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METHODS

Estimating worldwide life satisfaction

Saamah Abdallah, Sam Thompson, Nic Marks*

nef *(the new economics foundation)*

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ABSTRACT

Whilst studies of life satisfaction are becoming more common-place, their global coverage is far from complete. This paper develops a new database of life satisfaction scores for 178 countries, bringing together subjective well-being data from four surveys and using stepwise regression to estimate scores for nations where no subjective data are available. In doing so, we explore various factors that predict between-nation variation in subjective life satisfaction, building on Vemuri and Costanza's (Vemuri, A.W., & Costanza, R., 2006. The role of human, social, built, and natural capital in explaining life satisfaction at the country level: toward a National Well-Being Index (NWI). Ecological Economics, 58:119–133.) four capitals model. The main regression model explains 76% of variation in existing subjective scores; importantly, this includes poorer nations that had proven problematic in Vemuri and Costanza's (Vemuri, A.W., & Costanza, R., 2006. The role of human, social, built, and natural capital in explaining life satisfaction at the country level: toward a National Well-Being Index (NWI). Ecological Economics, 58:119–133.) study. Natural, human and socio-political capitals are all found to be strong predictors of life satisfaction. Built capital, operationalised as GDP, did not enter our regression model, being overshadowed by the human capital and socio-political capital factors that it inter-correlates with. The final database presents a stop-gap resource that, until robust surveys are carried out worldwide, allows comparisons of subjective life satisfaction between nations to be made with reasonable confidence.

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1. Introduction

Whilst the notion that subjective well-being is *the* fundamental good has a long history, subjective measures of well-being have been slow to gain credibility within policy circles. Instead, objective measures of well-being have been accepted as proxies – most obviously GDP and supplemented GDP indicators such as the Human Development Index (HDI – Desai, 1991 and the UNDP) – with the tacit assumption that there is no reliable way to monitor an individual's subjective well-being.

However, academic interest in the study of subjective well-being has grown rapidly in recent years. A literature search in the Social Sciences Citation Index of the Web of Science (on 11/07/2007) found almost 4300 published articles mentioning either the topic "life satisfaction" or "subjective well-being", of which over half were published since the year 2000. The *Journal of Happiness Studies* has been an outlet for much of this research, but there have also been regular publications in journals such as *Social Indicators Research* and *Ecological Economics* (for reviews of the burgeoning literature, see Diener et al., 1999; Layard, 2005). Research suggests that people can answer questions regarding their life satisfaction reliably and that these data have acceptable validity, including construct validity (Diener et al., 1999). Recently, Kingdon and Knight (2006) have argued that subjective life satisfaction may be the single most effective measure of poverty in developing

* *Corresponding author.*
E-mail address: saamah.abdallah@neweconomics.org (S. Abdallah).

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countries, encompassing both economic and social aspects of well-being.

Although there is reasonable consensus about the utility of subjective life satisfaction as an intra-nation measure, attempts to compare absolute levels of life satisfaction across nations have proven more problematic. Conceptually, some have argued against the validity of cross-cultural comparisons of subjective scales on the basis of reference groups effects (Heine et al., 2002) and response bias due to cultural differences (Triandis, 2002).

The first of these problems, reference group effects, is under-researched in the current literature. The relatively few papers to have addressed it directly with appropriate data have focused on personal income comparisons (for a recent review see Clark et al., in press). Income is, of course, an important dimension of inter-personal comparison, but it is far from being the only one. At the international level, moreover, it might be expected that reference group effects within nations would largely disappear (unless it could be shown convincingly that the main comparators for residents of a given country are people in other nations). Nonetheless, given the paucity of empirical evidence that speaks directly to the issue of reference group effects, it is difficult to say much other than to acknowledge it as a potential limitation of any analysis based on subjective life satisfaction.

The question of cultural differences, by contrast, has been subject to a good deal of empirical scrutiny and must be highlighted as a potentially significant limitation to any cross-national comparisons of subjective life satisfaction. There are several distinct aspects of culture difference that have been explored, which can be grouped into three broad areas: 1) translation and commensurability of concepts; 2) variation in the relative importance of different aspects of life; and 3) response bias attributable to cultural norms and values.

Difficulty in translation is a well-known problem in international surveys because languages do not map onto one another precisely. Words carry nuances and implications that can make exact translation difficult. However, most large international surveys attempt to deal with the problem by employing some form of back translation (i.e. translating the survey into a second language, asking an independent translator to render it back into the original language and then comparing the results). Veenhoven (1993) and Shao (1993) both examined results from different translations of life satisfaction surveys within bilingual communities; neither found evidence of significant discrepancy in responses. Russell and Sato (1995) used pictorial representations of different emotions and found that translations of emotion words like "happy" were interpreted the same way in English, Japanese and Chinese. Extant evidence, although by no means conclusive, thus suggests that translation may not be a critical factor in international comparisons of life satisfaction.

If the concept of life satisfaction can be meaningfully translated across different cultures, its relative *importance* for individuals within those cultures may still be quite different. For example, Diener et al. (1995a,b) found that in Chinese culture the very concept of life satisfaction was not valued as highly as it is in, for instance, the US. In another study, Diener and colleagues collected data from samples of students in 41 nations. They found that positivity – i.e. the tendency to report aspects of life in general as being good – was associated with the extent to which positive feelings and emotions were themselves seen as being valuable and worthwhile (Diener et al., 2000). For example, Latin American respondents showed strong normative beliefs about the value of positive feelings, in addition to reporting markedly higher-than-average levels of life satisfaction. A striking example of this kind of cultural variation is given by Eid and Diener (2001), who found that some 83% of Australians and Americans viewed *all* positive emotions as inherently desirable, compared with only 9% of Chinese holding the same view. In all of these cases, differences in cultural norms and values influence how people report feeling about their lives.

A third problem is response biases caused by social desirability. The suggestion here is that widely shared values such as personal modesty, an emphasis on collectivism over individualism, or a desire to "stand out from the crowd" may cause survey respondents in different countries to report subjective life satisfaction that does not accurately reflect their true feelings. This is implied by evidence that the shape of the distribution of life satisfaction responses differs between cultures; Chen et al. (1995), for instance, found that Japanese and Taiwanese students were less likely than American students to use the extremes of the response scale. Oishi (2002) used experience-sampling to compare the day-to-day and remembered well-being of Asian–Americans and Caucasian Americans. No differences were found in day-to-day reports, yet Asian Americans reported lower overall well-being when later asked to recall how they had felt over the whole of the same period.

To what extent do these problems cast doubt on the utility of inter-national comparisons of life satisfaction? A fair response would probably be that whilst there is little doubt cultural effects exist, their power has not been systematically documented at the aggregate level. Diener and Suh (2000) have noted various studies which support the cross-cultural validity of self-reports, by demonstrating correlation with a variety of non-self-report measures. Fahey and Smyth (2004) have argued that a good deal of international variation in subjective indicators can be explained by absolute differences in welfare, thus implying that they are valid tools at this level of analysis. In itself, correlation with objective welfare conditions does not imply that cultural effects are irrelevant, although it does suggest that their magnitude is not so great as to completely obscure other relationships.[1] In any case, it should not be assumed that all variation attributable to cultural differences is "error" or response bias. There may well be cultural differences that have a genuine impact on subjective well-being.

Pending more research into all of the problems highlighted above, however, the most significant obstacle to meaningful cross-country comparisons of life satisfaction in the short term is simply the lack of data. The largest cross-national studies to have consistently made use of a life satisfaction question are the *World Values Surveys* (henceforth WVS — Inglehart et al., 2004),

[1] Another interpretation might be that cultural norms and values are themselves correlated with objective welfare conditions.

which cover 81 countries, predominantly from the developed world. These surveys asked:

> "All things considered, how satisfied are you with your life as a whole these days?"

Veenhoven's (2005) *World Database of Happiness* (WDH) contains survey data from a differently worded question for a further 10 countries, bringing the total to 91. However, this still falls far short of the 178 countries listed in the Human Development Index, with developing countries poorly represented. This limited coverage is a severe barrier to the use of life satisfaction in comparing nations.[2]

This paper attempts to overcome this barrier by developing a database of subjective life satisfaction for all countries listed in the UN's Human Development Report. The core of this dataset is the WVS, although it also includes additional data from other large-scale surveys that we have transformed and calibrated with the WVS. Our main contribution is the use of two new regression models to predict subjective well-being in the remaining countries based on objective indicators. Our approach draws on a recent attempt to predict life satisfaction across nations by Vemuri and Costanza (2006); however, we believe our study addresses some of the limitations of their approach, particularly its inapplicability to developing countries.

The methodology and results sections of the paper are presented in two sections. The first outlines the process of gathering life satisfaction data from existing sources, including details of scale transformation procedures and statistical imputations of life satisfaction from other subjective data. The second section develops two regression models that are used to estimate life satisfaction for those countries where no data are available.

2. Methodology and results 1: data gathering, transformation and imputation of life satisfaction from other subjective data

Our strategy was to make maximum possible use of existing subjective data in compiling our data set. Where multiple data sources were available we chose what we considered to be the most reliable, and the closest to the standard question format. Our core data set was the WVS, transformed in the World Database of Happiness from its original 1–10 scale to a 0–10 scale by means of a linear equation (see Veenhoven, 2005, for details). Hence, where data from other surveys were used, we conducted statistical transformations to match response codes to this same scale. We also made the assumption that *subjective* ratings of other aspects of life (e.g. health, income) were likely to be better correlates of life satisfaction than objective data. Hence, for countries where life satisfaction data were unavailable but other subjective data had been collected, we imputed life satisfaction through the use of appropriate models. This section of the paper describes in detail all of our data sources and data handling procedures.

2.1. World Values Survey

To date, the WVS has involved four waves of surveys across 81 countries and entities, carried out between 1990 and 2005. The surveys ask about subjective perceptions across a vast range of issues, including work, politics, the environment and religion. All the surveys have included the following question:

> "All things considered, how satisfied are you with your life as a whole these days?"

Respondents answered on a 1–10 scale. Our database used the WVS data for 67 countries.[3] For ten further countries, the Latinobarometer (see below) was used instead, whilst for two African countries a mean was taken of the WVS figure and an estimated figure (see below). Figures for the remaining two countries from the WVS (Montenegro — 5.5 and Serbia — 5.1) were not included in our study as they had not been included in the Human Development Report.

2.2. Pew global attitudes survey

The *World Database of Happiness* includes scores for 10 countries not included in the WVS — these originate from a survey of 44 countries conducted by the Pew Research Centre (2002). Respondents were shown a diagram of a ladder and asked:

> "Suppose the top of the ladder represents the best possible life for you and the bottom of the ladder the worst possible life. Where on this ladder do you feel you personally stand at the present time?"

The rungs of the ladder were coded from 0–10. Naturally, this question results in different scores to a life satisfaction question, but the two are reasonably correlated ($r = 0.70$; Veenhoven, 2005). Veenhoven has developed a conversion algorithm to predict life satisfaction from this question (Life Sat = 1.248 + 0.867 × Rung). We used these data for seven of the ten countries for which they were available, rejecting them in favour of the Latinobarometer (see below) for the remaining three.

2.3. Latinobarometer

Conducted by an NGO based in Chile and funded by the USA's National Endowment for Democracy, the Latinobarometer survey was conducted across 18 Latin American countries,

[2] Since the present paper was accepted for publication, the Gallup World Poll (http://www.gallupworldpoll.com/) has been released. This survey contains subjective data from 130 countries in the world and includes questions on life satisfaction and well-being. However, the data-set is currently available only on a commercial basis and carries a very substantial release fee. Public access is limited to a composite "Well-being index" that combines five separate questions, without information about individual distributions or the weightings used to combine them. As such, it does not – at this stage – offer a solution to the problem of limited data availability.

[3] Further, we used the value of 6.6 reported for Indonesia as an estimate for East Timor, based on the fact that East Timor was a part of Indonesia when the surveys were carried out.

with representative samples of around 1000 respondents per country. We used data from the survey published in Graham and Felton (2005).[4] The relevant question was:

> "In general, would you say that you are satisfied with your life? Would you say that you are very satisfied, fairly satisfied, not very satisfied or not satisfied at all?"

Aside from minor differences in the wording, the most important distinction between this and the WVS question is the use of a 4-point response scale. As such, a transformation algorithm was necessary to convert 1–4 scores to 1–10 scores comparable with the WVS and subsequently to 0–10 scores like those reported by Veenhoven (2005).

The algorithm was developed through comparison of the WVS and a set of data from the Eurobarometer survey, a twice yearly survey of social attitudes in Europe which uses the same 4-point life satisfaction question. Two broad approaches are available for developing a transformation algorithm. The simplest is to plot the national averages from the Eurobarometer against those from the WVS for the 15 countries where both are available and determine a best-fit linear equation. This equation can subsequently be used to predict 1–10 scores for each of the countries surveyed in the Latinobarometer. Such an approach, however, makes no attempt to deal with the non-linearity that presumably exists between scores on the two scales – it is unlikely, in other words, that the intervals of a 1–4 scale map to equally spaced values on a 1–10 scale, as this approach assumes.

The second approach, which we favoured, mapped each possible score on the 1–4 scale to a score from 1–10 by utilising the distributions of responses from the two surveys. For example, 5.1% of Eurobarometer respondents in France reported being not satisfied at all with life – the lowest possible score on the 1–4 scale. We assumed that this 5.1%, had they been asked on a 1–10 scale, would have given the same answers as the lowest 5.1% of French respondents in the WVS. Specifically, 2% (of the overall sample) would have given the lowest possible score, 1% a score of 2, and the remaining 2.1% would presumably be amongst those who gave the next highest score, a 3. Averaging these scores, we can argue that the average French respondent giving a 1 on the 1–4 scale, would have given 2.02 on the 1–10 scale. Performing similar calculations for each possible response on the 1–4 scale for each country generates 15 sets of score mappings. A few example countries are shown in Table 1. It is worth noting that these mappings cannot be captured by a linear relationship between responses on a 1–4 scale and those on a 1–10 scale.

It is clear that the variation in mappings between countries is related to the mean level of well-being in that country. Correlating score mappings with life satisfaction estimated simply by aggregating scores on the 1–4 scale results in *r*-values of −0.62, −0.72, −0.63 and −0.61. In other words, in countries with higher mean life satisfaction, all responses on the 1–4 scale correspond to lower values on the 1–10 scale than in countries with lower aggregate life satisfaction. This relation may be coincidental and due to cultural differences in questionnaire response, but it seems more likely that it is an artefact of the mapping process and something that should be corrected for. To do this, we generated 4 regression equations (one for each set of mapping scores) to estimate the correct mapping score for any given country based on its aggregate life satisfaction from the 1–4 scale of the Latinobarometer or Eurobarometer. In this way we can estimate that those respondents in Panama who report not being satisfied at all with life, could be expected to report a mean life satisfaction of 1.5 on a 1–10 scale, or 0.5 on a 0–10 scale.

Table 1 – Conversion scores from Eurobarometer, to be used with Latinobarometer

Score on 1–4 scale	On 0–10, converts to…		
	UK	Germany	France
1	0.28	1.09	1.14
2	3.21	3.77	4.01
3	6.73	7.46	7.08
4	9.25	9.57	9.66

2.4. *Afrobarometer*

The Afrobarometer (Bratton et al., 2004) surveys public attitudes on various issues including democracy, civil society and living conditions. There have been three waves — we used data from the second, conducted between June 2002 and November 2003 and covering 15 countries. The survey developed a random sample based on a multi-stage, stratified, clustered area approach; sample sizes ranged between 1200 and 2004 respondents.

The Afrobarometer contains no questions on life satisfaction in general, but asks about respondents' satisfaction with personal economic, national economic and political conditions, their subjective physical and mental health, their fear of crime and violence, the stability of their family life, and how often they had gone without food over the past year. In principle, these data could be used as independent variables in a regression model to predict life satisfaction. Unfortunately, however, we only had actual reported life satisfaction data for eight of the Afrobarometer countries; hence, a regression approach to estimating scores for the remaining seven countries was unsuitable.

Instead, we calculated weighted means of the subjective variables available in the Afrobarometer, using a model based on Maslow's well-known "hierarchy of needs" (Maslow, 1943). Maslow identifies five levels of needs – physiological, safety, love and belonging, esteem and self-actualisation – and postulates that they are satisfied in strict sequence. Whilst Maslow's model has lost favour somewhat in considerations of well-being in the West, its relevance to developing countries has been explored in more recent studies; for example, Hagerty (1999) suggests that development occurs by moving upwards through the hierarchy of needs (see also Sirgy, 1986). Without insisting upon the sequentiality of the hierarchy, we used it to provide weightings of the different needs. These are shown in Table 2, alongside a list of the subjective indicators

[4] Although our data were obtained from a secondary source, access to the original survey data can be found at http://www.latinobarometro.org/.

used to operationalise each need. With no construct available to satisfactorily operationalise the top level of the hierarchy, we only considered the first four. The absolute weightings are, of course, relatively arbitrary, but modifying them slightly whilst keeping the overall "pyramid" proportions of the model roughly the same has only a very small effect on the resulting scores.

Existing subjective life satisfaction date from the eight African countries where it was available was used to roughly validate the resulting life satisfaction estimates. These were found to be acceptable: for example, Senegal's estimated life satisfaction was 5.84 compared with the true figure of 5.9; Kenya's 5.44 compared with 5.5; and Mali's 5.3 compared with 5.2. Estimates from the Afrobarometer were thus used for seven countries – Botswana, Cape Verde, Lesotho, Malawi, Mozambique, Namibia and Zambia. For two further countries (Ghana and Tanzania), we took an average of the Afrobarometer estimation and the WVS score (see below).

Despite the promising validations of our estimates, this approach is clearly somewhat ad hoc and limited. However, we would defend it as the best of a poor set of options. Subjective data from African countries is woefully lacking and, while the Afrobarometer survey did not provide data to fully operationalise the Maslow model, the questions undoubtedly reflect aspects of subjective quality of life. Methodologically, it was conducted on large samples and appeared to be sensitive to the complexities and issues of sub-Saharan Africa. Moreover, both the absolute values and the order of the estimated life satisfaction scores seem plausible: faring best were countries that have relatively stable economic and political conditions such as Namibia, South Africa and Cape Verde. Faring worst are countries such as Malawi (one of the poorest countries in the world, where life expectancy is dropping) and Lesotho (richer, but one of the countries hardest hit by the HIV pandemic in Southern Africa). Interestingly, our approach is also faithful to a widely reported aspect of subjective life satisfaction in Africa, namely that western African nations such as Nigeria have higher levels of subjective well-being than might be expected given objective welfare conditions.

2.5. *Overlapping data sets*

Where subjective data were available from two different sources, a judgement was required as to which should be accorded primacy. Generally, sources were prioritised according to how similar they were in concept to the WVS. However, there were two exceptions to this principle.

Table 2 – Maslow's needs and their operationalisation using Afrobarometer data

Need level	Issues	Weighting
Physiological	Access to food	40%
Safety	Physical health Mental health Personal economic conditions	30%
Love and belonging	Violence in the family Experience of crime	20%
Esteem	Satisfaction with democracy Optimism	10%

Table 3 – Comparison of WVS sample distribution and actual population distribution for selected countries

Country	Urbanisation		Working in agriculture	
	% of WVS Sample	Actual % of Population	% of WVS Sample	Actual % of Population
Chile	100	85	1.2	13.6
Colombia	99	74	9.6	22.7
Mexico	56	74	14.8	18
Uruguay	100	91	2.4	14
Venezuela	94	86	2.1	13

Firstly, Latinobarometer data were preferred to WVS data for all ten countries where there was a choice. Exploration of the sample distributions for the WVS in these countries suggested that there was evidence of substantial sample biases in these countries; specifically, whilst the income distributions within countries seemed well represented, there appeared to be a bias towards urbanised and well-educated respondents. This can be seen clearly in Table 3 which compares, for selected countries, the proportion of the WVS sample living in urbanised areas and working in agriculture with the actual population distribution, using data from the World Development Indicators database (World Bank, 2007) and the CIA World Factbook (Central Intelligence Agency, 2007).

The second exception is the case of two African nations: Ghana and Tanzania. For both these countries WVS data were available, but problematic. Veenhoven (2005) notes that Ghana's reported life satisfaction score of 7.7 is not corroborated by surveys asking other questions and is probably an overestimate – he suggests a figure closer to 6.0. Meanwhile, Tanzania's remarkably low score of 3.2 appears to be the result of a particularly unusual distribution of scores along the ten point scale, with 40% of respondents choosing the very lowest response code. In both these cases, then, we used the mean of the reported life satisfactions from the World Values Survey (Ghana — 7.7; Tanzania — 3.2) and the estimated life satisfactions based on the Afrobarometer (Ghana — 5.9; Tanzania — 5.7), resulting in scores of 6.8 and 4.4 respectively.

3. Methodology and results 2: imputation from objective data

For 76 countries on the HDI list, no subjective data were available whatsoever. To fill these missing values, we followed Vemuri and Costanza (2006) in attempting to account for life satisfaction in terms of objective data based on different types of capital: natural, built, human and social/political. There are several differences between our approach and their's (these are reviewed in the discussion, below) but for now one key methodological difference should be highlighted. Whilst we both used linear ordinary-least-squares regression to predict life satisfaction scores, Vemuri and Costanza's strategy was to enter all predictor variables simultaneously and search for those making a significant contribution to the model. To avoid the problem of multicollinearity, they excluded highly inter-correlating variables at the outset.

We adopted a more inductive approach. Rather than exclude potentially interesting variables *a priori*, our standard tool was the forward stepwise regression method. In this iterative method, the initial model consists just of the regression intercept. At each subsequent step, the independent variable whose F value corresponds with the lowest probability below the entry criteria (in our case, $p<0.1$) is added to the model, and variables already in the model are removed if their probability of F then exceeds the removal criteria ($p>0.15$). The method terminates when no further variables are eligible for inclusion or exclusion. Using this method, the possibility of two highly correlated predictor variables entering the model is minimised. Once the first predictor has been entered, it is unlikely that the second will enter as well since it will not explain much additional variance. Resulting models tend to be parsimonious whilst avoiding the problem of multicollinearity. (The approach is not without problems, however — these are discussed below). Table 4 shows all the variables tested in the stepwise regressions and their individual correlations with life satisfaction.

3.1. *Human and built capital*

The suggestion that human capital (such as health and education) and built capital (most succinctly operationalised as GDP at purchasing power parity — PPP) are associated with subjective life satisfaction is hardly novel. In particular, GDP per capita has been shown to correlate somewhat with life satisfaction in many studies (e.g. Diener and Biswas-Diener, 2002; Frey and Stutzer, 2002). However, most leave unanswered the question of whether it is income *per se* that drives life satisfaction, or any of a broad range of its correlates: health, education, individualistic ideology, political freedom and rights, and so on (see Diener and Biswas-Diener, 2002, for a discussion of this issue). Wary of inter-correlation, Vemuri and Costanza (2006) collapse human and built capital in their model, using the United Nations' *Human Development Index* (HDI) which combines data on life expectancy, literacy and enrolment rates and GDP per capita. With our use of stepwise regressions we had less cause to worry about testing the effects of inter-correlating variables. Hence, we were able to include separately the life expectancy and the education index from the HDI (for human capital) as well as the natural logarithm of GDP per capita (for built capital) to see which of the three was the best predictor of life satisfaction.

There has been some debate over whether the logarithm of GDP or GDP itself is a better predictor of life satisfaction. Rephrased, the question is whether a percentage increase in GDP or an absolute increase in GDP is more pertinent to well-being. Should one expect two rich countries whose GDPs differ by $1000 to be separated by the same absolute difference in life satisfaction scores as two poor countries whose GDPs differ by $1000 (Mayraz et al., 2006)? Put this way, it seems theoretically indefensible to expect a linear relationship between the two variables and economists (and, indeed, the public) typically focus on percentage changes in GDP rather than absolute changes. This is also consistent with the general concept of diminishing returns, as well as the evidence that examines the within-country effects of income on life satisfaction (Mayraz et al., 2006).

Empirically, however, the pattern is less clear. Using data from the WVS, a logarithmic function (or at least something curvilinear) seems most appropriate (e.g. Veenhoven, 1991; Mayraz et al., 2006). However, others using different sources believe there is insufficient evidence to argue for a non-linear relationship (e.g. Diener et al., 1995a,b; Schyns, 2002). It may be the case that this disagreement is a result of genuine differences in the data sets used and/or an artefact of different statistical approaches,[5] or it may be that other variables that correlate with GDP (such as, for instance, governance factors) may be distorting the results. Given the lack of empirical consensus on this issue and our use of a stepwise regression methodology, we tested both GDP and its logarithm in our models.

Table 4 – List of variables tested and correlations with life satisfaction

Human and built capital	
Human Development Index	0.550 **
Education (component from HDI)	0.340 **
Life Expectancy	0.537 **
ln(GDP)	0.604 **
GDP	0.648 **
Natural capital	
ESP per capita, logged	0.105
ESP / km^2, logged	0.307 **
ESP density per capita, capped at 100,000 $/km/pop$^{-1/2}$, logged	0.201 *
Mean maximum temperature in hottest month	−0.192
Mean minimum temperature in coldest month	0.134
Number of months with less than 30 mm precipitation	−0.254*
Arctic, temperate or tropical	–
Urbanisation levels (% of population living in urban areas)	0.502 **
Social / political capital	
Voice and accountability	0.612 **
Political stability	0.464 **
Government effectiveness	0.616 **
Regulatory quality	0.608 **
Rule of law	0.608 **
Control of corruption	0.655 **
Arithmetic mean of governance factors	0.624 **
Weighted mean of governance factors	0.630 **
Principal component of governance factors	0.625 **

* $p<0.05$, ** $p<0.01$.

3.2. *Natural capital*

Like Vemuri and Costanza (2006), our key indicator of natural capital was the ecosystem services product (ESP), which attempts to quantify the value of natural land types. For example, wetlands are deemed to be of high value to a country due to their disturbance regulation, water supply and waste treatment functions. Meanwhile, deserts are deemed to have

[5] Both Diener et al. (1995a,b) and Schyns (2002) relied on a smaller set of countries (55 and 42 respectively). The former combined various surveys, some asking about happiness, some about life satisfaction. Meanwhile, the latter did not actively search for a logarithmic relationship, only using weak tests to explore the possibility of curvilinear effects.

no value whatsoever (see Costanza et al., 1997). In this way, a gross ESP can be calculated for each country (Sutton and Costanza, 2002) from which one can calculate either the ESP per capita or the ESP/km^2. Vemuri and Costanza (2006) used the natural logarithm of the latter in their model. We tested the logarithms of both, as well as a combination of the two divisions (i.e. ESP/(sqrt(area*population)). For the combination variable, values were capped at 100,000 \$/km/pop$^{-1/2}$ before logging to avoid runaway effects of natural capita. Statistically speaking, both capping and logging had the effect of reducing skew.

Climate has also been found to have an effect on subjective well-being. Rehdanz and Maddison (2005)[6] demonstrate the significant factors to be the mean maximum temperature in the hottest month of the year, the mean minimum temperature in the coldest month of the year, and the number of months with a total precipitation of less than 30 mm. We used the same methodology as these authors to generate a single set of figures for each nation, taking a weighted average of the figures for all urban areas with a population of over one million,[7] for each of the three variables. As well as this, simple dichotomous variables for arctic and tropical latitudes were included (arctic if capital is above 55°, tropical if it is below 30°, temperate if between)

Lastly, urbanisation levels (% of population living in urban areas, UN 2004) were included, with the implication that lower urbanisation implies better access to natural capital.

3.3. Social/Political capital

Vemuri and Costanza (2006) claim to capture social capital using the Freedom House press freedom rating, which they find to have no significant effect on life satisfaction. They suggest that this may be because available indicators for social capital at the national level (press freedom, political rights, and so on) correlate highly with both built and human capital ratings. The authors also acknowledge that such indicators are not ideal operationalisations of the concept of social capital, which should ideally reflect the strength of family and friendship networks, trust and association within the community (e.g. Putnam, 1993). We would argue that all the variables explored by Vemuri and Costanza (2006) measure *political* capital, not social capital.

Nevertheless, we believe political capital may be an interesting predictor of well-being, and potentially one that does not always correlate with human and built capital, especially when comparing *amongst* countries with similar economic development. One major data set not utilised by Vemuri and Costanza (2006; perhaps thought too far removed from their defined target of "social capital") are the World Bank's *Governance Matters* indicators (Kaufman et al., 2005). These data, covering all our target countries, includes separate indicators measuring the following aspects of government:

i. voice and accountability
ii. political stability
iii. government effectiveness
iv. regulatory quality
v. rule of law
vi. control of corruption

Helliwell and Huang (2006) explored the relationships between reported life satisfaction and these indicators. They found that governance definitely does matter to life satisfaction, to the extent of dominating average income when the two are entered into a regression model simultaneously. The authors also found that the Governance Matters indicators dominated those from Freedom House related to civil liberties and political rights when both sets were entered into a regression. Our stepwise methodology enabled us to enter all six *Governance Matters* indicators simultaneously, allowing their relative importance to emerge inductively. We also entered three composite variables based on the indicators, including an arithmetic mean, a weighted mean, and their principal component.

3.4. Stepwise regressions — which country set?

An important conceptual issue is whether a single regression model could be adequate for predicting life satisfaction across the entire set of countries, or whether separate models should be estimated for different regions so as to better reflect differences in culture and circumstances not captured by our chosen predictor variables.[8]

To explore this issue, we conducted a single stepwise regression including all the factors described above as well as dummy variables for seven regions of the World: Latin America, Africa, Asia, West Europe, Anglo-Saxon New World, Middle East and Post-Communist Eurasia. By far the most significant difference is for Post-Communist Eurasia. According to the β coefficient, being a post-communist country depresses mean life satisfaction 1.3 below what would be expected in a country with otherwise similar objective conditions — a substantial difference. This finding is discussed in greater depth in Marks et al. (2006), but is probably related to a decline in living standards in many of these countries over recent years, a decline in world status, and perhaps to certain cultural traits (see e.g. Veenhoven, 2001).

3.5. Stepwise regression — results

As a result of this preliminary analysis, we carried out a main regression to predict life satisfaction based on data from all 79 countries beyond post-communist Eurasia for which we had both life satisfaction and objective data. So as to fill in the gaps

[6] Also see Besabe et al., 2002.

[7] Climate data taken from www.worldweather.org, supplemented by www.worldtravelguide.net. Where figures are not available for a given urban area, they are estimated from nearby locations. Country averages weighted by population of each urban area. For China, India, and the USA, all of which have over 15 urban areas with a population of over 1 million, only those cities with a population of over 1.5 million were included. Population figures for urban areas taken from Wikipedia.

[8] See, for example, Diener and Suh (2000), for a collection of studies showing cross-cultural differences. Also, Helliwell and Huang (2006) found different effects of governance for different regions.

Table 5 – Final regression models

Factor	Capital	Model 1: Global				Model 2: Post-Communist Countries			
		B	*β*	*t*	Tol.	*B*	*t*	Tol.	*β*
Life Expectancy	Human	0.050	0.65	7.86**	0.49				
Voice & Accountability	Political	0.372	0.34	4.10**	0.50				
Tropics	Natural	0.419	0.21	2.40*	0.46				
ESP	Natural	0.192	0.19	2.87**	0.79				
Dry months	Natural	−0.062	−0.18	−2.83**	0.80				
GDP (000s)	Built					0.172	0.94	6.05**	0.73
Urbanisation	Natural					−0.043	−0.50	−3.00**	0.63
Average max temp	Natural					0.075	0.33	1.87	0.58
(constant)		0.956				3.956			
R^2		0.760**				0.722**			
N		79				21			

* $p<0.05$, ** $p<0.01$.

in the post-communist Eurasian data, we also carried out a separate regression, based on life satisfaction data from 21 countries of that region. The results for both regressions are laid out in Table 5 with global predictors listed in order of decreasing *β*-value):

The main regression reveals significant effects of human, socio-political and natural capital. Life expectancy (human capital) has the highest β coefficient, followed by levels of voice and accountability (socio-political capital). The remaining three variables all relate to natural capital. Surprisingly, neither GDP per capita nor its logarithm entered our model. Both do correlate with life satisfaction, but it seems that other correlating variables such as life expectancy and voice and accountability keep them out of the model. Once they have been entered, GDP per capita only has an associated *t*-value of 0.47 ($p=0.6$). Obviously, a study like this does not allow one to claim that GDP is not relevant to life satisfaction, but it does demonstrate that, for the 79 countries in our main regression model, human and socio-political factors are better predictors, and that GDP per capita does not add any further predictive power. It may therefore be the case that built capital's influence on well-being is mediated through its effect on human and socio-political capital. However, one cannot rule out the possibility that this is simply a result of idiosyncrasies of the particular data available to us.

Unlike Vemuri and Costanza, we found political capital contributing significantly to life satisfaction. Whilst all the Governance Matters components correlated significantly with well-being, Voice and Accountability emerged as the strongest predictor. An argument could be made for entering a composite Governance score using all the components and including that in the model instead. This was tried using a straightforward arithmetic mean, a mean weighted by the individual component's correlation with life satisfaction and the principal component of the indicators determined through principal component analysis. None of these composites had a stronger effect than the Voice and Accountability indicator alone.[9]

[9] Voice and Accountability is the second factor to enter the regression, after life expectancy, with a t-value of 4.73. The next highest governance t-value at this stage is that for regulatory quality — but it is only 3.97. Once Voice and Accountability has been entered into the regression, all the other governance factors are no longer significant.

Lastly, natural capital emerged as highly significant. After life expectancy and voice and accountability, the next factor to enter the model is the combined, capped and logged form of ESP, which captures both ESP per capita and ESP/km^2. Countries with higher ESP density report higher life satisfaction. So too do those countries in the tropics, scoring 0.42 higher *ceteris paribus*. Surprisingly, actual climate data showed little predictive power. Maximum and minimum temperatures did not enter the main regression, only the number of dry months — countries which enjoy more dry months have *lower* levels of life satisfaction. As Rehdanz and Maddison (2005) suggest, even this may not be a direct effect of climate but rather the indirect effect of climate on the landscape.

Why do we see such a weak effect of climate, whereas Rehdanz and Maddison (2005) have found stronger effects? It may be because we have controlled for other relevant factors (notably ESP and governance data) or because we have included a larger number of countries (79, even without post-communist countries, whereas they only had data for 56 countries). However, an alternative explanation may be simply that we used reported life satisfaction, whereas Rehdanz and Maddison (2005) used reported happiness.

For the 79 countries for which we had actual survey data, the three forms of capital combined to account for 76% of the variation in life satisfaction, considerably higher than the 35% in Vemuri and Costanza's model. Moreover, thanks to the stepwise methodology there do not appear to be problems with multicollinearity. The lowest tolerance value is 0.46, well above even the most stringent of standard tolerance thresholds (0.2 — Menard, 1995).

Amongst post-communist countries, the regression equation emerged slightly differently. Here built capital did enter the model (in the form of GDP), but neither human nor socio-political capital did. Alongside GDP, urbanisation also entered the model as a negative proxy for natural capital. Lastly, rather than ESP having a positive effect, it seems that temperature proved relevant here, with those countries having the highest average temperatures in the hottest months scoring higher life satisfaction. At best, these patterns should be taken with caution given the very small sample size (only 21 countries). Further, the effect of temperature should be understood in the context of the fact that these are generally colder countries.

Table 6 – Predicted and reported life satisfaction scores in descending order

Country	Predicted life satisfaction	Reported life satisfaction	Source
Denmark	7.31	**8.20**	1
Switzerland	7.46	**8.20**	1
Austria	7.19	**7.80**	1
Iceland	.	**7.80**	1
Finland	7.70	**7.70**	1
Sweden	7.56	**7.70**	1
Canada	7.70	**7.60**	1
Ireland	7.38	**7.60**	1
Luxembourg	6.85	**7.60**	1
Malta	6.93	**7.50**	1
Netherlands	7.24	**7.50**	1
Bahamas	**7.48**	.	5
Belize	**7.46**	.	5
Dominica	**7.46**	.	5
Costa Rica	7.53	**7.41**	3
New Zealand	7.67	**7.40**	1
Norway	7.72	**7.40**	1
United States of America	7.21	**7.40**	1
St. Kitts and Nevis	**7.36**	.	5
St. Vincent and the Grenadines	**7.36**	.	5
Antigua and Barbuda	**7.32**	.	5
Vanuatu	**7.32**	.	5
Australia	7.56	**7.30**	1
Belgium	6.86	**7.30**	1
Venezuela	6.76	**7.27**	3
Seychelles	**7.27**	.	5
St. Lucia	**7.25**	.	5
Germany	7.08	**7.20**	1
Barbados	**7.20**	.	5
Panama	7.18	**7.16**	3
Colombia	6.80	**7.14**	3
Suriname	**7.12**	.	5
Honduras	6.48	**7.11**	3
Samoa (Western)	**7.11**	.	5
United Kingdom	7.40	**7.10**	1
Hong Kong	**7.06**	.	5
Spain	6.91	**7.00**	1
Dominican Republic	6.91	**6.98**	3
Guatemala	6.18	**6.97**	3
Guyana	**6.96**	.	5
Malaysia	**6.95**	.	5
Mexico	6.76	**6.94**	3
Brunei Darussalam	**6.92**	.	5
Tonga	**6.92**	.	5
Cyprus	6.74	**6.90**	1
Italy	7.04	**6.90**	1
Singapore	7.18	**6.90**	1
Jamaica	**6.89**	.	5
Trinidad and Tobago	**6.89**	.	5
Sri Lanka	**6.84**	.	5
Argentina	6.64	**6.82**	3
Solomon Islands	**6.82**	.	5
Ghana	5.94	**6.79**	1 & 4
Fiji	**6.75**	.	5
El Salvador	6.48	**6.72**	3
Mauritius	**6.72**	.	5
Grenada	**6.72**	.	5
Israel	6.40	**6.70**	1
Paraguay	6.75	**6.68**	3
Chile	6.78	**6.65**	3
Cuba	**6.64**	.	5
São Tomé and Principe	**6.64**	.	5
Maldives	**6.62**	.	5
Thailand	**6.61**	.	5
France	7.08	**6.60**	1
Indonesia	6.51	**6.60**	1
Slovenia	7.07	**6.60**	1
Taiwan	7.17	**6.60**	1
Timor-Leste	.	**6.60**	1*
Uruguay	7.05	**6.56**	3
Brazil	7.09	**6.54**	3
Nicaragua	6.74	**6.53**	3
Nigeria	4.99	**6.50**	1
Czech Republic	6.41	**6.40**	1
Philippines	6.54	**6.40**	1
Uzbekistan	5.35	**6.40**	2
Comoros	**6.31**	.	5
China	5.48	**6.30**	1
Greece	6.83	**6.30**	1
Namibia	5.57	**6.29**	4
Japan	7.25	**6.20**	1
Peru	6.31	**6.18**	3
Ecuador	6.75	**6.16**	3
Portugal	6.90	**6.10**	1
Vietnam	5.99	**6.10**	1
Bolivia	6.40	**6.08**	3
Cape Verde	6.08	**6.06**	4
Kuwait	**6.06**	.	5
United Arab Emirates	**6.04**	.	5
Papua New Guinea	**6.03**	.	5
Gabon	**6.01**	.	5
Iran	5.30	**6.00**	1
Cóte d'Ivoire	5.11	**6.00**	2
Qatar	**5.97**	.	5
Turkmenistan	**5.94**	.	5
Croatia	5.41	**5.90**	1
Poland	5.06	**5.90**	1
Senegal	5.72	**5.90**	2
Oman	**5.88**	.	5
Cambodia	**5.82**	.	5
Madagascar	**5.81**	.	5
Korea	6.65	**5.80**	1
Benin	**5.79**	.	5
Tunisia	**5.74**	.	5
Tajikistan	**5.73**	.	5
Bangladesh	5.92	**5.70**	1
Hungary	5.73	**5.70**	1
Bahrain	**5.70**	.	5
Nepal	**5.66**	.	5
Haiti	**5.66**	.	5
Morocco	5.55	**5.60**	1
Lebanon	5.72	**5.60**	2

(continued on next page)

Table 6 (continued)

Country	Predicted life satisfaction	Reported life satisfaction	Source
Congo	**5.57**	.	5
Bhutan	**5.53**	.	5
South Africa	5.63	**5.50**	1
Kenya	5.22	**5.50**	2
Gambia	**5.45**	.	5
Palestine	**5.44**	.	5
Saudi Arabia	**5.42**	.	5
India	5.94	**5.40**	1
Slovakia	5.88	**5.40**	1
Botswana	5.14	**5.38**	4
Laos	**5.38**	.	5
Turkey	5.86	**5.30**	1
Burma	**5.30**	.	5
Guinea	**5.23**	.	5
Mozambique	5.15	**5.21**	4
Cameroon	**5.21**	.	5
Algeria	5.44	**5.20**	1
Romania	5.04	**5.20**	1
Uganda	5.56	**5.20**	1
Mali	5.33	**5.20**	2
Togo	**5.18**	.	5
Kyrgyzstan	**5.15**	.	5
Equatorial Guinea	**5.14**	.	5
Bosnia and Herzegovina	5.08	**5.10**	1
Estonia	4.90	**5.10**	1
Jordan	5.54	**5.10**	1
Libya	**5.10**	.	5
Guinea-Bissau	**5.07**	.	5
Sierra Leone	**5.02**	.	5
Central African Republic	**4.98**	.	5
Yemen	**4.98**	.	5
Kazakhstan	**4.96**	.	5
Syria	**4.96**	.	5
Burkina Faso	**4.95**	.	5
Ethiopia	**4.95**	.	5
Sudan	**4.91**	.	5
Azerbaijan	4.73	**4.90**	1
Macedonia	4.85	**4.90**	1
Mauritania	**4.85**	.	5
Burundi	**4.84**	.	5
Congo, Dem. Rep. of the	**4.81**	.	5
Niger	**4.81**	.	5
Egypt	4.93	**4.80**	1
Angola	4.54	**4.80**	2
Rwanda	**4.80**	.	5
Zambia	4.74	**4.75**	4
Djibouti	**4.73**	.	5
Latvia	4.51	**4.70**	1
Lithuania	4.77	**4.70**	1
Eritrea	**4.64**	.	5
Albania	5.28	**4.60**	1
Chad	**4.55**	.	5
Tanzania	5.44	**4.44**	1 & 4
Malawi	5.10	**4.35**	4
Bulgaria	4.31	**4.30**	1
Pakistan	5.23	**4.30**	1
Russia	4.22	**4.30**	1
Swaziland	**4.29**	.	5
Mongolia	**4.19**	.	5
Lesotho	4.66	**4.11**	4
Georgia	3.99	**4.10**	1
Belarus	3.70	**4.00**	1
Armenia	4.30	**3.70**	1
Ukraine	3.88	**3.60**	1
Moldova	4.24	**3.50**	1
Zimbabwe	4.21	**3.30**	1

Data in bold represent the final data set suitable for further use.
Reported scores should be interpreted with 95% confidence intervals of ±0.12 and predicted scores ±1.08.
Key for sources
1 — World Values Survey (68 countries).
2 — Pew Global Attitudes Survey (7 countries).
3 — Latinobarometer (18 countries).
4 — Afrobarometer (7 countries).
5 — Predicted from regressions (76 countries).
1 & 4 — Averages of WVS and Afrobarometer (2 countries).
* — East Timor assumed to be covered by same figure as for Indonesia, as it was part of that country at the time of the surveys.

Nevertheless, the three variables combined produce a statistically significant model accounting for 72% of variation in life satisfaction amongst these countries, which is still notably high.[10]

3.6. *Predicting life satisfaction scores*

The main regression model allowed the prediction of life satisfaction values for 71 countries, predominantly in Africa, the Caribbean and the West Pacific. The secondary regression allowed the prediction of life satisfaction value for the five remaining countries in the post-Communist bloc, all in Central Asia.

Table 6 shows our complete set of scores for the 178 countries reported in the UN HDR, in descending order of life satisfaction. We present both predicted and reported values where available and for each of the reported values the key indicates the data source and the 95% confidence interval.[11] Fig. 1 shows a scatterplot of predicted vs. reported scores for those countries where both were available.

Caution should be exercised in interpreting Table 6; because of sampling error and unknown variance in the regression, two countries several ranks apart may not be statistically different from one another. Rather than report separate confidence intervals for each country, we have adopted a pragmatic approach that yields two "ballpark" figures: one for real scores

[10] It should be noted that the governance matters variables were not entered separately in this stepwise regression, but rather as three composite variables. Entered separately, they lead to counter-intuitive interactions, with Control of Corruption and Regulatory Quality entering, but the latter only as a *negative* predictor. With such a small dataset, it is likely that these results are only a result of the high inter-correlation between these variables and random variation between them. None of the three composites of the governance matters variables entered the model.

[11] For East Timor and Iceland, we did not have data for all the independent variables and could therefore not predict life satisfaction. However, reported data is available for both of these countries.

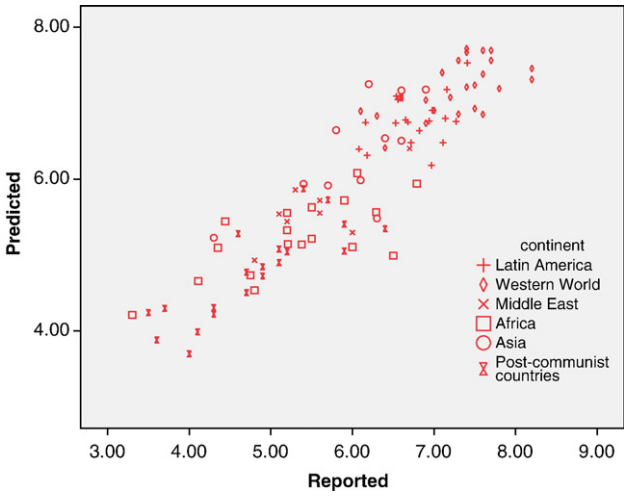

Fig. 1 – Scatterplot of real vs. predicted values for those countries where both data are available ($r = 0.90$ **).

and one for scores estimated in the regression. The former was calculated using the average sample size and average standard deviation across countries from wave four of the WVS. The resulting 95% confidence interval is ±0.12. Note that, at least for data from Veenhoven's World Database of Happiness, this is a conservative estimate — Veenhoven's data is based on aggregates of several waves of the WVS, which inevitably leads to tighter confidence intervals than those based a single wave because of the higher total *N*. For the estimated scores, we used SPSS to calculate individual prediction intervals (in effect, confidence intervals at 95%) for each country, yielding a mean interval across the sample of ±1.08. Clearly this is considerably larger than that for real scores and reflects the variance unaccounted for by the regression model.

4. Discussion

The central motivation for the present work was to develop a set of national-level life satisfaction scores that could be used alongside objective indicators in a metric for international comparison (Marks et al., 2006). In this endeavour we followed previous researchers in attempting to estimate missing scores as robustly as possible, given the limitations of existing data.

The resulting data set should properly be regarded as a stop-gap. Ideally, real subjective data on life satisfaction (and, for that matter, many other aspects of well-being) should be gathered for all countries in the World and, if properly sampled, would naturally take precedence over our predicted scores. Unfortunately for researchers and policy-makers interested in making international comparisons of well-being, there seems to be little prospect of such comprehensive data being collected – or at least made widely available – in the near future. Large scale surveys of the kind that would be required are not only hugely expensive and time-consuming, but also politically sensitive.

There are some stark differences between our predictions and those of Vemuri and Costanza (2006), whose paper represents the most substantial previous attempt to estimate worldwide scores. Notably, their predictions range from 8.2 (Bahamas) to 0.2 (Mali), whereas ours fit more within the national averages actually found in life satisfaction surveys, ranging from 7.7 (Norway) to 3.7 (Belarus). We believe that our estimations are a more accurate portrayal of the real level of life satisfaction in many countries, particularly given the substantially higher R^2 of our main regression model. To improve model fit, Vemuri and Costanza exclude poorer countries from their model — this increased the fit to 0.72, but makes it conceptually problematic to apply the model to poor countries. There is a danger of circularity in predicting life satisfaction amongst poorer countries using a model based only on richer countries, when the poorer countries were excluded in the first place because they were found to be outliers.

We note the following essential differences between our method and that of Vemuri and Costanza:

- The use of a greater number of data points on which to base our regression model: 78, excluding post-communist states, compared with 56 (of which six were later excluded).
- The use of a more representative set of countries (for example, we had data for 19 sub-Saharan African nations, whilst they had only three, of which they excluded two).
- A forward stepwise methodology, allowing the inclusion and exploration of a greater number of independent variables.
- The use of the Governance Matters data set to better capture social / political capital.
- The use of a combined and capped ESP score reflecting not only the density of natural capital, but also the amount per capita, as well as acknowledging that there is probably a limit to the benefits of natural capita to subjective life satisfaction.

4.1. *Limitations of the present study*

Two general criticisms of the stepwise regression method should be noted, one technical and one conceptual. Firstly, it can be blind to interactions between variables. Two variables that are not strong predictors individually but become so when their interactions are considered might not find their way into a stepwise regression model, since variables are entered one-by-one. In the present case, however, there were no strong theoretical reasons to believe that any of our independent variables might be interacting in an interesting way. Running full entry regressions afterwards, we were able to check if any important variables had been left out. No additional variables emerged as significant at the 0.05 level.

Secondly, one should be wary of conclusions drawn when one variable enters the model and a related one is excluded. For example, as noted above, we tested a battery of six variables from the World Bank's *Governance Matters* reports. These six variables, unsurprisingly, inter-correlate fairly strongly, meaning that the inclusion of one of the six typically (but not necessarily) excludes the other five from the model. This does not imply that, for example, the control of corruption is important, whereas government effectiveness is not (as might be concluded from looking at the data from the subset of African countries). All that can be concluded without carrying out further analyses is that overall quality of governance matters to life satisfaction for this group of countries and that this is best captured by the "control of corruption" indicator. Stepwise regression is thus more

appropriate for conducting exploratory analysis with a view to data reduction and building models with maximum explanatory power (as was the purpose here) rather than for testing hypotheses or inferring causation. As such, we make no strong claims that our models reflect underlying processes through which subjective life satisfaction is determined from individual to individual.

More generally, we would caution against using the full set of estimated scores to determine predictors of life satisfaction (e.g. as a dependent variable in regression models) due to the risk of artificially inflated correlation with independent variables that may themselves be correlated with those used to make the estimates in the first place. That said, the high R^2 of both models can reasonably be taken to imply that the patterns of correlations observed in countries for which real life satisfaction data exist are likely to be replicated across the remaining countries.

Finally, we are aware that cultural factors of the kind discussed earlier are absent from our model and we note several authors who have demonstrated their importance (e.g. Diener and Suh, 2000; Diener et al., 1995a,b). However, there currently exist no available data sets on culture that cover the entire world, or even a large portion of it — the most extensive probably being the WVS itself. As such, we have to discount such variables until sufficient data are made available. At any rate, using dummy variables in for each region revealed only one significant effect — that of the post-Communist countries (which we have already discussed).

5. Conclusions

In this paper, we have presented a comprehensive set of life satisfaction data for 178 countries across the World. We have made use of the best and most recent available data, transforming this where appropriate to ensure maximum comparability. For countries where no suitable data have been collected to-date, we have estimated scores based on two regression models, both of which fit the existing data extremely well and produce estimates that have good face validity. We hope that this data set will prove useful to researchers interested in understanding differences between nations, not only in terms of life satisfaction but also other aspects of socio-economic development where consideration of a subjective component can help provide important insights.

We are mindful that this is a controversial project but we hope that readers will find our approach persuasive. No statistical estimation of subjective data can be a truly adequate substitute for the real thing. If nothing else, we would be happy if this paper provides a catalyst for the collection of high quality, properly sampled and open-access data, using appropriate questions, which would render our estimations obsolete.

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