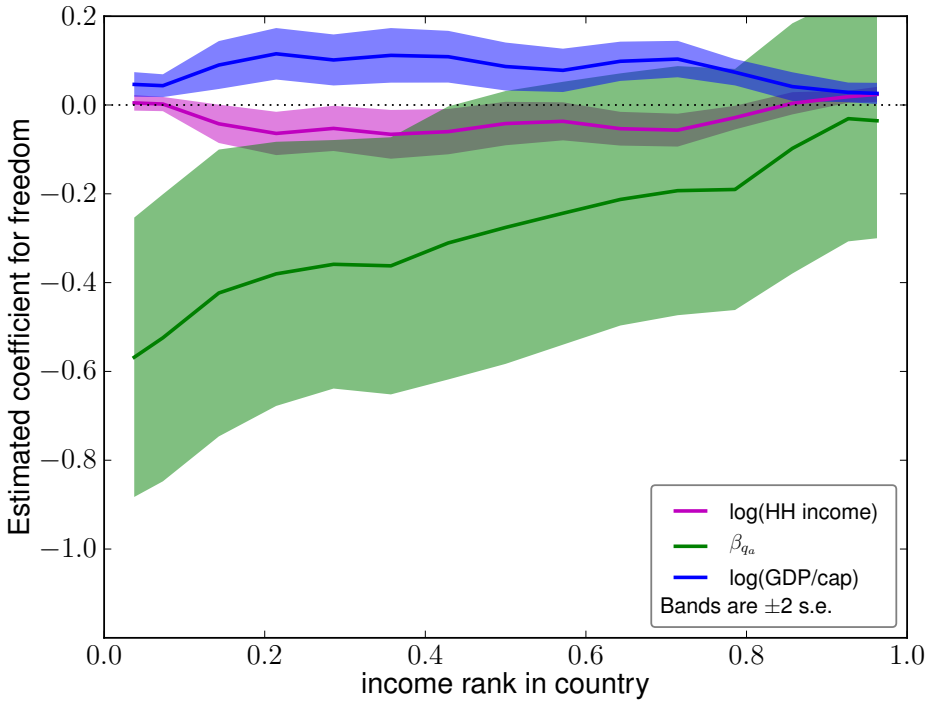

Figure 7: Global rolling regression for "freedom" by income quantile. *As Figure 5 but with freedom of choice as a dependent variable.*

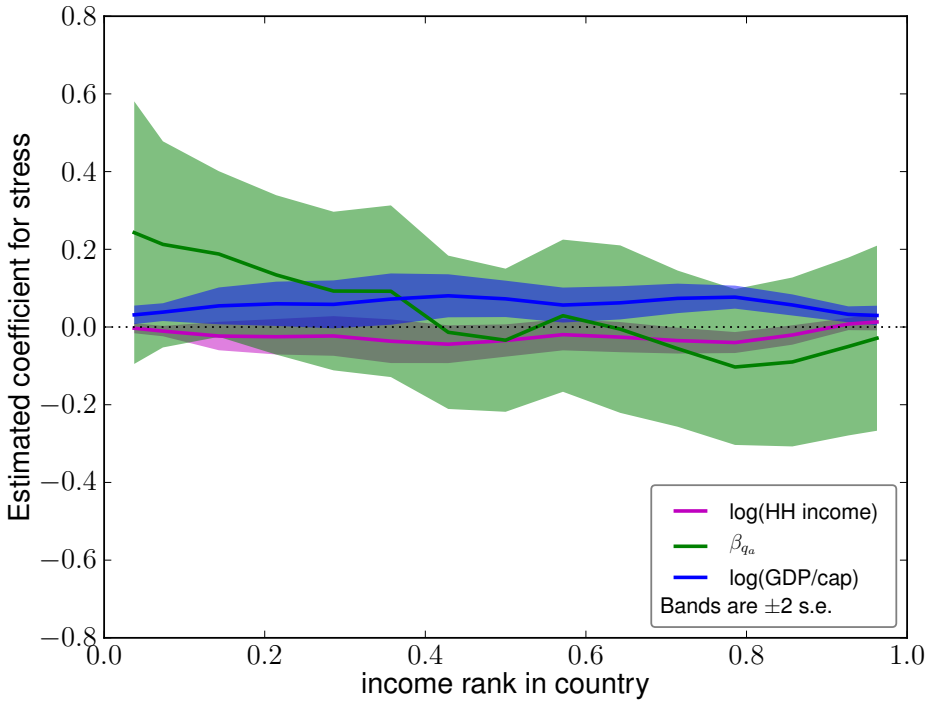

Figure 8: Global rolling regression for stress by income quantile. *As Figure 5 but with experienced stress as a dependent variable.*

7 Theoretical account of differences in β_q

> *The fact is that most people who have no skill have had no education for the same reason — low intelligence or low ambition.* (Senator Barry Goldwater, opposing the offering of education to the structurally unemployed. Time Magazine, 24 Jan 1964)

> *In order to gain and to hold the esteem of men it is not sufficient merely to possess wealth or power. The wealth or power must be put in evidence, for esteem is awarded only on evidence.* (Veblen, 1899, p. 35)

Further study will be needed to elaborate on the mechanisms at play in connecting the economic gradient of well-being with low SWB for all, and to understand how the findings presented above relate to theories mentioned in the Introduction.

7.1 Variation in the underlying economic gradient of well-being

In order to emphasize that there is no obvious socially optimal value for β_q, it is worthwhile to outline the range of economic and social factors that may account for international variation in the economic gradient of well-being. These relate either to the distribution of income or to the way income standing is valued by society.

Income redistribution

In general, dispersion of socially-mediated objective attributes such as income are said to be evidence of either *social selection* or *social causation.*

If *social selection* into income classes dominates, there is strong economic sorting based on individual health and fitness, whether determined by intrinsic personal traits arising from genotype or by other random happenstance. In such a pure meritocracy, there is no insurance for the "lotteries" of genetic endowments and random shocks to human capital development.

On the other hand, prenatal and childhood environments have a strong effect on phenotype and subsequent development, so if the quality of these environments is correlated with income class, an apparent meritocracy may

perpetuate existing gradients and become a case of *social causation*, in which existing heirarchies determine individual traits. Other factors than epigenetics also reinforce such gradients. For instance, there may be very little intergenerational economic mobility for institutional reasons such as well defined occupational social classes, low levels of redistribution and insurance, corruption, or other reasons; in these cases, social gradients are also signs of strong social causation.

The importance of income for well-being

Cross-country differences in the well-being – income gradient may also arise for other, nearly orthogonal reasons. Two possibly distinct cultural dimensions affect the relationship between wealth and SWB independently of the shape of the distribution of wealth.

First, the degree to which superficial appearances are the basis of judgements about wealth and socioeconomic class is an aspect of culture that may vary from place to place. According to Wilkinson and Pickett, this relates to "consumerism," in which social identity formation emphasises acquisition, conspicuous display, and keeping up with changing, marketed fashion. Put differently, it is plausible that the link between well-being and wealth may depend on the extent to which people are able to signal their wealth to others and infer that of others from visible characteristics. Wilkinson and Pickett describe a number of reasons why these factors are on the rise in increasingly urbanised and marketed societies, meaning that an increasing fraction of people's energies are directed towards making and receiving superficial judgements, with concomitant rises in social evaluative stress and anxiety. Clear evidence for these detailed mechanisms, however, is wanting.

Secondly, there may be cultural variation in the extent to which one's intrinsic worth or social standing is judged by effort and success in the economic realm, and therefore by wealth or income. A culture may place more or less value on altruisim, frugality, entrepreneurial success, political influence, and so on. If these values play out in intrinsic motivation, one can expect self-reports of life satisfaction to capture them through cognitive self-evaluation. An interesting finding of Wilkinson and Pickett (2009) is that in societies with higher economic inequality, the number of youth aspiring to lower-paying professions is lower. If vocations attract respect largely for their income class — rather than for their associated intrinsic motivation — in economically unequal societies, one would expect this value system to be

reflected in the the economic gradient of well-being.

Thus in principle a society may have little redistribution and a significant spread in income which reflects largely a labor/leisure (or market/home production) choice rather than a lack of opportunity. In this case, the choice is relatively decoupled from social standing and therefore relatively decoupled from well-being. By contrast, in equilibrium people will choose less leisure in a culture that emphasizes buying power or in which performance in the market economy is seen to reflect a person's intrinsic value or ability.

7.2 Measurement effects

There are other, confounding factors which may account for some differences in β_q.

Attenuation bias

Standardized regression coefficients have the advantage of being dimensionless and therefore relatively easily comparable across countries, for instance those with different mean levels of SWB. However, they are not immune to attenuation bias, which may vary across countries. For instance, if income is sporadic or seasonal and is assessed over different time scales in different locations, annual incomes imputed from shorter durations will be noisier. In general, if a variable such as income is less well measured in one country than another, the noisier signal will result in a smaller correlation between income rank and SWB, and thus a lower apparent inequality as measured by β_q. Fortunately, the variations in implementation method across countries are relatively minor for the Gallup World Poll.

Top compression and censoring

Responses to SWB questions may suffer from top-compression; in places where most people feel their life is not too far from their ideal, the discrete scale provides few options near the top with which to capture the true variation.[18] This enhanced quantization noise could lead to a lower β_q for

[18] A worthy improvement in the implementation of quantitative scale subjective response survey questions is to capture as much precision as the respondent has in mind, allowing either decimal / fractional responses or discrete (integer) choices, in order to minimise the problems with a discrete and bounded scale. A similar innovation of providing both

countries with very high (or very low) mean SWB, and thus a negative correlation between β_q and mean SWB. The following three findings are of note in this regard:

1. β_q and mean SWB are not significantly correlated across countries.
2. When the rich and big countries are removed from the sample, the estimate for equation (6) is not significantly changed.
3. As mentioned earlier, when a sample of countries restricted to central values of mean SWB is used, the main finding is also preserved.

Future directions

It may be possible to unpack some pathways by using multiple measures of inequality to complement β_q, as has been done in the growth literature (Voitchovsky, 2009). For instance, intergenerational and intragenerational mobility in economic class or educational attainment, and matching in the marriage market, tap into more specific parts of the story. In countries with higher economic inequality, people place romance lower in a list of priorities for finding a partner (Wilkinson and Pickett, 2009, p. 44). This tells both a story of positive feedback in social causation (lower genetic mixing across income classes when they are already pronounced), as well as a reason to expect an across-the-distribution decrease in SWB in high-inequality economies (higher social evaluative stress and instrumental motivations in choosing a partner).

Relevant data on other attitudes, such as those relating to consumption, may also help to differentiate between redistributional policy and cultural priorities, although the two are necessarily linked in equlibrium. Lastly, analysis of within-country ethnic "gradients" in SWB in a form analogous to the economic gradient of well-being analysed here could shed light on other, possibly confounded, dimensions of inequality.

8 Conclusions

The main findings presented here are that:

continuous and discrete response options is common for income.

1. After controlling for national incomes, within-nation income rank is a better predictor of individual subjective well-being than the log of cardinal income. This is consistent with a model in which social heirarchies and the nature of social interactions, rather than material consumption *per se*, play a major role in determining the distribution of well-being within societies.

2. The dependence of well-being on income quantile, denoted by β_q, is a measure of the portion of well-being dispersion that is correlated with income quantile. Therefore, conceptually it captures a useful component of inequality that reflects the income distribution but measures it in a way that is relevant for both welfare considerations and behavioural motivations.

3. Countries with higher levels of this measure of social gradient of well-being exhibit not only steeper gradients of welfare outcomes between rich and poor but also lower SWB overall, controlling for cardinal income. This effect is so strong that it fully compensates for the benefit to the richest of living in a nation where being the richest is highly rewarded, overall. Put another way, on average a high economic gradient of well-being is bad, even for the rich who benefit the most from it.

There is another, important possible stance on these findings. It is remarkable that, despite the many pairwise correlations found by Wilkinson and Pickett (2007, 2009) between their measure of income inequality and various important social outcomes,[19] the dependence of well-being on income quantile parameter β_q described here does not exhibit a strong cross-country correlation with traditional metrics of income inequality, nor with the various measures of social outcomes highlighted by Wilkinson and Pickett. If my argument for why β_q should *in principle* be an important measure of the effects of economic inequality has been convincing, then the lack of correlation with existing measures is surprising. In this case, testing the connection of the metric β_q to policy-relevant variables in support of an "intuitive criterion"

[19] Economic inequality indicies have recently been related to even more diverse outcomes than those treated here or by Wilkinson and Pickett, such as environmental conservation, both theoretically and empirically. For instance, Mikkelson et al. (2007) and Holland et al. (2009) find that the Gini coefficient is more powerful than population density or environmental governance rating in predicting proportions of biodiversity loss across nations and amongst states of the U.S.A.

can be taken as a bigger-picture test of the validity and cross-country comparability of SWB data for serious policy applications. Seen in this light, the present work may serve as a challenge to continue exploring the implications of subjective well-being data for economic issues and to test their role in providing new insight into poorly measured but important aspects of life.

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A Supplementary material

A.1 Descriptive statistics

Variable	Mean	Std.Dev.	min	max	Obs.	Description
ladder	5.4	2.2	0	10	584929	Cantril's ladder from Gallup World Poll
SWL	6.0	2.4	0	10	142762	Satisfaction with life from Gallup World Poll
affect balance	5.3	5.6	−10	10	531311	5(smile/laugh+enjoyment) $-\frac{10}{3}$(sadness+depression+anger)
stress	.27	.44	0	1	475281	Stress felt during a lot of the day
freedom to choose	.70	.46	0	1	532804	Freedom to choose what to do with one's life

Table A.3: Summary statistics: respondent-level variables. *See page 24 for description of affect variables.*

	SWL	affect balance	stress	freedom to choose
ladder	**.62**†	**.25**†	**−.067**†	**.17**†
	($<10^{-5}$)	($<10^{-5}$)	($<10^{-5}$)	($<10^{-5}$)
SWL		**.27**†	**−.060**†	**.22**†
		($<10^{-5}$)	($<10^{-5}$)	($<10^{-5}$)
affect balance			**−.37**†	**.16**†
			($<10^{-5}$)	($<10^{-5}$)
stress				**−.047**†
				($<10^{-5}$)
Significance:	**0.1%**†	**1%***	***5%***	*10%*$^{+}$

Table A.4: Raw correlations: respondent-level variables. *[Correlations among key variables]Correlations among key variables.*

Variable	Mean	Std.Dev.	min	max	Obs.	Description
$\beta_{q_{ad}}$						The main measure used in the paper, calculated with household-size adjusted income quantile and controls for age and gender.
β_{q_a}						
$\beta_{q_{\text{raw}}}$	.27	.088	.042	.57	133	Calculated with unadjusted income quantile and without demographic controls.
$b_{I_{ad}}$						The raw coefficient on adjusted cardinal income in an equation explaining SWB, with controls for age and gender.
nation: ln(GDP/cap)	−1.79	1.22	−4.7	.20	133	log(GDP/capita scaled to USA) from Penn World Tables (PWT) 6.2
Gini	.40	.098	.23	.74	125	Income Gini from WIID
nation: ladder	5.4	1.11	3.0	7.9	133	Cantril's ladder from Gallup World Poll
nation: SWL	5.9	1.42	2.4	8.5	114	Satisfaction with life from Gallup World Poll
GDPgrowthRate	4.5	4.1	−10.4	25.1	133	GDP growth rate (PWT 6.2, 2004–2007)

Table A.5: Summary statistics: national variables. *The following countries are not included in these statistics due to their highly insignificant estimates for $\beta_{q_{ad}}$: Palestine, Mali, Haiti, Serbia, Turkmenistan, Kosovo.*

	β_{q_a}	$\beta_{q_{\text{raw}}}$	$b_{I_{ad}}$	*nation:* ln(GDP/cap)	Gini	*nation:* ladder	*nation:* SWL	GDPgrowthRate
$\beta_{q_{ad}}$	**.97**†	**.94**†	**.77**†	.084	.011	−.083	−.073	***.17***
	(<10^{-5})	(<10^{-5})	(<10^{-5})	(.33)	(.90)	(.33)	(.43)	(.045)
β_{q_a}		**.97**†	**.76**†	.059	.011	***−.21***	*−.18*$^{+}$	**.23***
		(<10^{-5})	(<10^{-5})	(.50)	(.91)	(.017)	(.059)	(.009)
$\beta_{q_{\text{raw}}}$			**.74**†	.061	.069	***−.19***	−.14	***.21***
			(<10^{-5})	(.48)	(.44)	(.030)	(.15)	(.015)
$b_{I_{ad}}$				*.17*$^{+}$	−.053	−.048	−.025	.13
				(.051)	(.56)	(.58)	(.79)	(.13)
nation: ln(GDP/cap)					**−.38**†	**.82**†	**.79**†	***.16***
					(<10^{-5})	(<10^{-5})	(<10^{-5})	(.049)
Gini						**−.31**†	**−.34**†	*−.14*$^{+}$
						(.0002)	(.0002)	(.100)
nation: ladder							**.92**†	−.050
							(<10^{-5})	(.54)
nation: SWL								.008
								(.93)

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

Table A.6: Raw correlations: national variables. *See Table A.5 for variable definitions*

A.2 Global income rank

	$\frac{1}{2}$(ladder+SWL)		
	(1)	(2)	(3)
ln(HH inc_{adj})	**.59**†		.085
	(.026)		(.061)
global income quantile		**3.3**†	**2.8**†
		(.14)	(.38)
age/100	**−3.4**†	**−3.4**†	**−3.4**†
	(.49)	(.47)	(.47)
$(\text{age}/100)^2$	**2.8**†	**2.8**†	**2.8**†
	(.59)	(.57)	(.57)
male	**−.059**†	**−.054***	**−.055***
	(.017)	(.017)	(.017)
constant	**8.1**†	**4.9**†	**5.3**†
	(.15)	(.12)	(.37)
Ladder only (SWL n/a)	**−.33**†	**−.32**†	**−.32**†
	(.062)	(.061)	(.061)
obs.	340936	340936	340936
R^2(adj)	.198	.204	.204
$\text{N}_{\text{clusters}}$	140	140	140
Significance:	**0.1%**†	**1%***	***5%***	*10%*$^{+}$

Table A.7: Global income rank explains SWB. *Remarkably, a single global ordering of all respondent incomes explains more of the variance of individual SWB, holding some demographic variables constant, than cardinal income. When both are included, the cardinal income drops out. In light of the difficulties of generating meaningful combined public and private good consumption measures that are comparable across nations (Section 5), it is surprising that global ordinal income is a particularly strong predictor of well-being. Table 1 on page 9 shows a similar test using within-country ranking of income.*

A.3 Wilkinson and Pickett correlations

Table A.8: Wilkinson and Pickett international correlations, controlling for income. *Wilkinson and Pickett generally report only scatter plots and Pearson correlations. Here I show coefficients estimated with their data but controlling for PPP GDP/capita and presented with heteroscedasticity-robust standard errors. Note that most of their measures of social goods/ills do not attract significant coefficients for income, but do for their measure of income inequality. Definitions of variables, the list of rich countries for which data are available in each case, and the data themselves, are available from the authors.*
Significance: **0.1%†** **1%⋆** ***5%*** 10%+

		log(GDP/capita)	constant	WP_Incomeinequality	obs.	R^2(adj)
(1)	WP_Advertising	−.15	**.49†**	**.075⋆**	23	.324
		(.17)	(.12)	(.026)		
(2)	WP_Calorieintake	112	**2926†**	***89.3***	21	.136
		(243)	(223)	(40.1)		
(3)	WP_Childconflict	.20	**−1.63⋆**	**.30⋆**	19	.315
		(.57)	(.60)	(.11)		
(4)	WP_Childoverweight	*6.8+*	2.7	**2.2†**	19	.370
		(3.9)	(2.9)	(.62)		
(5)	WP_Childwellbeing	.21	**.85⋆**	**−.15⋆**	22	.342
		(.33)	(.29)	(.050)		
(6)	WP_Drugsindex	***1.62***	**−1.89†**	**.41†**	22	.513
		(.73)	(.42)	(.093)		
(7)	WP_Foreignaid	*.36+*	**1.03†**	**−.088⋆**	21	.390
		(.18)	(.20)	(.034)		
(8)	WP_Homicides	−1.78	−2.9	3.5	23	.140
		(15.8)	(10.4)	(2.5)		
(9)	WP_Imprisonmentlog	.55	**2.9†**	**.30†**	23	.552
		(.50)	(.24)	(.053)		

Continued on next page

		log(GDP/capita)	constant	WP_Incomeinequality	obs.	R^2(adj)
(10)	WP_Indexofhealthsocial_problems	.36	**−2.4**†	**.45**†	21	.748
		(.48)	(.35)	(.077)		
(11)	WP_Infantmortality	***1.76***	**1.62**†	**.58**†	22	.678
		(.76)	(.49)	(.073)		
(12)	WP_Lifeexpectancy	−.027	**80.4**†	*−.32*$^{+}$	23	.112
		(1.22)	(1.14)	(.17)		
(13)	WP_Loneparents	***15.9***	***9.8***	***1.87***	21	.139
		(6.6)	(4.6)	(.85)		
(14)	WP_Maternityleave	8.7	**53.9***	***−5.9***	21	.242
		(13.5)	(17.4)	(2.7)		
(15)	WP_Mathsandliteracyscores	40.5	**547**†	***−6.3***	21	.217
		(26.9)	(18.1)	(2.8)		
(16)	WP_Mathseducationsciencescore	34.7	**546**†	***−6.4***	21	.186
		(27.9)	(19.8)	(3.0)		
(17)	WP_Mentalillness	11.5	.13	**3.2**†	12	.494
		(12.5)	(7.4)	(.90)		
(18)	WP_Obesity	5.1	.53	**2.9***	21	.270
		(6.0)	(4.9)	(.95)		
(19)	WP_Patents	7.1	**32.6**†	**−3.4***	22	.179
		(8.7)	(7.9)	(1.14)		
(20)	WP_Peaceindex	−.33	**.98**†	***.10***	23	.156
		(.60)	(.26)	(.042)		
(21)	WP_Police	−161	35.5	**34.5**†	16	.229
		(119)	(70.1)	(9.9)		
(22)	WP_Publichealthexpenditure	***−17.9***	**98.1**†	**−5.5**†	23	.512

Continued on next page

		log(GDP/capita)	constant	WP_Incomeinequality	obs.	R^2(adj)
		(8.8)	(6.8)	(1.17)		
(23)	WP_Recycling	−.77	−2.0	**1.28**†	11	.587
		(2.2)	(1.65)	(.19)		
(24)	WP_Socialexpenditure	*−7.1*$^{+}$	**31.3**†	**−1.86***	21	.265
		(3.9)	(4.1)	(.72)		
(25)	WP_Socialmobility	−.016	.002	**.033**†	8	.815
		(.040)	(.023)	(.004)		
(26)	WP_Teenagebirths	*19.4*$^{+}$	**−17.0***	**6.5**†	21	.585
		(10.1)	(6.5)	(1.52)		
(27)	WP_Trust	**24.8***	**81.7**†	**−6.3**†	23	.495
		(9.2)	(8.7)	(1.26)		
(28)	WP_Womens_status	*.84*$^{+}$	**1.48***	***−.22***	23	.229
		(.49)	(.57)	(.086)		

A.4 Alternative indices and subsamples

Table A.9: Alternative global estimates for individual SWB. *In all cases, the dependent variable is the mean of available life evaluation responses (ladder and SWL) for the individual. When "crossterm" is included, it is an interaction between the Gini and b or β. The estimated interaction term is never significant. $\beta^{\text{affect}}_{q_{ad}}$ is analogous to $\beta_{q_{ad}}$ but calculated for affect balance rather than life evaluations.*
Significance: **0.1%†** **1%⋆** ***5%*** 10%+

	Nation: log(income)	HH: log(income$_{\text{adj}}$)	$\beta_{q_{\text{raw}}}$	$\beta_{q_{ad}}$	$b_{I_{ad}}$	$\beta^{\text{affect}}_{q_{ad}}$	Gini	crossterm	constant	set	R^2(adj)	obs.	N$_{\text{clusters}}$
(1)							**−3.1†**		**7.6†**	superset	.030	529565	138
							(.94)		(.42)				
(2)							***−2.1***		**7.1†**		.022	321458	128
							(1.05)		(.49)				
(3)	**.77†**						−.090		**7.9†**		.154	321458	128
	(.052)						(.73)		(.33)				
(4)	***.14***	**.54†**					.24		**8.2†**		.202	321458	128
	(.064)	(.027)					(.71)		(.32)				
(5)	***1.52***	**.57†**					***−4.0***		**10.7†**	rich	.127	58233	28
	(.71)	(.055)					(1.85)		(.72)				
(6)	−.050	**.56†**					.77		**7.7†**	central	.140	271871	101
	(.064)	(.029)					(.79)		(.30)				
(7)			***−2.8***						**6.9†**	superset	.022	548646	135
			(1.20)						(.42)				
(8)			***−2.9***						**7.0†**		.025	339500	134
			(1.15)						(.50)				
(9)	**.76†**		**−3.4†**						**8.7†**		.175	339500	134
	(.040)		(.75)						(.31)				
(10)	**.14⋆**	**.54†**	**−3.4†**						**9.1†**		.222	339500	134
	(.051)	(.023)	(.71)						(.30)				
(11)	.16	**.58†**	**−4.3⋆**						**10.3†**	rich	.129	63011	30
	(.52)	(.049)	(1.53)						(.50)				
(12)	−.011	**.55†**	**−2.7†**						**8.7†**	central	.153	286279	106
	(.051)	(.026)	(.65)						(.32)				
(13)	**.16⋆**	**.55†**	−3.3				.70	−.91	**9.0†**		.222	320277	126

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	Nation: log(income)	HH: log(income$_{\text{adj}}$)	$\beta_{q_{\text{raw}}}$	$\beta_{q_{ad}}$	$b_{I_{ad}}$	$\beta^{\text{affect}}_{q_{ad}}$	Gini	crossterm	constant	set	R^2(adj)	obs.	N$_{\text{clusters}}$
	(.058)	(.024)	(3.9)				(2.6)	(9.2)	(1.11)				
(14)				−.85					**6.4**†	superset	.012	561194	139
				(.96)					(.31)				
(15)				***−2.5***					**6.9**†		.022	340681	136
				(1.05)					(.46)				
(16)	**.76**†			**−3.3**†					**8.7**†		.174	340681	136
	(.042)			(.71)					(.30)				
(17)	**.15***	**.53**†		**−3.3**†					**9.1**†		.220	340681	136
	(.051)	(.024)		(.67)					(.29)				
(18)	.37	**.59**†		***−3.6***					**10.1**†	rich	.120	63011	30
	(.54)	(.051)		(1.64)					(.52)				
(19)	−.005	**.54**†		**−2.8**†					**8.6**†	central	.154	287149	107
	(.051)	(.026)		(.61)					(.29)				
(20)	**.18***	**.54**†		−1.68			1.38	−4.3	**8.7**†		.219	321458	128
	(.059)	(.024)		(3.3)			(2.2)	(7.9)	(.96)				
(21)					−.082				**6.3**†	superset	.010	561194	139
					(1.10)				(.24)				
(22)					−1.95				**6.6**†		.016	340681	136
					(1.38)				(.37)				
(23)	**.76**†				**−3.2***				**8.3**†		.166	340681	136
	(.047)				(1.02)				(.28)				
(24)	***.15***	**.54**†			**−3.3***				**8.7**†		.213	340681	136
	(.057)	(.025)			(1.01)				(.28)				
(25)	.75	**.59**†			−1.81				**9.5**†	rich	.107	63011	30
	(.47)	(.054)			(2.3)				(.42)				
(26)	−.027	**.55**†			**−2.3***				**8.2**†	central	.148	287149	107
	(.054)	(.027)			(.83)				(.28)				
(27)	***.16***	**.54**†			−2.6		.089	−2.5	**8.7**†		.212	321458	128
	(.062)	(.025)			(5.2)		(1.46)	(12.7)	(.65)				
(28)						−.009			**6.3**†	superset	.010	549629	136

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	Nation: log(income)	HH: log(income$_{\text{adj}}$)	$\beta_{q_{raw}}$	$\beta_{q_{ad}}$	$b_{I_{ad}}$	$\beta^{\text{affect}}_{q_{ad}}$	Gini	crossterm	constant	set	R^2(adj)	obs.	N$_{\text{clusters}}$
					(.40)				(.32)				
(29)					−.072				**6.4**†		.013	340681	136
					(.40)				(.41)				
(30)	**.78**†				**−.85**†				**8.3**†		.165	340681	136
	(.045)				(.23)				(.26)				
(31)	**.16***	**.55**†			**−.96**†				**8.7**†		.213	340681	136
	(.055)	(.024)			(.23)				(.26)				
(32)	.033	**.60**†			**−1.26***				**9.8**†	rich	.126	63011	30
	(.53)	(.055)			(.39)				(.32)				
(33)	−.007	**.55**†			**−.64***				**8.3**†	central	.147	287149	107
	(.056)	(.027)			(.22)				(.27)				
(34)	***.16***	**.55**†			−1.72		−1.02	1.98	**9.2**†		.212	321458	128
	(.063)	(.025)			(1.20)		(1.64)	(3.3)	(.65)				

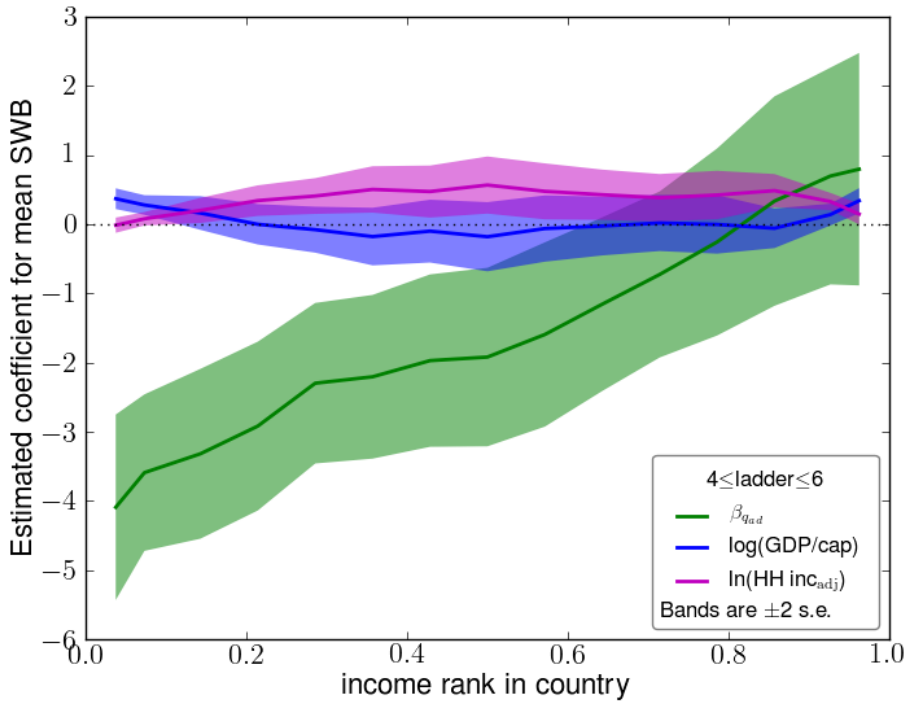

Figure A.9: Rolling estimates: β_q. *Rolling estimate for SWB for the restricted sample from the 84 countries with mean Cantril ladder response in the central range of 4–6, i.e. the least likely to exhibit scale compression effects.*

	(1)	(2)	(3)	(4)	(5)
$\beta_{q_{ad}}$		**.12***	**.11***	.010	**.13***
		(.036)	(.037)	(.036)	(.047)
log(income)2004	***.012***	***.012***	***.012***	*−.034*$^{+}$	***.014***
	(.005)	(.005)	(.005)	(.018)	(.006)
Gini	−.038		−.027		
	(.035)		(.036)		
non-corruption (WGI)	−.011	−.008	−.008	.020	−.025
	(.012)	(.011)	(.012)	(.016)	(.017)
secondary education	.016	.007	.013	−.004	.003
	(.024)	(.023)	(.023)	(.024)	(.027)
freedom to choose	−.025	−.011	−.013	.034	−.016
	(.023)	(.023)	(.023)	(.060)	(.025)
rule of law (WGI)	−.005	−.009	−.009	***−.034***	.005
	(.013)	(.012)	(.014)	(.013)	(.016)
gov't share of GDP	.0007	.0007	.0007	*−.002*$^{+}$	.0007
	(.0005)	(.0005)	(.0005)	(.001)	(.0005)
rich countries				✓	×
R^2(adj)	.106	.172	.179	.357	.161
obs.	131	129	123	30	99
Significance:	**0.1%**†	**1%***	***5%***	*10%*$^{+}$	

Table A.10: Growth. *Estimate for the log of GDP per capital growth rate, averaged over 2004–2007.*

A.5 Growth

In principle, there are many reasons to expect a relationship between economic growth and economic inequality. Economists have focused heavily on causal channels from existing inequality to future growth, with great detail in exploring the theoretical mechanisms by which inequality might either accelerate or retard growth. These efforts and conclusions have not been matched by comparable successes in the empirical literature largely because of the crudeness of available data and the limited number of national economies. Voitchovsky (2009) reviews recent empirical developments in the economic growth and inequality literature.

The World Income Inequality Database (WIID) has become the standard-setting dataset for time series estimates of the relationship between growth

and inequality. The Gallup World Poll's four years of data are sufficient only for a snapshot, and in Table A.10 I present a crude cross-section OLS estimate of economic growth, incorporating an income Gini and β_q. The suggestion is that the dependence of well-being on income quantile may be positively related to contemporary growth in the less wealthy countries. In this parsimonious specification, the income Gini does not come in significantly. As the availability of broad and consistent international SWB time series continues to improve, a richer specification and time series estimates will become feasible.