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Towards a Measure of non-Economic National Well-being Achievement: μ_i and other Constructs

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SUMMARY

It is common to treat human well-being as a multidimensional concept, enveloping diverse, separable or behaviourally distinct components, domains or dimensions It is in particular thought to be a much richer or vital concept than economic well-being: much of the literature is justifiably emphatic about this point. Accordingly, there is a long history of efforts to both refocus attention away from the established, although invariably far less than perfect, monetary measures of national economic well-being achievement and to better capture non-economic well-being achievement. A plethora of indicators has been proposed for these purposes. Indicators of health and educational status are most widely-used in inter-country ordinal and cardinal assessments of national well-being achievement, and are now available for diverse samples of 160 or more countries. Multidimensional indicators are also available for similar samples, based either solely or predominantly on these indicators, and include the Physical Quality of Life Index (PQLI) and the very well-known Human Development Index (HDI).

As valid as their conceptual justifications might be, these standard indicators are often highly correlated, both ordinally and cardinally, among countries with income per capita, the most accepted measure of economic well-being achievement. This is especially the case for large, diverse samples of countries, much to the frustration or disappointment of the proponents of these indicators. Inter-country variation in non- or non-exclusively economic well-being achievement, measured using these standard measures is, therefore, well-predicted by variation in economic well-being. An implication of this relationship is that the standard non-economic or non-exclusively economic measures might not capture the rich essence or vitality the well-being concept, giving an incomplete picture of it. The contribution of the standard non-economic measures has been questioned on these grounds, with some commentators going so far as to claim they are empirically redundant *vis-a-vis* income per capita.

Yet a simple and instructive point has been either overlooked or given insufficient attention in the literature. While there is a high correlation between income per capita and the standard non- or non-exclusively economic indicators in large and diverse samples of countries, some countries perform better in the latter than predicted by the former and some countries perform worse. What would seem, therefore, to be more interesting and informative, than correlations between indicators, is that variation in measures of standard non- or non-exclusively economic well-being not accounted for by income per capita. A measure of this well-being achievement, on which international comparisons are based, would appear to be warranted. Such is the focus of this paper.

This paper commences by extracting, using principal components analysis, the maximum possible information from various standard national non-economic well-being achievement measures. It then empirically identifies the variation in this extraction not accounted for by variation in income per capita, in the form of a variable called μ_i. This variable is the residual yielded by a cross-country regression of the extraction on the logarithm of PPP GDP per capita. μ_i is interpreted as *inter alia* a measure of non-economic human well-being achievement *per se*, in the sense that it captures well-being achieved independently of income. Given that μ_i is a purely statistical construct, obtained econometrically, the paper then looks at correlations between this measure and variants of it and other well-being or well-being related indicators in an attempt to find the variable or group of variables which best captures non-economic well-being achievement. It should be emphasised that this a purely measurement exercise, in that inferences regarding causality are not drawn explicitly. It is though of potential practical benefit, as it provides a case for allocating more resources to the collection and reporting of this variable or variables. Measures of youth education status and gender empowerment performs best in this regard, although none of these less widely-used indicators perform better than a very widely-used one, adult literacy. The paper also examines the implications of this result for the collection and reporting of well-being statistics and for future research.

Towards a Measure of non-Economic National Well-being Achievement: μ_i and other Constructs

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Abstract

Income per capita and most widely reported, non- or non-exclusively income based human well-being indicators are highly correlated among countries. Yet many countries exhibit higher achievement in the latter than predicted by the former. The reverse is true for many other countries. This paper commences by extracting the inter-country variation in a composite of various widely-reported, non-income-based well-being indices not accounted for by variations in income per capita. This extraction is interpreted *inter alia* as a measure of non-economic well-being. The paper then looks at correlations between this extraction and a number of new or less widely-used well-being measures, in an attempt to find the measure that best captures these achievements. Various empirical procedures are performed, which *inter alia* allow for measurement error in the non-income-based measures. A number of indicators are examined, including measures of poverty, inequality, health status, education status, gender bias, empowerment, governance and subjective well-being.

JEL Codes: I31, D63, C43, C21

Key Words: human well-being achievement, well-being dimensions, income per capita, Human Development Index, principal components analysis.

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I. Introduction

It is common to treat human well-being as a multidimensional concept, enveloping diverse, separable or behaviourally distinct components, domains or dimensions (Alkire, 2000; Cummins, 1996; Doyal and Gough, 1993; Finnis, 1980; Galtung, 1994; Narayan, 2000; Nussbaum, 1988; Qizilbash, 1996, Sen, 1990, 1993; Stewart, 1996; UNDP, 1990-2003, among many other studies).[2] It is in particular thought to be a much richer or vital concept than economic well-being: much of the literature is justifiably emphatic about this point. Accordingly, there is a long history of efforts to both refocus attention away from the established, although invariably far less than perfect, monetary measures of national economic well-being achievement and to better capture non-economic well-being achievement. A plethora of indicators has been proposed for these purposes. Indicators of health and educational status are most widely-used in inter-country ordinal and cardinal assessments of national well-being achievement, and are now available for diverse samples of 160 or more countries (see UNDP, 2003). Multidimensional indicators are also available for similar samples, based either solely or predominantly on these indicators, and include the Physical Quality of Life Index (PQLI) and the very well-known Human Development Index (HDI).

As valid as their conceptual justifications might be, these standard indicators are often highly correlated, both ordinally and cardinally, among countries with income per capita, the most accepted measure of economic well-being achievement (Hicks and Streeten, 1979; Larson and Wilford, 1979; McGillivray, 1991; McGillivray and White, 1992; Srinivasan, 1994; Noorbakhsh, 1998; Cahill, 2004). This is especially the case for large, diverse samples of countries, much to the frustration or disappointment of the proponents of these indicators. Inter-country variation in non- or non-exclusively economic well-being achievement, measured using these standard measures is, therefore, well-predicted by variation in economic well-being.[3] An implication of this relationship is that the standard non-economic or non-exclusively economic measures might not capture the rich essence or vitality the well-being concept, giving an incomplete picture of it. The contribution of the standard non-economic

2. For the purposes of this paper notions such as human well-being, quality of human life, human development, basic human needs fulfilment are treated as synonymous.

3. These correlations hold for large samples of countries, both developed and developing. Smaller samples yield much lower correlation coefficients, although in most cases these coefficients are statistically significant.

measures has been questioned on these grounds, with some commentators going so far as to claim they are empirically redundant *vis-a-vis* income per capita.

Yet a simple and instructive point has been either overlooked or given insufficient attention in the literature. While there is a high correlation between income per capita and the standard non- or non-exclusively economic indicators in large and diverse samples of countries, some countries perform better in the latter than predicted by the former and some countries perform worse. What would seem, therefore, to be more interesting and informative, than correlations between indicators, is that variation in measures of standard non- or non-exclusively economic well-being not accounted for by income per capita. A measure of this well-being achievement, on which international comparisons are based, would appear to be warranted. Such is the focus of this paper.

This paper commences by extracting, using principal components analysis, the maximum possible information from various standard national non-economic well-being achievement measures. It then empirically identifies the variation in this extraction not accounted for by variation in income per capita, in the form of a variable called $\mu_{i.}$. This variable is the residual yielded by a cross-country regression of the extraction on the logarithm of PPP GDP per capita. $\mu_{i.}$ is interpreted as *inter alia* a measure of non-economic human well-being achievement *per se*, in the sense that it captures well-being achieved independently of income. Given that $\mu_{i.}$ is purely a statistical construct, obtained econometrically, the paper then looks at correlations between this measure and variants of it and other well-being or well-being related indicators in an attempt to find the variable or group of variables which best captures non-economic well-being achievement. It should be emphasised that this a purely measurement exercise, in that inferences regarding causality are not drawn explicitly. It is though of potential practical benefit, as it provides a case for allocating more resources to the collection and reporting of this variable or variables. Measures of youth education status and gender empowerment performs best in this regard, although none of these less widely-used indicators perform better than a very widely-used one, adult literacy. The paper also examines the implications of this result for the collection and reporting of well-being statistics and for future research.

II. non-Economic Well-being Achievement

Let us commence with the following composite, 'standard' index of non-economic well-being for country *i*:

$$W_i = \sum_{k=1}^{m} \Phi_k x_{k,i}^{t} \qquad i = 1,...,n. \tag{1}$$

where $x_{k,i}^{t}$ are appropriately transformed values of the well-being indicators $x_{k,i}$ and the Φ_k are weights. The $x_{k,i}$ are 'standard' non-economic well-being indicators. Characterised above, these indicators are those commonly used and reported, available for a large number of countries and typically highly correlated with income per capita. W_i captures that maximum obtainable information from the $x_{i,k}$ subject to an appropriate condition. This is achieved by choosing the Φ_k that maximise the variance of W_i subject to a normalisation condition. Φ_ks are therefore obtained by principal components analysis, with W_i being the first principal component extracted from the $x_{k,i}^{t}$ and Φ_k being an (m × 1) eigenvector. The corresponding eigenvalue is λ_k and the normalisation condition is that Φ_k^2 equals λ_k.[4]

W_i as a standard non-economic measure will be highly correlated with income per capita. Our task is to extract from it that information which is not predicted by income. The following regression equation is therefore estimated:

$$W_i = \alpha + \beta \ln y_i + \mu_i \tag{2}$$

where $\ln y_i$ is the logarithm of income per capita. The logarithm is used to reflect diminishing returns to the conversion of income into economic well-being. This transformation is consistent with the well-known Atkinson formula for the utility or well-being derived from income, which is written as follows:

$$W(y_i) = \frac{1}{1-\varepsilon} y_i^{1-\varepsilon} \tag{3}$$

where $W(y_i)$ is the utility or well-being derived from income and ε measures the extent of diminishing returns. As ε approaches one $W(Y_i)$ becomes the logarithm of y_i.[5]

4. Ram (1982), Ogwang (1994) and Lai (2000) also use the principal components technique to derive well-being measures.

5. Anand and Sen (2000) provide a detailed discussion of this issue in the context of the HDI.

The error term from (2), $\mu_{i,}$, is central to our analysis. It is by definition orthogonal with respect to lny_i, and as such is not subject to the criticism that it reveals disappointingly little additional information in inter-country well-being than income per capita. More pointedly, it is is interpreted as a measure of non-economic or income-independent human well-being achievement. It is also interpreted, possibly contentiously, as a measure both of the success in converting economic well-being into non-economic well-being and of the non-economic well-being component, dimension or domain within the space of W_i.

III. Estimating μ_i: Data and Results

The chosen components of index W_i prior to transformations are years of life expectancy ($x_{1,i}$), the adult literacy rate ($x_{2,i}$) and the gross school enrolments ratio ($x_{3,i}$). The measure of income is PPP GDP per capita. Data on these variables are taken from the UNDP's *Human Development Report 2002* (UNDP, 2002). These variables are the components of the HDI. W_i can thus be interpreted as a modified HDI.[6] They are available for a sample of 173 countries and are very widely used. Moreover, as Tables 1 and 2 show, they are quite highly correlated among each other, with PPP GDP per capita and the HDI as a whole. The Pearson (zero-order) coefficients between these variables and the logarithm of PPP GDP per capita in Table 1 range from 0.701 to 0.794 and the corresponding Spearman (rank-order) coefficients in Table 2 range from 0.695 to 0.840.

6. The HDI is a weighted average of life expectancy, adult literacy, gross school enrolment and the logarithm of PPP GDP per capita, each scaled within theoretical ranges of zero and one-hundred. The first and fourth of these variables are assigned weights of one-third, while the second and third variables are assigned weights of two-ninths and one-ninth, respectively. It follows that W_i, differs from the HDI in that it assigns different weights to each variable (income per capita receives a weight of zero) and that the variables are transformed using a different procedure, outlined above. Stewart and Ranis (2000) use a similar index, which is identical to the HDI in all respects other than assigning a zero weighting to income per capita.

Table 1: Zero-order (Pearson) Correlation Coefficients between Commonly-used Well-being Indicators (*n*=173)

		Life Expectancy ($x_{1,i}$)	Adult Literacy (x_{2i})	Gross Enrolment ($x_{3,i}$)	HDI	PPP GDP per capita (log) ($\ln y_i$)
Life Expectancy	($x_{1,i}$)	1.000				
Adult Literacy	($x_{2,i}$)	0.726	1.000			
Gross Enrolment	($x_{3,i}$)	0.736	0.803	1.000		
Human Development Index	(HDI)	0.925	0.870	0.881	1.000	
PPP GDP per capita (log)	($\ln y_i$)	0.794	0.701	0.792	0.923	1.000

Table 2: Rank-order (Spearman) Correlation Coefficients between Commonly-used Well-being Indicators (*n*=173)

		Life Expectancy ($x_{1,i}$)	Adult Literacy ($x_{2,i}$)	Gross Enrolment ($x_{3,i}$)	HDI	PPP GDP per capita ($\ln y_i$)
Life Expectancy	($x_{1,i}$)	1.000				
Adult Literacy	($x_{2,i}$)	0.724	1.000			
Gross Enrolment	($x_{3,i}$)	0.715	0.773	1.000		
Human Development Index	(HDI)	0.938	0.841	0.833	1.000	
PPP GDP per capita (log)	($\ln y_i$)	0.840	0.695	0.780	0.938	1.000

Results of the principal components analysis, which is based on the transformed components, the $x^t_{k,i}$, are shown in Table 3.[7] W_i, the first principal component performs very well in extracting information from the three component variables, capturing 84 percent of the eigenvalues. The component variable weights Φ_k are very similar, varying from 0.565 to 0.585. Correlation coefficients between W_i, and its component variables, shown in Table 4, are all very high, ranging from 0.895 to 0.927 and 0.894 to 0.908 for the zero- and rank-order coefficients, respectively. Each of the preceding results are consistent with the rather high correlations between the three component variables reported above. W_i is also very highly correlated with the HDI and, pertinently, with $\ln y_i$. The zero-order and rank-order coefficients between W_i and the HDI are 0.976 and 0.956, respectively. The corresponding coefficients between W_i and $\ln y_i$ are 0.833 and 0.838, respectively, thus deeming W_i as a standard indicator in the sense defined above. A scatter plot of W_i and PPP GDP per capita are shown in Figure 1.

Table 3: Principal Components Analysis Results

		Principal Components		
		First ($PC_{1,i}=W_i$)	Second ($PC_{2,i}$)	Third ($PC_{3,i}$)
Eigenvalue		2.510	0.293	0.197
Cumulative Percentage of Eigenvalues		83.654	93.424	100.000
Component Weights (Φ_k):	Life Expectancy ($x_{1,i}$)	0.565	-0.824	-0.051
	Adult Literacy ($x_{2,i}$)	0.582	0.441	-0.683
	Gross Enrolment ($x_{3,i}$)	0.585	0.356	0.729

7. The principal components analysis was conducted using the computer program SHAZAM, which allows the analysis to be done on a number of alternative matrices. The correlation matrix was chosen, which is appropriate when the original variables are measured in different units, as is the case with the $x_{k,i}$. This dictated that the $x^t_{k,i}$s, in equation (1) above, from which W_i were extracted, were obtained through the following transformation of the $x_{k,i}$s:

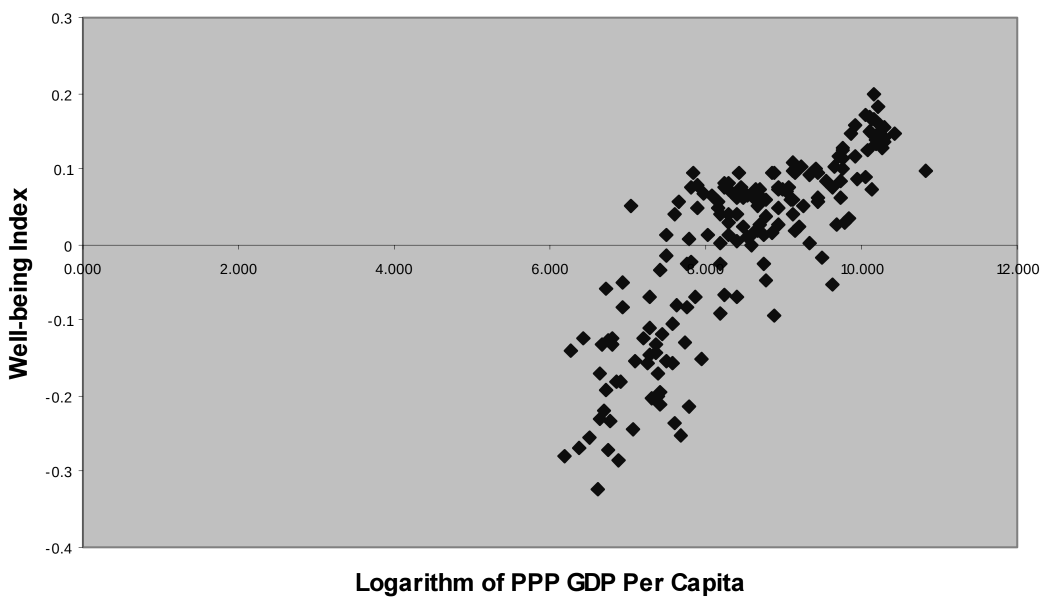
$$x^t_{k,i} = \frac{x_{k,i} - \bar{x}_{k,i}}{\left[\sum_{i=1}^{n} \left(x_{k,i} - \bar{x}_{k,i}\right)^2\right]^{\frac{1}{2}}} .$$

where the bar denotes a mean value. This is a linear transformation, such that a scatter plots of each $x^t_{k,i}$ on the corresponding $x_{k,i}$ are perfectly straight lines, with these variables sharing a correlation coefficient of one.

Table 4: Correlation Coefficients between Well-being Indicators

		Well-being Index (W_i=$PC_{1,i}$) Zero-order	Well-being Index (W_i=$PC_{1,i}$) Rank-order
Life Expectancy	($x_{1,1,i}$)	0.895	0.894
Adult Literacy	($x_{2,1,i}$)	0.923	0.908
Gross Enrolment	($x_{3,1,i}$)	0.927	0.905
Human Development Index (HDI)		0.976	0.956
PPP GDP per capita (log)	($\ln y_i$)	0.833	0.838

Figure 1: Scatter Plot of Well-being Index and Income Per Capita



Regressing W_i, on $\ln y_i$ yielded the following equation:

$$\hat{W}_i = \underset{(-19.50)}{-0.755} + \underset{(19.67)}{0.089}\ln y_i .$$

The numbers in parentheses are *t* ratios. The R^2 and $\bar{R}^2$ are 0.694 and 0.692, respectively. Estimates of μ_i, are shown, along with values of W_i and all other variables mentioned above in Appendix Table A1. Those countries with the 15 highest and 15 lowest residual values are shown in Table 5. High residual values indicate that countries do better in terms of non-economic, or non-income predicted, well-being achievement. The group of countries which

Table 5: Well-being Data - Selected Countries

	PPP GDP per capita			HDI		Well-being Index		Residual	
Country	Value (y_i)	Value ($\ln y_i$)	Rank	Value	Rank	Value (W_i)	Rank	Value (μ_i)	Rank
Tajikistan	1152	7.049	151	0.667	112	0.050	81	0.177	1
Armenia	2559	7.847	117	0.754	77	0.096	33	0.152	2
Uzbekistan	2441	7.800	119	0.727	95	0.075	50	0.135	3
Georgia	2664	7.888	115	0.748	81	0.079	46	0.131	4
Moldova, Rep. of	2109	7.654	126	0.701	105	0.056	78	0.130	5
Viet Nam	1996	7.599	128	0.688	109	0.040	89	0.118	6
Azerbaijan	2936	7.985	112	0.741	89	0.069	61	0.113	7
Suriname	3799	8.242	103	0.756	74	0.083	44	0.103	8
Cuba	4519	8.416	90	0.795	55	0.095	35	0.101	9
Mongolia	1783	7.486	134	0.655	113	0.012	106	0.100	10
Ecuador	3203	8.072	110	0.732	93	0.064	64	0.100	11
Kyrgyzstan	2711	7.905	114	0.712	102	0.048	84	0.099	12
Congo	825	6.715	163	0.512	136	-0.059	123	0.098	13
Philippines	3971	8.287	97	0.754	76	0.081	45	0.097	14
Ukraine	3816	8.247	102	0.748	80	0.074	52	0.095	15
Mauritania	1677	7.425	136	0.438	152	-0.196	157	-0.102	159
Cote d'Ivoire	1630	7.396	139	0.428	156	-0.200	158	-0.104	160
Vanuatu	2802	7.938	113	0.542	131	-0.152	147	-0.104	161
Oman	13356	9.500	40	0.751	78	-0.016	114	-0.108	162
Luxembourg	50061	10.821	1	0.925	16	0.097	32	-0.112	163
Mozambique	854	6.750	160	0.322	170	-0.270	170	-0.117	164
Gambia	1649	7.408	137	0.405	160	-0.213	160	-0.118	165
Central African Rep.	1172	7.066	150	0.375	165	-0.244	166	-0.118	166
Botswana	7184	8.880	64	0.572	126	-0.093	132	-0.129	167
Burkina Faso	976	6.883	155	0.325	169	-0.286	172	-0.144	168
Djibouti	2377	7.774	121	0.445	149	-0.214	161	-0.151	169
Equatorial Guinea	15073	9.621	38	0.679	111	-0.053	122	-0.155	170
Guinea	1982	7.592	129	0.414	159	-0.235	165	-0.157	171
Niger	746	6.615	168	0.277	172	-0.324	173	-0.158	172
Angola	2187	7.690	125	0.403	161	-0.253	167	-0.183	173

does best in terms of this well-being is dominated by those which either still have or in their recent pasts have had non-market, centrally planned economies. Eleven of the top 15 or each of the top ten countries in terms of this well-being fall into this category. More generally, most of these 15 countries have moderately low incomes per capita and, albeit to a lesser extent, HDI values. These are characteristics of most of the 30 countries listed in Table 5, with one great exception. That one country is Luxemburg, which has by far the highest PPP GDP per capita of the 173 countries for which the residual was estimated. Its residual ranking is 163, the 11th lowest. The 15 bottom ranked countries appear to be more diverse, in that there is no one characteristic which all or the bulk of them share. Among these countries are Oman and Equatorial Guinea, which are ranked among the top 25 percent of the 173 country sample in terms of income per capita. All of the remaining 15 lowest ranked countries in terms of $\mu_{i,}$, with the exception of Botswana, are ranked very lowly in terms of each of the W_i, the HDI and PPP GDP per capita. Botswana is ranked lowly in the first two, but not third, of these variables.

IV. Correlates with μ_i: Data and Results

μ_i is a purely statistical construct. Policy makers might be reluctant to monitor a residual obtained from a linear regression of a principal component on the logarithm of income per capita. A key question, therefore, concerns that variable which best individually accounts for the variation in μ_i across countries. Of particular interest is whether less widely available and reported well-being or well-being related indicators perform better than the standard indicators, W_i, $x^s_{k,i}$ and the HDI.[8] If so, then this would appear to be an *a priori* case for the relevant bodies to further develop these indicators. This could involve one or more of further refining, expanding the country coverage or increasing the reporting or usage of these indicators. The following simple hypotheses were therefore be evaluated:

$$H_0\text{: } |\varrho_{ns,j}| \leq |\varrho^{max}_s|$$
$$H_1\text{: } |\varrho_{ns,j}| > |\varrho^{max}_s|$$

where $\varrho_{ns,j}$ is the correlation coefficient between μ_i and the *j*th less widely reported indicator and ϱ^{max}_s is the highest correlation coefficient between μ_i and the standard non-exclusively economic indicators, respectively, for the sample of countries under consideration. We shall for convenience label the former as non-standard indicators. Both zero-order (Pearson) and rank-order (Spearman) coefficients are reported, although the former as given most emphasis. All coefficients are also subjected to the standard hypothesis test, that being whether they are significantly different from zero.[9]

A related issue is measurement error.[10] While few if any well-being indicators considered thus far are free of measurement error, arguably those subject to greatest error are

8. Note that it makes no difference whether one uses $x^l_{k,i}$ or $x_{k,i}$ given the way the former have been obtained.

9. It should be noted that μ_i was re-estimated for each of the sample for which data the non-standard indicators were available. This is necessary to ensure that it is orthogonal with respect to $\ln y_i$.

10. Specific thanks are due to Stephan Klasen to alerting the author to the significance of this issue.

the standard non-economic indicators, as defined. This is of relevance to the above hypothesis tests given its implications for W_i, as can now be demonstrated. Let the true, unobservable and measurement error free variable be W_i^*. Its relationship with W_i. is:

$$W_i = W_i^* + \mu_i^* . \tag{4}$$

where μ_i^* is the error in measuring W_i^*. It follows from (4) that μ_i is a composite variable, defined as:

$$\mu_i = \nu_i + \mu_i^* . \tag{5}$$

where ν_i is the true measure of non-economic well-being achievement, as defined above.

Given (1), μ_i^* is defined as:

$$\mu_i^* = \sum_{k=1}^{m} \Phi_k \mu_{k,i}^{l,*} \tag{6}$$

where $\mu_{k,i}^{l,*}$ are the errors in measuring $x_{k,i}^{l,*}$. It follows from (1) and (5) that regressing μ_i on W_i is the equivalent of regressing (ν_i+μ_i^*) on (W_i^*+μ_i^*). Similarly, from (1), (5) and (6), regressing μ_i on $x_{1,i}$, $x_{2,i}$, or $x_{3,i}$ is the equivalent of regressing (ν_i+μ_i^*) on ($x_{1,i}^*$+$\Phi_1\mu_{1,i}^{l,*}$), ($x_{2,i}^*$+$\Phi_2\mu_{2,i}^{l,*}$) or ($x_{3,i}^*$+$\Phi_3\mu_{3,i}^{l,*}$), respectively. A regression of μ_i on the HDI also involves regressing of μ_i^* on itself given that the HDI shares variables with W_i. The resulting correlation coefficients will therefore be distorted upwards, in absolute terms, in the sense that each regression involves regressing μ_i^* on itself or on one of its components. This in turn means that ϱ_s^{max} will be distorted upwards, therefore, possibly leading to the erroneous rejection of the null hypothesis outlined above.

Addressing this issue is less than straightforward as we are required to speculate as to likely values of μ_i^* to obtain ν_i. ν_i can then be regressed on W_i, $x_{1,i}$, $x_{2,i}$, $x_{3,i}$ and the HDI to obtain a less distorted ϱ_s^{max}. The issue was addressed as follows. Given (4) and (5), we can after some algebraic manipulation write the following equation:

$$W_i = \alpha + \beta \ln y_i + \gamma_q \varepsilon_{q,i} + \nu_{q,i} \tag{7}$$

where $\gamma_q\varepsilon_{q,i}$ are alternative estimates of μ_i^*. $\varepsilon_{q,i}$ is one of q variables and λ_q are the corresponding parameters. Equation (7) was estimated a number of times using different formulations of $\varepsilon_{q,i}$ and values of γ_q. Three formulations and values were, in the final analysis, adopted. These formulations are, of course, necessarily no more than informed guesses as to the likely values of μ_i^*. No attempt was made to guestimate the $\mu_{k,i}^{l,*}$, and as such each of the $x_{k,i}$ are assumed to be approximately equally erroneously measured.

It is reasonable to assume that error in measuring W_i will be subject to a random process but also be a decreasing function of the resources a country allocates to the collection and reporting of aggregate well-being data and the effectiveness with which these resources have been allocated. Moreover, it is also reasonable to posit that both of the second of these factors will be an increasing function of the income per capita. The formulations of $\varepsilon_{q,i}$ are based on these assumptions. The first, $\varepsilon_{1,i}$, was defined as a standard random variable with a mean of zero and variance of one, expressed as a ratio of the reciprocal of $\ln y_i$. For a given random value, therefore, $\varepsilon_{1,i}$ will be smaller the larger is a country's income per capita and *vice versa*. In estimating (7) with $\varepsilon_{1,i}$, the value of γ_1 was unrestricted, being determined purely by the data. This is appropriate as the resultant estimate of μ_i^* will be scaled in proportion to W_i. $\varepsilon_{2,1}$ was defined as a random normal variable but with a mean, standard deviation and variance differing according to country group. For low- and middle-income countries the standard deviation was twice and four times that of the high-income countries, respectively. γ_2 was determined by the data to ensure that the corresponding estimate of μ_i^* is in proportion to W_i. Finally, $\varepsilon_{3,1}$ was defined as a uniform random number, but with its range being set according to some fraction of W_i. This fraction was set at 0.025, 0.05 and 0.20 for high-, middle- and low-income countries, respectively. λ_3 was restricted to one in estimating (7) with $\varepsilon_{3,i}$

The non-standard variables were taken from the *Human Development Report 2002* (UNDP, 2002) and the *World Happiness Database* (Veenhoven, 2002a, 2002b). The variables are categorised as follows: Human Development, Human Poverty, Health Services Provision, Health Status, Survival, Education Status, Gender Bias, Gender Empowerment, Income Inequality, Governance and Happiness. There is of course overlap between these categories. The governance indicators are subjective and relate to well-being derived from civil liberties, political rights, non-violence and the like. The happiness variables are intended to measure subjective, self-assessed well-being. Fifty-six variables, in addition to those for which correlation coefficients are reported in Tables 1 and 2, were either taken directly from the above sources or calculated using data contained in them. A full list of variables and their definitions is provided in Appendix Table A2.

Results are reported in Table 6.[11] Sixty-one zero- and rank-order coefficients are reported, with 38 of the former and 33 of the latter being significantly different from zero. All coefficients relating to the standard indicators, the first five in Table 6, are significant in this sense. Of these indicators, adult literacy is most highly correlated with μ_i, with zero- and rank-order coefficients between the two being 0.612 and 0.513, respectively. Mixed results were obtained for the remaining variables. Roughly half are significantly correlated, cardinally or ordinally, with μ_i. Those with the highest correlations with μ_i, are the contraceptive prevalence, youth literacy and women professionals and technicians variables. The zero-order coefficients between these variables and μ_i are 0.535, 0.581 and 0.569, respectively. The corresponding rank-order coefficients are 0.538, 0.559 and 0.374. Only one of the variables income inequality, governance and happiness groups - life enjoyment - is significantly correlated with μ_i.

Evaluation of the hypotheses relating to whether the non-standard indicators perform better than their standard counterparts in accounting for the variation in μ_i produced interesting results. While many of the coefficients between the non-standard indicators and μ_i are significantly different from zero, the above-outlined null hypothesis, that $|\varrho_{ns,j}| \leq |\varrho_s^{max}|$, cannot be rejected in favour of the alternative in all cases. In all cases the *t*-ratios were well short of the critical values required for rejection of the null. Adult literacy was the standard indicator most statistically associated with μ_i in every sample under consideration based on zero-order correlation coefficients. It also shared the highest rank-order coefficient of these indicators with μ_i every sample except those for which the gender empowerment variables were available. For these samples, school enrolment was the standard indicator most highly correlated with μ_i. Accounting for measurement error in the standard indicators, using the procedure outlined above, did not change these results. While the correlation coefficients

11. Appendix Table A3 reports correlation coefficients between $\ln y_i$ and the variables listed in Table 6. It has been suggested that the correlations between these variables and μ_i will be a decreasing function of their correlations with $\ln y_i$, with in particular the indicator being most highly correlated with μ_i being that which is most lowly correlated with $\ln y_i$. A comparison of the coefficients in Tables 6 and A3 shows that this is not the case. It is true that variables highly correlated with $\ln y_i$ tend to be lowly correlated with μ_i, but the relationship is not a systematic one in the sense suggested.

Table 6: Correlations between μ_i and Well-being Indicators

Variables	Zero-order	Rank-order	*n*
Human Development			
Human Development Index	0.373*	0.242*	173
Life Expectancy	0.421*	0.262*	173
Adult Literacy	0.612*	0.513*	173
Gross Enrolment	0.482*	0.398*	173
Well-being Index (W_i)	0.554*	0.438*	173
Human Poverty			
Human Poverty Index	-0.483*	-0.470*	87
Survival to 40	-0.428*	-0.342*	116
Water Usage	-0.182	-0.221*	108
Poverty Headcount ($1)	-0.278*	-0.215	60
Poverty Headcount ($2)	0.200	-0.196	60
Health Services			
Sanitation Facilities	0.199*	0.139	123
Drug Access	-0.042	-0.094	170
Water Services	0.185*	0.076	165
Measles Immunisation	0.456*	0.416*	165
Tuberculosis Immunisation	0.394*	0.398*	140
Oral Rehydration	-0.205	-0.015	56
Contraceptive Prevalence	0.535*	0.538*	91
Birth Attendance	0.371*	0.327*	122
Physicians	0.389*	0.413*	165
Health Status			
Undernourishment	-0.132	-0.120	101
Underweight Children	-0.257*	-0.286*	124
Underheight Children	-0.186*	-0.186*	118
Underweight Infants	-0.281*	-0.286*	150
Adults with HIV/AIDS	-0.290*	-0.325*	144
Women with HIV/AIDS	-0.213	-0.197	73
Malaria Cases	-0.346*	-0.342*	84
Tuberculosis Cases	-0.205*	-0.038	170
Cigarette Consumption	0.132	0.143	110
Survival			
Infant Mortality Rate	-0.393*	-0.203*	172
Child Mortality Rate	-0.419*	-0.204*	172
Survival to 65 (Females)	0.425*	0.273*	166
Survival to 65 (Males)	0.347*	0.233*	166
Maternal Mortality Rate	-0.416*	-0.174*	144

* - significantly different from zero at the 95% confidence level or greater.

Table 6 (continued): Correlations between μ_i and Well-being Indicators

Variables	Zero-order	Rank-order	*n*
Education Status			
Youth Literacy Rate	0.581*	0.559*	128
Primary School Enrolment	0.445*	0.349*	122
Secondary School Enrolment	0.317*	0.186	95
Children Grade 5	0.062	0.092	48
Gender Bias			
Gender-related Development Index	0.357*	0.243*	146
Human Development Disparity	-0.390*	-0.436*	146
Life Expectancy Ratio	0.340*	0.380*	166
Adult Literacy Ratio	0.456*	0.358*	149
School Enrolment Ratio	0.460*	0.372*	162
Earned Income Ratio	0.130	0.115	90
Gender Empowerment			
Gender Empowerment Measure	0.265*	0.127	66
Women in Parliament	0.113	0.127	170
Women in Senior Positions	0.457*	0.364*	77
Women Professionals & Technicians	0.569*	0.374*	78
Income Inequality			
Gini Coefficient	-0.117	-0.048	116
Income Share Ratio (20%)	-0.154	-0.040	116
Income Share Ratio (10%)	-0.128	-0.049	116
Governance			
Polity Score	0.144	0.111	147
Civil Liberties	-0.100	-0.107	173
Political Rights	-0.113	-0.103	173
Press Freedom	-0.067	-0.078	173
Voice and Accountability	0.058	0.064	156
Political Stability and non-Violence	-0.046	-0.074	151
Law and Order	-0.087	-0.117	159
Rule of Law	-0.046	-0.074	151
Happiness			
Life Enjoyment	-0.410*	-0.361*	66
Happy Life Years	-0.209	-0.228	66
Life Enjoyment Inequality	-0.036	-0.030	55

* - significantly different from zero at the 95% confidence level or greater.

between the standard indicators and the alternative estimates of $\nu_{q,i}$, produced often much lower correlation coefficients, these coefficients were still of an order dictating that the null could clearly not be rejected for the alternative hypothesis, that $|\varrho_{ns,j}| > |\varrho_s^{max}|$.[12]

V. Conclusion

A range of indicators has been used over recent decades in an attempt to empirically capture non-economic dimensions of human well-being. Most of the commonly used indicators, available for large country samples, are very highly correlated with various measures of income per capita. Given this they have been criticised for not being able to tell us much more than income per capita alone and, as a consequence, for not sufficiently capturing non-economic dimensions of cross-country well-being achievement. This paper has responded to this criticism. It identified the variation in a composite of the most widely used non-economic well-being indicators not accounted for by income per capita. It did this by regressing this composite on the logarithm of PPP GDP per capita, observing the values of the residual term of the regression. This residual was interpreted as an income-independent, or non-economic, measure of national well-being achievement. Estimates of this residual were provided for 173 countries. An interesting result is that the top ranked countries, in terms of non-economic well-being achieved measured according to this residual, were dominated by those which either still have or in their recent pasts have had non-market, centrally planned economies. The bottom ranked countries were far more diverse, seemingly without a unifying, common characteristic.

The paper then looked at correlations between its measure and other less widely-used well-being indicators in an attempt to find the indicator which best captures non-economic well-being achievement. The rationale for this is that the above-mentioned residual is a purely statistical construct, derived from a series of econometric procedures. It is not what might be described as a direct measure of well-being, therefore. As it turned out, none of the less widely-used indicators perform better in this regard than a standard indicator, which in almost all cases was the adult literacy rate. This was a particularly robust result, which was obtained consistently across different samples of countries and under different assumed error measurement scenarios. What are the implications of this result? Most obviously, it suggests that if we wish to use a direct measure of well-being, in the sense defined above, that best captures this paper's notion of non-economic well-being achievement, we should be using the

12. Full details of results are available from the author.

adult literacy rate. This is an interesting finding, to the extent that the adult literacy rate is subject to the above-mentioned criticism regarding correlations with income. It is also a disappointing, to the extent that there have been many attempts to shift focus away from the standard measures, including adult literacy, towards newer, hopefully more enlightening indicators. As such one is tempted to conclude that the search for an alternative, information rich non-economic well-being measure continues.

Of the newer, less widely available or used indicators, this paper found that contraceptive prevalence, youth literacy and the female share of employment in positions deemed as professional and technical performed best in accounting for the variation in the non-economic well-being achievement indicator. This would appear to provide a case for reporting agencies to devote more resources to increase the country coverage of these indicators and to more widely report them.

Finally, let us consider some possible directions for future research. First, while this paper has made some attempt to account for measurement error in the standard indicators, further work on this is clearly required both at a conceptual level, involving further consideration of the source of measurement error, and at the purely empirical level. It is not beyond the bounds of imagination to speculate the correlation between μ_i and adult literacy is due to errors in measurement not captured in this paper. Further tests for the sensitivity of this result to possible measurement error would appear to be warranted, therefore. Second, there is far from universal acceptance that a logarithmic transformation of income per capita, used in this paper, is appropriate. Alternative transformations could be investigated. Third, non-economic achievement could be measured using period-averages of the relevant data instead of data for a single year. This might better capture long-run relationships between income and the non-economic indicators. Fourth, rather than seeking to correlate this paper's measure of non-economic well-being achievement on a single variable, one could look at correlating it against a composite of a number of indicators, thereby providing a multidimensional non-economic well-being achievement indicator.

Appendix: Detailed Results and Variable Definitions

Table A1: Well-being Data

Country	Life Expectancy ($x_{1,i}$)	Adult Literacy ($x_{2,i}$)	Gross Enrolment ($x_{3,i}$)	PPP GDP per capita Value (y_i)	PPP GDP per capita Value ($\ln y_i$)	PPP GDP per capita Rank	HDI Value	HDI Rank	Well-being Index Value (W_i)	Well-being Index Rank	Residual Value (μ_i)	Residual Rank
Tajikistan	67.6	99.0	67	1152	7.049	151	0.667	112	0.050	81	0.177	1
Armenia	72.9	98.4	80	2559	7.847	117	0.754	77	0.096	33	0.152	2
Uzbekistan	69.0	99.0	76	2441	7.800	119	0.727	95	0.075	50	0.135	3
Georgia	73.2	99.0	70	2664	7.888	115	0.748	81	0.079	46	0.131	4
Moldova, Rep. of	66.6	98.9	72	2109	7.654	126	0.701	105	0.056	78	0.130	5
Viet Nam	68.2	93.4	67	1996	7.599	128	0.688	109	0.040	89	0.118	6
Azerbaijan	71.6	97.0	71	2936	7.985	112	0.741	89	0.069	61	0.113	7
Suriname	70.6	94.0	82	3799	8.242	103	0.756	74	0.083	44	0.103	8
Cuba	76.0	96.7	76	4519	8.416	90	0.795	55	0.095	35	0.101	9
Mongolia	62.9	98.9	58	1783	7.486	134	0.655	113	0.012	106	0.100	10
Ecuador	70.0	91.6	77	3203	8.072	110	0.732	93	0.064	64	0.100	11
Kyrgyzstan	67.8	97.0	68	2711	7.905	114	0.712	102	0.048	84	0.099	12
Congo	51.3	80.7	63	825	6.715	163	0.512	136	-0.059	123	0.098	13
Philippines	69.3	95.3	82	3971	8.287	97	0.754	76	0.081	45	0.097	14
Ukraine	68.1	99.0	77	3816	8.247	102	0.748	80	0.074	52	0.095	15
Turkmenistan	66.2	98.0	81	3956	8.283	100	0.741	87	0.073	58	0.090	16
Myanmar	56.0	84.7	55	1027	6.934	152	0.552	127	-0.051	121	0.087	17
Sri Lanka	72.1	91.6	70	3530	8.169	108	0.741	88	0.057	77	0.084	18
Fiji	69.1	92.9	83	4668	8.448	89	0.758	72	0.077	47	0.079	19
Albania	73.2	84.7	71	3506	8.162	109	0.733	92	0.048	83	0.076	20
Lebanon	73.1	86.0	78	4308	8.368	95	0.755	75	0.066	62	0.076	21
Sao Tome and Principe	65.1	83.1	58	1792	7.491	133	0.632	119	-0.014	113	0.074	22
Bolivia	62.4	85.5	70	2424	7.793	120	0.653	114	0.008	108	0.068	23
Maldives	66.5	96.7	77	4485	8.408	93	0.743	84	0.062	68	0.068	24
Jamaica	75.3	86.9	62	3639	8.199	104	0.742	86	0.041	86	0.066	25
Peru	68.8	89.9	80	4799	8.476	88	0.747	83	0.063	66	0.063	26
Solomon Islands	68.3	76.6	50	1648	7.407	138	0.622	121	-0.033	119	0.062	27
Lithuania	72.1	99.0	80	7106	8.869	65	0.808	49	0.096	34	0.061	28

continued ...

Table A1: Well-being Data (continued)

Country	Life Expectancy ($x_{1,i}$)	Adult Literacy ($x_{2,i}$)	Gross Enrolment ($x_{3,i}$)	PPP GDP per capita: Value (y_i)	PPP GDP per capita: Value (log) ($\ln y_i$)	PPP GDP per capita: Rank	HDI: Value	HDI: Rank	Well-being Index: Value (W_i)	Well-being Index: Rank	Residual: Value (μ_i)	Residual: Rank
Macedonia, TFYR	73.1	94.0	70	5086	8.534	85	0.772	68	0.066	63	0.061	29
Latvia	70.4	99.0	82	7045	8.860	66	0.800	53	0.094	38	0.060	30
Belize	74.0	93.2	73	5606	8.632	82	0.784	58	0.074	53	0.060	31
Malawi	40.0	60.1	73	615	6.422	170	0.400	163	-0.124	137	0.059	32
China	70.5	84.1	73	3976	8.288	96	0.726	96	0.041	85	0.058	33
Tanzania, U. Rep. of	51.1	75.1	32	523	6.260	172	0.440	151	-0.140	144	0.058	34
Bulgaria	70.8	98.4	72	5710	8.650	80	0.779	62	0.071	59	0.056	35
Indonesia	66.2	86.9	65	3043	8.021	111	0.684	110	0.014	104	0.054	36
Kenya	50.8	82.4	51	1022	6.930	153	0.513	134	-0.084	130	0.054	37
Panama	74.0	91.9	74	6000	8.700	75	0.787	57	0.073	55	0.053	38
Poland	73.3	99.0	84	9051	9.111	53	0.833	37	0.109	26	0.053	39
Australia	78.9	99.0	116	25693	10.154	12	0.939	6	0.198	1	0.049	40
Paraguay	70.1	93.3	64	4426	8.395	94	0.740	90	0.040	88	0.047	41
Guyana	63.0	98.5	66	3963	8.285	99	0.708	103	0.029	93	0.046	42
Saint Lucia	73.4	90.2	70	5703	8.649	81	0.772	67	0.059	74	0.043	43
Uruguay	74.4	97.7	79	9035	9.109	54	0.831	40	0.098	31	0.042	44
Dominica	72.9	96.4	65	5880	8.679	77	0.779	61	0.059	72	0.041	45
Kazakhstan	64.6	98.0	77	5871	8.678	78	0.750	79	0.058	75	0.040	46
Estonia	70.6	99.0	86	10066	9.217	48	0.826	42	0.104	27	0.038	47
Colombia	71.2	91.7	73	6248	8.740	72	0.772	66	0.060	70	0.037	48
Nicaragua	68.4	66.5	63	2366	7.769	122	0.635	118	-0.026	118	0.037	49
Honduras	65.7	74.6	61	2453	7.805	118	0.638	116	-0.023	115	0.037	50
Cambodia	56.4	67.8	62	1446	7.277	145	0.543	130	-0.070	127	0.036	51
Belarus	68.5	99.0	77	7544	8.929	63	0.788	56	0.076	48	0.036	52
Chile	75.3	95.8	78	9417	9.150	50	0.831	39	0.095	36	0.035	53
Venezuela	72.9	92.6	65	5794	8.665	79	0.770	69	0.051	79	0.034	54
Romania	69.8	98.1	69	6423	8.768	69	0.775	63	0.060	71	0.034	55
Libyan Arab Jamahiriya	70.5	80.0	92	7570	8.932	62	0.773	64	0.074	54	0.033	56
United Kingdom	77.7	99.0	106	23509	10.065	20	0.928	13	0.172	3	0.031	57

continued ...

Table A1: Well-being Data (continued)

Country	Life Expectancy ($x_{1,i}$)	Adult Literacy ($x_{2,i}$)	Gross Enrolment ($x_{3,i}$)	PPP GDP per capita Value (y_i)	PPP GDP per capita Value (log) ($\ln y_i$)	PPP GDP per capita Rank	HDI Value	HDI Rank	Well-being Index Value (W_i)	Well-being Index Rank	Residual Value (μ_i)	Residual Rank
Jordan	70.3	89.7	55	3966	8.286	98	0.717	99	0.013	105	0.030	58
Zambia	41.4	78.1	49	780	6.659	165	0.433	153	-0.132	142	0.030	59
New Zealand	77.6	99.0	99	20070	9.907	24	0.917	19	0.157	8	0.029	60
Madagascar	52.6	66.5	44	840	6.733	161	0.469	147	-0.127	139	0.029	61
Syrian Arab Republic	71.2	74.4	63	3556	8.176	106	0.691	108	0.001	111	0.028	62
Belgium	78.4	99.0	109	27178	10.210	9	0.939	5	0.181	2	0.027	63
Croatia	73.8	98.3	68	8091	8.999	59	0.809	48	0.073	56	0.027	64
Yemen	60.6	46.3	51	893	6.795	158	0.479	144	-0.125	138	0.025	65
Sweden	79.7	99.0	101	24277	10.097	17	0.941	2	0.169	4	0.024	66
Cape Verde	69.7	73.8	77	4863	8.489	87	0.715	101	0.025	97	0.024	67
Spain	78.5	97.6	95	19472	9.877	25	0.913	21	0.148	11	0.023	68
Costa Rica	76.4	95.6	67	8650	9.065	57	0.820	43	0.075	49	0.022	69
Russian Federation	66.1	99.0	78	8377	9.033	58	0.781	60	0.069	60	0.020	70
Finland	77.6	99.0	103	24996	10.126	16	0.930	10	0.165	5	0.018	71
Argentina	73.4	96.8	83	12377	9.424	44	0.844	34	0.101	30	0.017	72
Slovakia	73.3	99.0	76	11243	9.328	46	0.835	36	0.093	39	0.017	73
Nigeria	51.7	63.9	45	896	6.798	157	0.462	148	-0.133	143	0.016	74
Netherlands	78.1	99.0	102	25657	10.153	13	0.935	8	0.165	6	0.015	75
Portugal	75.7	92.2	96	17290	9.758	30	0.880	28	0.128	20	0.014	76
Thailand	70.2	95.5	60	6402	8.764	70	0.762	70	0.036	90	0.011	77
El Salvador	69.7	78.7	63	4497	8.411	91	0.706	104	0.005	109	0.011	78
Hungary	71.3	99.0	81	12416	9.427	43	0.835	35	0.094	37	0.010	79
Korea, Rep. of	74.9	97.8	90	17380	9.763	28	0.882	27	0.124	22	0.010	80
Brazil	67.7	85.2	80	7625	8.939	60	0.757	73	0.048	82	0.007	81
Samoa (Western)	69.2	80.2	65	5041	8.525	86	0.715	100	0.011	107	0.006	82
Greece	78.2	97.2	81	16501	9.711	34	0.885	25	0.116	24	0.006	83
France	78.6	99.0	94	24223	10.095	18	0.928	12	0.149	10	0.005	84
Dominican Republic	67.1	83.6	72	6033	8.705	74	0.727	94	0.025	96	0.005	85
Mexico	72.6	91.4	71	9023	9.108	55	0.796	54	0.060	69	0.004	86

continued ...

Table A1: Well-being Data (continued)

Country	Life Expectancy ($x_{1,i}$)	Adult Literacy ($x_{2,i}$)	Gross Enrolment ($x_{3,i}$)	PPP GDP per capita Value ($y_{,i}$)	Value (log) ($\ln y_{,i}$)	Rank	HDI Value	Rank	Well-being Index Value (W_i)	Rank	Residual Value (μ_i)	Rank
Trinidad and Tobago	74.3	93.8	65	8964	9.101	56	0.805	50	0.059	73	0.003	87
St Vincent & the Grenadines	69.6	88.9	58	5555	8.622	83	0.733	91	0.016	102	0.003	88
Slovenia	75.5	99.0	83	17367	9.762	29	0.879	29	0.115	25	0.000	89
Iran, Islamic Rep. of	68.9	76.3	73	5884	8.680	76	0.721	98	0.019	100	0.000	90
Canada	78.8	99.0	97	27840	10.234	7	0.940	3	0.157	7	0.000	91
Barbados	76.8	98.0	77	15494	9.648	36	0.871	31	0.103	28	-0.001	92
Egypt	67.3	55.3	76	3635	8.198	105	0.642	115	-0.026	117	-0.001	93
Germany	77.7	99.0	94	25103	10.131	15	0.925	18	0.146	13	-0.002	94
Lesotho	45.7	83.4	61	2031	7.616	127	0.535	133	-0.079	128	-0.002	95
Togo	51.8	57.1	62	1442	7.274	146	0.493	141	-0.111	134	-0.003	96
Congo, Dem. Rep.	51.3	61.4	31	765	6.640	166	0.431	155	-0.171	152	-0.007	97
Norway	78.5	99.0	97	29918	10.306	3	0.942	1	0.156	9	-0.008	98
Nepal	58.6	41.8	60	1327	7.191	148	0.490	142	-0.123	136	-0.008	99
Denmark	76.2	99.0	97	27627	10.227	8	0.926	14	0.147	12	-0.009	100
Algeria	69.6	66.7	72	5308	8.577	84	0.697	106	-0.002	112	-0.011	101
Tunisia	70.2	71.0	74	6363	8.758	71	0.722	97	0.014	103	-0.011	102
Israel	78.7	94.6	83	20131	9.910	23	0.896	22	0.116	23	-0.012	103
Czech Republic	74.9	99.0	70	13991	9.546	39	0.849	33	0.083	43	-0.012	104
Malta	78.0	92.0	80	17273	9.757	31	0.875	30	0.101	29	-0.013	105
Grenada	65.3	94.4	65	7580	8.933	61	0.747	82	0.027	95	-0.014	106
Austria	78.1	99.0	90	26765	10.195	10	0.926	15	0.139	16	-0.014	107
Zimbabwe	42.9	88.7	65	2635	7.877	116	0.551	128	-0.069	126	-0.016	108
Malaysia	72.5	87.5	66	9068	9.113	52	0.782	59	0.041	87	-0.016	109
Italy	78.5	98.4	84	23626	10.070	19	0.913	20	0.126	21	-0.016	110
Turkey	69.8	85.1	62	6974	8.850	67	0.742	85	0.017	101	-0.017	111
India	63.3	57.2	55	2358	7.766	123	0.577	125	-0.083	129	-0.020	112
Antigua and Barbuda	73.9	86.6	69	10541	9.263	47	0.800	52	0.051	80	-0.020	113
Japan	81.0	99.0	82	26755	10.194	11	0.933	9	0.132	18	-0.021	114
Iceland	79.2	99.0	89	29581	10.295	5	0.936	7	0.141	15	-0.021	115

continued ...

Table A1: Well-being Data (continued)

Country	Life Expectancy ($x_{1,i}$)	Adult Literacy ($x_{2,i}$)	Gross Enrolment ($x_{3,i}$)	PPP GDP per capita Value (y_i)	PPP GDP per capita Value (log) ($\ln y_i$)	PPP GDP per capita Rank	HDI Value	HDI Rank	Well-being Index Value (W_i)	Well-being Index Rank	Residual Value (μ_i)	Residual Rank
Saint Kitts and Nevis	70.0	97.8	70	12510	9.434	41	0.814	44	0.062	67	-0.023	116
Ghana	56.8	71.5	42	1964	7.583	130	0.548	129	-0.104	133	-0.025	117
Cameroon	50.0	75.8	43	1703	7.440	135	0.512	135	-0.118	135	-0.026	118
Seychelles	72.7	88.0	73	12508	9.434	42	0.811	47	0.058	76	-0.028	119
Bahrain	73.3	87.6	80	15084	9.621	37	0.831	38	0.075	51	-0.028	120
Ireland	76.6	99.0	91	29866	10.304	4	0.925	17	0.135	17	-0.028	121
Brunei Darussalam	75.9	91.5	76	16779	9.728	33	0.856	32	0.084	42	-0.028	122
United States	77.0	99.0	95	34142	10.438	2	0.939	4	0.146	14	-0.029	123
Switzerland	78.9	99.0	84	28769	10.267	6	0.928	11	0.129	19	-0.031	124
Lao People's Dem. Rep.	53.5	48.7	58	1575	7.362	142	0.485	143	-0.131	141	-0.032	125
Uganda	44.0	67.1	45	1208	7.097	149	0.444	150	-0.155	149	-0.032	126
Eritrea	52.0	55.7	26	837	6.730	162	0.421	157	-0.191	156	-0.036	127
Rwanda	40.2	66.8	40	943	6.849	156	0.403	162	-0.181	154	-0.036	128
Haiti	52.6	49.8	52	1467	7.291	144	0.471	146	-0.145	146	-0.040	129
South Africa	52.1	85.3	93	9401	9.149	51	0.695	107	0.019	99	-0.041	130
Benin	53.8	37.4	45	990	6.898	154	0.420	158	-0.183	155	-0.042	131
Mauritius	71.3	84.5	63	10017	9.212	49	0.772	65	0.023	98	-0.042	132
Comoros	59.8	55.9	35	1588	7.370	141	0.511	137	-0.142	145	-0.044	133
Cyprus	78.0	97.1	68	20824	9.944	22	0.883	26	0.086	41	-0.045	134
Guatemala	64.8	68.6	49	3821	8.248	101	0.631	120	-0.066	124	-0.045	135
Gabon	52.7	71.0	86	6237	8.738	73	0.637	117	-0.025	116	-0.048	136
Bhutan	62.0	47.0	33	1412	7.253	147	0.494	140	-0.158	150	-0.049	137
Bahamas	69.2	95.4	74	17012	9.742	32	0.826	41	0.063	65	-0.050	138
Singapore	77.6	92.3	75	23356	10.059	21	0.885	24	0.090	40	-0.051	139
Mali	51.5	41.5	28	797	6.681	164	0.386	164	-0.219	162	-0.059	140
Swaziland	44.4	79.6	72	4492	8.410	92	0.577	124	-0.068	125	-0.062	141
Papua New Guinea	56.7	63.9	38	2280	7.732	124	0.535	132	-0.130	140	-0.064	142
Morocco	67.6	48.9	52	3546	8.174	107	0.602	123	-0.091	131	-0.064	143
Guinea-Bissau	44.8	38.5	37	755	6.627	167	0.349	167	-0.231	163	-0.066	144

continued ...

Table A1: Well-being Data (continued)

Country	Life Expectancy ($x_{1,i}$)	Adult Literacy ($x_{2,i}$)	Gross Enrolment ($x_{3,i}$)	PPP GDP per capita Value	PPP GDP per capita Value (log) ($\ln y_i$)	PPP GDP per capita Rank	HDI Value	HDI Rank	Well-being Index Value (W_i)	Well-being Index Rank	Residual Value (μ_i)	Residual Rank
Sudan	56.0	57.8	34	1797	7.494	132	0.499	139	-0.154	148	-0.067	145
Bangladesh	59.4	41.3	37	1602	7.379	140	0.478	145	-0.171	153	-0.073	146
Hong Kong, China (SAR)	79.5	93.5	63	25153	10.133	14	0.888	23	0.073	57	-0.074	147
Saudi Arabia	71.6	76.3	61	11367	9.338	45	0.759	71	0.002	110	-0.074	148
Namibia	44.7	82.0	78	6431	8.769	68	0.610	122	-0.048	120	-0.075	149
Pakistan	60.0	43.2	40	1928	7.564	131	0.499	138	-0.158	151	-0.077	150
Sierra Leone	38.9	36.0	27	490	6.194	173	0.275	173	-0.280	171	-0.077	151
Kuwait	76.2	82.0	59	15799	9.668	35	0.813	45	0.027	94	-0.079	152
Ethiopia	43.9	39.1	27	668	6.504	169	0.327	168	-0.255	168	-0.079	153
Chad	45.7	42.6	31	871	6.770	159	0.365	166	-0.232	164	-0.080	154
Burundi	40.6	48.0	18	591	6.382	171	0.313	171	-0.268	169	-0.081	155
Qatar	69.6	81.2	75	18789	9.841	26	0.803	51	0.036	91	-0.086	156
United Arab Emirates	75.0	76.3	68	17935	9.795	27	0.812	46	0.030	92	-0.087	157
Senegal	53.3	37.3	36	1510	7.320	143	0.431	154	-0.204	159	-0.101	158
Mauritania	51.5	40.2	40	1677	7.425	136	0.438	152	-0.196	157	-0.102	159
Cote d'Ivoire	47.8	46.8	38	1630	7.396	139	0.428	156	-0.200	158	-0.104	160
Vanuatu	68.0	34.0	38	2802	7.938	113	0.542	131	-0.152	147	-0.104	161
Oman	71.0	71.7	58	13356	9.500	40	0.751	78	-0.016	114	-0.108	162
Luxembourg	77.4	99.0	72	50061	10.821	1	0.925	16	0.097	32	-0.112	163
Mozambique	39.3	44.0	23	854	6.750	160	0.322	170	-0.270	170	-0.117	164
Gambia	46.2	36.6	45	1649	7.408	137	0.405	160	-0.213	160	-0.118	165
Central African Republic	44.3	46.7	24	1172	7.066	150	0.375	165	-0.244	166	-0.118	166
Botswana	40.3	77.2	70	7184	8.880	64	0.572	126	-0.093	132	-0.129	167
Burkina Faso	46.7	23.9	23	976	6.883	155	0.325	169	-0.286	172	-0.144	168
Djibouti	43.1	64.6	22	2377	7.774	121	0.445	149	-0.214	161	-0.151	169
Equatorial Guinea	51.0	83.2	64	15073	9.621	38	0.679	111	-0.053	122	-0.155	170
Guinea	47.5	41.0	28	1982	7.592	129	0.414	159	-0.235	165	-0.157	171
Niger	45.2	15.9	16	746	6.615	168	0.277	172	-0.324	173	-0.158	172
Angola	45.2	42.0	23	2187	7.690	125	0.403	161	-0.253	167	-0.183	173

Table A2: Variable Definitions

Variable	Year and Definition
Human Development Index	2000. Human Development Index value - a composite index combining measures of life expectancy, adult literacy, school enrolment and PPP GDP per capita.
Life Expectancy	2000. Life expectancy at birth (years) - the number of years a newborn infant would live if prevailing patterns of age-specific mortality rates at the time of birth were to stay the same throughout the child's life.
Adult Literacy	2000. Adult literacy rate - the percentage of people aged 15 and above who can, with understanding, both read and write a short, simple statement on their everyday life.
Gross Enrolment	1999. Combined primary, secondary and tertiary gross enrolment ratio (%) - the number of students enrolled in a level of education, regardless of age, as a percentage of the population of official school age for that level.
Human Poverty Index (HPI-1)	2000. Human poverty index value - a composite index combining measures of lack of access to improved water services, probability of not surviving to age 40, underweight children and adult illiteracy.
Survival to 40	1995-2000. Probability at birth of not surviving to age 40 (% of cohort) - calculated as 1 minus the probability of surviving to a specified age for a given cohort.
Water Usage	2000. Population not using improved drinking water sources (%) - calculated as 100 minus the percentage of the population using any of the following types of water supply for drinking: piped water, a public tap, a borehole with a pump, a protected well, a protected spring or rainwater.
Poverty Headcount ($1)	1983-2000. Percentage of the population living below income poverty line set at $1 a day in 1985 prices ($1.08 in 1993 prices), adjusted for purchasing power parity.
Poverty Headcount ($2)	1983-2000. Percentage of the population living below income poverty line set at $2 a day in 1985 prices ($2.16 in 1993 prices), adjusted for purchasing power parity.
Sanitation Facilities	2000. Population using adequate sanitation facilities (%) - the percentage of the population using adequate sanitation facilities, such as a connection to a sewer or septic tank system, a pour-flush latrine, a simple pit latrine or a ventilated improved pit latrine. An excreta disposal system is considered adequate if it is private or shared (but not public) and if it hygienically separates human excreta from human contact.
Drug Access	1999. Population with access to essential drugs (%) - the percentage of the population for whom a minimum of 20 of the most essential drugs are continuously and affordably available at public or private health facilities or drug outlets within one hour's travel from home.

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Table A2: Variable Definitions (continued)

Variable	Year and Definition
Water Services.	2000. Population using improved water services (%) - the proportion of the population using piped water, water from a public tap, water from a borehole with a pump, water from a protected well or protected spring or rainwater for drinking.
Measles Immunisation	1999. One-year-olds fully immunized against tuberculosis (%).
Tuberculosis Immunisation	1999. One-year-olds fully immunized against measles (%).
Oral Rehydration	1994-2000. Oral rehydration therapy use rate (%) - the percentage of all cases of diarrhoea in children under age five treated with oral rehydration salts or recommended home fluids, or both.
Contraceptive Prevalence	1995-2000. Contraceptive prevalence (%) - the percentage of married women aged 15-49 who are using, or whose partners are using, any form of contraception, whether modern or traditional.
Birth Attendance	1994-2000. Births attended by skilled health staff (%) - the percentage of deliveries attended by a doctor, nurse or midwife or trained traditional birth attendant.
Physicians	1990-999. Physicians (per 100,000 people) - includes graduates of a faculty or school of medicine who are working in any medical field (including teaching, research and administration).
Undernourishment	1997-99. Undernourished people (as % of total population) - people whose food intake is insufficient to meet their minimum energy requirements on a chronic basis.
Underweight Children	1995-2000. Underweight children under age-five (%) - includes moderate and severe underweight, which is defined as below two standard deviations from the median weight for age of the reference population.
Under height Children	1995-2000. Children under height for age (% under age 5) - includes moderate and severe stunting, which is defined as below two standard deviations from the median height for age of the reference population.
Underweight Infants	1995-2000. Infants with low birth-weight (%) - the percentage of infants with a birth-weight of less than 2,500 grams.
Adults with HIV/AIDS	2001. People living with HIV/AIDS, adults (% age 15-49) - the estimated number of people living with HIV/AIDS at the end of the year specified.
Women with HIV/AIDS	2001. People living with HIV/AIDS, women (% age 15-49) - the estimated number of people living with HIV/AIDS at the end of the year specified.

continued ...

Table A2: Variable Definitions (continued)

Variable	Year and Definition
Malaria Cases	2000. Malaria cases (per 100,000 people) - the total number of malaria cases reported to the World Health Organization by countries in which malaria is endemic.
Tuberculosis Cases	1999. Tuberculosis cases (per 100,000 people) - the total number of tuberculosis cases reported to the World Health Organization. A tuberculosis case is defined as a patient in whom tuberculosis has been bacteriologically confirmed or diagnosed by a clinician.
Cigarette Consumption	1999-2000. Cigarette consumption per adult (annual average) - the sum of production and imports minus exports of cigarettes divided by the population aged 15 and above.
Infant Mortality Rate	2000. Infant mortality rate (per 1,000 live births) - the probability of dying between birth and exactly one year of age expressed per 1,000 live births.
Child Mortality Rate	2000. Under-five mortality rate (per 1,000 live births) - the probability of dying between birth and exactly five years of age expressed per 1,000 live births.
Survival to 65 (Females)	1995-2000. Probability at birth of surviving to age 65, female (% of cohort) - the probability of a newborn infant surviving to a specified age if subject to prevailing patterns of age-specific mortality rates.
Survival to 65 (Males)	1995-2000. Probability at birth of surviving to age 65, male (% of cohort) - the probability of a newborn infant surviving to a specified age if subject to prevailing patterns of age-specific mortality rates.
Maternal Mortality Rate	1985-99. Maternal mortality ratio reported (per 100,000 live births) - reported annual number of deaths of women from pregnancy-related causes per 100,000 live births, not adjusted for the well-documented problems of underreporting and misclassification.
Youth Literacy Rate	2000. Youth literacy rate (% age 15 -24) - the percentage of people aged 15-24 who can, with understanding, both read and write a short, simple statement on their everyday life.
Primary School Enrolment	1998. Net primary enrolment ratio (%) - the number of students enrolled in a level of education who are of official school age for that level, as a percentage of the population of official school age for that level.
Secondary School Enrolment	1998. Net secondary enrolment ratio (%) - the number of students enrolled in a level of education who are of official school age for that level, as a percentage of the population of official school age for that level.

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Table A2: Variable Definitions (continued)

Variable	Year and Definition
Children Grade 5	1995-97. Children reaching grade 5 (%) - the percentage of children starting primary school who eventually attain grade 5 (grade 4 if the duration of primary school is four years). The estimates are based on the reconstructed cohort method, which uses data on enrolment and repeaters for two consecutive years.
Gender-related Development Index	2000. Gender-related development index (GDI) value - the HDI but with its components adjusted for inequalities between men and women.
Human Development Disparity	2000. Ratio of the Human Development Index to the Gender-related Development Index.
Life Expectancy Ratio	2000. Ratio female to male life expectancy at birth.
Adult Literacy Ratio	2000. Ratio of female to male adult literacy rate.
School Enrolment Ratio	2000. Ratio of female to male combined primary, secondary and tertiary gross enrolment ratio.
Earned Income Ratio	2000. Ratio of female to male estimated earned income - each income is roughly derived on the basis of the ratio of the female non-agricultural wage to the male non-agricultural wage, the female and male shares of the economically active population, total female and male population and GDP per capita (PPP US$).
Gender Empowerment Measure	1991-2002. Gender empowerment measure (GEM) value - a composite index combining measures in gender inequality in parliamentary seats, legislative, senior official and managerial positions, professional and technical employment and earned income.
Women in Parliament	2002. Seats in parliament held by women (as % of total) - refers to seats held by women in a lower or single house or an upper house or senate, where relevant.
Women in Senior Positions	1991-2000. Female legislators, senior officials and managers (as % of total) - women's share of positions defined according to the International Standard Classification of Occupations (ISCO-88).
Women Professionals and Technicians	1991-2000. Female professional and technical workers (as % of total) - women's share of positions defined according to the International Standard Classification of Occupations (ISCO-88).
Gini Coefficient	Various years. Gini coefficient values expressed as percentages.
Income Share Ratio (20%)	Various years. Ratio of income or consumption share of the richest 20 percent of the population to that of the poorest 20 percent, expressed as a percentage.
Income Share Ratio (10%)	Various years. Ratio of income or consumption share of the richest ten percent of the population to that of the poorest ten percent, expressed as a percentage.

continued ...

Table A2: Variable Definitions (continued)

Variable	Year and Definition
Polity Score	2000. A subjective measure of the extent to which laws and institutions which allow for democratic participation are present.
Civil Liberties	2000. A subjective, Freedom House assessment of nations based upon the observance of civil liberties.
Political Rights	2000. A subjective, Freedom House assessment of nations based upon the observance of political rights.
Press Freedom	2000. A subjective, Freedom House assessment of whether nations have a free press.
Voice and Accountability	2000-01. A subjective assessment, based on surveys of public perception regarding the quality of national governance, taking into account political process, civil liberties, political rights and press freedom and independence.
Political Stability and non-Violence	2000-01. A subjective assessment, based on surveys of public perception regarding the quality of national governance.
Law and Order	2001. Subjective law and order measure from the International Country Risk Guide.
Rule of Law	2000-01. A subjective assessment, based on surveys of public perception regarding the quality of national governance.
Life Enjoyment	1990s. Self-assessed subjective enjoyment of life, based on information obtained from surveys. Respondents are asked to assess their life satisfaction on scale of one to ten, and a national average is derived from these individual assessments.
Happy Life Years	1990s. Happiness adjusted life years. National life enjoyment multiplied by years of life expectancy at birth.
Life Enjoyment Inequality	1990s. Inequality in happiness among nations. Obtained by taking the standard deviation of national life enjoyment.

Sources: Governance variables - UNDP (2002); Happiness variables - Veenhoven (2002a, 2002b).

Table A3: Correlations between PPP GDP per capita (log) and Well-being Indicators

Variables	Zero-order	Rank-order	*n*
Human Development			
Human Development Index	0.923	0.938	173
Life Expectancy	0.794	0.840	173
Adult Illiteracy	0.701	0.705	173
Gross Enrolment	0.792	0.780	173
Well-being Index (W_i)	0.833	0.838	173
Human Poverty			
Human Poverty Index (HPI-1)	-0.816	-0.829	87
Survival to 40	-0.733	-0.773	116
Water Usage	-0.676	-0.719	108
Poverty Headcount ($1)	-0.700	-0.709	60
Poverty Headcount ($2)	-0.790	-0.790	60
Health Services			
Sanitation Facilities	0.643	0.674	123
Drug Access	0.626	0.675	170
Water Services	0.676	0.699	122
Measles Immunisation	0.315	0.445	165
Tuberculosis Immunisation	0.524	0.482	140
Oral Rehydration	0.161	-0.017	56
Contraceptive Prevalence	0.678	0.698	91
Birth Attendance	0.768	0.789	122
Physicians	0.607	0.696	165
Health Status			
Undernourishment	-0.706	-0.714	101
Underweight Children	-0.681	-0.713	124
Underheight Children	-0.761	-0.774	118
Underweight Infants	-0.593	-0.623	150
Adults with HIV/AIDS	-0.292	0.447	144
Women with HIV/AIDS	-0.054	-0.033	73
Malaria Cases	-0.379	-0.463	84
Tuberculosis Cases	-0.328	-0.602	170
Cigarette Consumption	0.693	0.728	110
Survival			
Infant Mortality Rate	-0.823	-0.892	172
Child Mortality Rate	-0.800	-0.896	172
Survival to 65 (Females)	0.797	0.851	166
Survival to 65 (Males)	0.756	0.846	166
Maternal Mortality Rate	-0.756	-0.847	144

Table A3: Correlations between PPP GDP per capita (log) and Well-being Indicators (continued)

Variables	Zero-order	Rank-order	*n*
Education Status			
Youth Literacy Rate	0.649	0.665	128
Primary School Enrolment	0.655	0.573	122
Secondary School Enrolment	0.871	0.849	95
Children Grade 5	0.716	0.826	48
Gender Bias			
Gender-related Development Index	0.932	0.944	146
Human Development Disparity	-0.513	-0.582	146
Life Expectancy Ratio	0.347	0.407	166
Adult Literacy Ratio	0.643	0.673	149
School Enrolment Ratio	0.34	0.395	162
Earned Income Ratio	0.347	0.322	90
Gender Empowerment			
Gender Empowerment Measure	0.806	0.826	66
Women in Parliament	0.403	0.391	170
Women in Senior Positions	0.058	-0.068	77
Women Professionals & Technicians	-0.002	-0.023	78
Income Inequality			
Gini Coefficient	-0.434	-0.438	116
Income Share Ratio (20%)	-0.324	-0.375	116
Income Share Ratio (10%)	-0.3	-0.356	116
Governance			
Polity Score	0.394	0.527	147
Civil Liberties	-0.540	-0.575	173
Political Rights	-0.522	-0.579	173
Press Freedom	-0.530	-0.545	173
Voice and Accountability	0.676	0.662	156
Political Stability and non-Violence	0.748	0.772	151
Law and Order	0.809	0.784	159
Rule of Law	0.784	0.772	151
Happiness			
Life Enjoyment	0.419	-0.115	66
Happy Life Years	0.656	0.663	66
Life Enjoyment Inequality	-0.556	-0.667	55

References

Alkire, S., (2002), "Dimensions of Human Development", *World Development* 30: 181-205.

Anand, S. and A. Sen (2000) 'The Income Component of the Human Development Index', *Journal of Human Development* 1: 83-106.

Cahill, M (2004), 'Is the Human Development Index Redundant?', *Eastern Economic Journal*, forthcoming.

Cummins, R.A. (1996), "Domains of Life Satisfaction: An Attempt to Order Chaos", *Social Indicators Research* 38: 303-328.

Doyal, L. and Gough, I. (1993), "Need Satisfaction as an Measure of Human Welfare" in W. Glass and J. Foster (editors), *Mixed Economies in Europe*, Edward Elgar, London.

Fielding, D. (2001), *Why is Africa so Poor? A Structural Model of Economic Development and Income Inequality*, Centre for the Study of African Economies Working Paper WPS/2001-5, Centre for the Study of African Economies, Oxford.

Fielding, D. (2002), "Health and Wealth: A Structural Model of Social and Economic Development", *Review of Development Economics* 6: 393-414.

Finnis, J. (1980), *Natural Law and Natural Rights*, Clarendon Press, Oxford.

Galtung, J. (1994), *Human Rights in Another Key*, Polity Press, Cambridge.

Hicks, N. and P. Streeten (1979), 'Indicators of Development: The Search for a Basic Needs Yardstick', *World Development* 7: 567-580.

Lai, D., (2000), "Temporal Analysis of Human Development Indicators: Principal Component Approach", *Social Indicators Research* 51: 331-366.

Larson, D.A., and W. T. Wilford, (1979), "The Physical Quality of Life Index: A Useful Social Indicator?", *World Development* 7: 581-584.

McGillivray, M. (1991) 'The Human Development Index: Yet Another Redundant Composite Development Indicator?', *World Development* 19: 1461-1468.

McGillivray, M. and H. White (1993) 'Measuring Development? The UNDP's Human Development Index', *Journal of International Development* 5: 183-192.

Morris, M. D., (1979), *Measuring the Conditions of the World's Poor: The Physical Quality of Life Index*, Pergamon, New York.

Narayan, D., *Voices of the Poor. Volume 1: Can Anyone Hear Us?*, Oxford University Press, New York.

Noorbakhsh, F. (1998) 'The Human Development Index: Some Technical Issues and Alternative Indices', *Journal of International Development* 10: 589-605.

Nussbaum, M., (1988), "Nature, Function and Capability: Aristotle on Political Distribution", *Oxford Studies in Ancient Philosophy*, Supplementary Volume 6, Clarendon Press, Oxford.

Ogwang, T. (1994) 'The Choice of Principal Variables for Computing the Human Development Index', *World Development* 19: 2011-2014.

Qizilbash, M. (1996), "Capabilities, Well-being and Human Development: A Survey", *Journal of Development Studies* 33: 143-162.

Ram, R., (1982), 'Composite Indices of Physical Quality of Life, Basic Needs Fulfilment, and Income: A 'Principal Component' Representation'', *Journal of Development Economics* 11: 227-247.

Ranis, G., F. Stewart and A. Ramirez (2000), 'Economic Growth and Human Development', *World Development* 28: 197-219.

Sen, A.K. (1990), "Development as Capability Expansion" in K. Griffin and J. Knight (editors), *Human Development and the International Development Strategy for the 1990s*, Macmillan, London.

Sen, A.K. (1993), "Capability and Well-being" in A. Sen and M.C. Nussbaum (editors), *The Quality of Life*, Clarendon Press, Oxford.

Srinivasan, T.N. (1994), 'Human Development: A New Paradigm or Reinvention of the Wheel?', *American Economic Review Papers and Proceedings* 84: 238-243.

Stewart, F., (1996), "Basic Needs, Capabilities and Human Development", in A. Offer (editor), *Pursuit of the Quality of Life*, Oxford University Press, Oxford.

United Nations Development Program (UNDP) (2002), *Human Development Report,* Oxford University Press, New York.

Veenhoven, R., (2002a), *Happy Life Years in 67 Nations in the 1990s*, World Database of Happiness, Rank Report 2002/2, www.eur.nl/fsw/research/happiness.

Veenhoven, R., (2002b), *Equality of Happiness in 59 Nations in the 1990s*, World Database of Happiness, Rank Report 2002-3, www.eur.nl/fsw/research/happiness.