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A Comparative Analysis of Four Different Well-Being Measures and Their Policy Implications: The Case of Bhutan

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Abstract

Due to the imperfection of Gross Domestic Product (GDP) as a well-being measure, which has recently been widely acknowledged, many alternative measures were proposed and eventually used to measure the holistic progress in several countries. The purpose of this study is to provide a comparative analysis of the four advanced well-being measures, including, Per Capita Expenditure, Composite Well-being Index, Gross National Happiness Index, and Subjective Well-being Index. Study uses Bhutan Living Standard Survey data 2017 and calculated multidimensional indices, Composite Well-being Index and Gross National Happiness Index, using fourteen significant variables. Per Capita Expenditure and Subjective Well-being Index are calculated using consumption expenditure variables and subject well-being variables available in the survey data respectively. For comparison, the study applies the four measures to the whole sample and then to the bottom group of the sample. Study finds that: (i) Gross National Happiness Index and Composite Wellbeing Index are relatively closer, whereas (ii) there is a sizable difference in the people classified in the bottom decile and quartile by the four measures. In particular, less than 1 percent of the sample population belongs to the bottom decile according to all the measures.

Keywords: Composite Well-being Index; Gross National Happiness Index; Multidimensional indices; Per capita expenditure; Subjective Well-being Index.

Introduction

The recent progress of many well-being measures is mainly due to the insufficient and monetary deviousness of Gross Domestic Product (GDP). The argument had become clear when Bhutan officially started measuring Gross National Happiness (GNH) in 2007, and Stiglitz et al. (2009) reported on the shortcoming of GDP in their commission report of the measurement

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of the economic performance and social progress. GDP cannot be a sufficient measure of social progress, but it is one of the conventional monetary measures of well-being. Mankiw (2016) explains that a large GDP does not ensure people's happiness, but it can be the best recipe for happiness.

The need of the era is a holistic approach that measures all indicators which are necessary for the well-being or happiness of the people. Some of the recent holistic measures like Composite Well-being Index (CWI), Gross National Happiness Index (GNHI), and the Subjective Well-being Index (SWI), are studied and discussed in this paper along with the income or expenditure measure of well-being.

The expenditure measure of well-being is selected for the study as it is exclusively used practice for making interpersonal comparisons for the redistribution. From a large number of multidimensional measures in use, CWI and GNHI are widely used objective-based measures. Measures like Human Development Index (HDI) and Multidimensional Poverty Index (MPI) are also widely used objective-based measures. However, CWI and GNHI are more improved measurement methods developed after HDI and MPI. Another widely used measure is subjective well-being which reports the direct score of happiness and life satisfaction. There are also few other well-being measures based on utility. However, measures based on utility are not widely used.

The four measures of well-being have been calculated and compared using the data from Bhutan Living Standard Survey (BLSS), 2017 which involved 11660 household heads. Like the purpose of GDP that summarises all data into monetary value, all well-being measures in this study translate the data into a single index. The index can be a gauge to describe the state of holistic development in a given time, while GDP value can only describe the state of economic development.

The individuals in the economy who make up the society care less about the total outcome of the economy, but they care about the well-being and the number of goods and services they consume (Mankiw, 2016). Hence, this paper computes the monetary aspect of well-being using consumption expenditure. The conventional GDP in this paper is substituted by the consumption expenditure in which most of the prices of commodities, goods, and services are adjusted for the current market value.

The second and the third well-being measures are multidimensional, as they are alternatives to purely monetary measures of GDP. CWI and GNHI have some similar basic mechanisms before aggregating indices. The well-being dimensions are categorised into binary variables based on the sufficiency thresholds, which determines how much is sufficient for the individual to be

well off in the society. The two multidimensional measures are compared using normative and empirical weighting schemes. In this case, the normative scheme uses equal weights to all domains and variables under each domain, whereas the empirical scheme uses the data-driven weights differently for all variables.

The fourth measure, SWI, is the most representative measure of the individual's state of well-being as individuals report their life evaluations. SWI is calculated using the happiness level of the people. It becomes difficult to point out the factors that affect the happiness of an individual as it varies from person to person. Nevertheless, self-evaluation of life becomes the key well-being measure to compare and understand other measures.

Measuring the indices itself hardly provides any information important for policy making. The purpose of this study is to provide a comparative analysis of the four well-being measures. Analysing the similarities and differences arising from the measures will help in policy decisions to select the viable method in accounting the well-being of its people. Therefore, after analysing each indicator, people are classified into the bottom decile and compared how they differ from indicator to indicator. The remaining part of the paper is organised as follows.

The next section of the paper reviews the related literature emphasising also on the methods of calculating well-being indices. Section three presents the data and methodology, which clearly defines the nature of data and the methods used in calculating indices for this work using BLSS 2017. Followed by results and discussion where the comparison among measures and policy implications are being discussed using the whole sample and the bottom groups of the respondents. In the concluding section, findings are summarised including cautions and recommendations for future studies.

Literature Review

A similar analysis on different well-being measures can be seen in the work of Decanq and Neumann (2016) based on the German Socio-Economic Panel (SOEP) data for 2010. In their work, they have used five different measures of well-being; income, the composite index of well-being, subjective well-being measure, equivalence income, and Von Neumann–Morgenstern Utility, and they have found a sizable difference between the worst-off measured by five well-being measures. However, well-being measures like utility and equivalence income are not predominant. The blithely developed philosophy of utility to measure well-being in the classical economy has some ambiguity in modern application. For instance, Varian (2014) indicates that utility is only a way to describe preferences in measuring happiness.

Therefore, this study excludes equivalence income and Von Neumann–Morgenstern Utility and instead uses GNHI as one of the multidimensional well-being measures.

In the work of Delhey and Kroll (2013), the alternative well-being measures commonly called quality-of-life (QOL) were tested to see how they capture happiness compared to GDP measures. The alternative measures tested were HDI, inequality-adjusted Human Development Index, OECD Better Life Index, Index of Social Progress, WBI, and Social Development Index. Using the data from 34 OECD societies, they concluded that most of the QOL measures do not outperform GDP measures except the OECD Better Life Index, which effectively predicts subjective well-being in the wealthiest countries of OECD. Boarini et al. (2006) stated that most of the well-being indicators are correlated to GDP per capita while a composite index points to a significant difference in whatever the weight used on indicators. Similarly, Delhey and Kroll (2013) also indicated that happiness and life satisfaction are only inadequately correlated to GDP per capita levels across OECD countries. Dolan and Peasgood (2008) compared subjective and income measures to see if they fulfil the three standard criteria; the right concept, valid measure, and empirically useful. They found a similar result that the subjective measure performs better than the income while neither subjective measure nor income measure met the ideal standards.

National Statistical Bureau (NSB, 2017) collected subjective information on poverty and happiness in its BLSS report. Household heads were asked to rate themselves on a scale of 1 to 5 on how happy or poor they felt. They found that the individual perception of happiness is associated with the perception of wealth. The survey reveals that 76 percent of Bhutan's population is happy and argues that there is a positive relationship between happiness and per capita household consumption expenditure.

While there are many studies on the relations and predictabilities of different measures, it is important to understand the significance of each measure and their predictability in detail. Firstly, the per capita consumption expenditure is used for the measurement of monetary well-being instead of per capita income. The consumption expenditure is considered a more relevant measure of utility or preferences of an individual as income is a means and expenditure is an end (Janvry & Sadoulet, 2016). The ideals of using consumption as a proxy measure of well-being outweigh its deficiencies as discussed by Janvry and Sadoulet (2016) in their book Development Economics. However, monetary measures or GDP measures are considered only approximate provided its imperfect valuation of goods and services. Monetary measure neglects many aspects of economic activities like

household products and services. GDP in general does not inform about the distribution of wealth, household activities, and underground activities.

It is certain that the GDP method is simply not the ideal method of measuring progress and requires either improvement or change (Boyd, 2007; Cobb et al., 1995; Corrado, et al., 2017; Costanza et al., 2009; Henderson et al., 2011; Thomas & Evans, 2010). In some of the descriptions, the GDP method was understood as telling next to nothing about what is happening in reality rather than a simple measure of gross market activity and money changing hands (Cobb et al., 1995). Besides pointing out the deficiencies of the GDP method, some suggested the transformation in the GDP method by in-lining with the environment and intangibles (Boyd, 2007; Corrado, et al., 2017; Thomas & Evans, 2010).

The second measure of composite well-being index (CWI) aggregates the different aspects of the life of an individual covering their choices and preferences, abilities and possibilities, status and practices. This measure specifies how to tradeoff between different aspects of life (Decanq & Neumann, 2016). Chaaban et al. (2015) also developed the Composite Global Well-Being Index (CGWBI) based on the OECD Better Life Index (BLI) which is highly correlated to HDI. The BLI uses a set of eleven dimensions and assigns weights based on users' ratings. However, as mentioned by Mizobuchi (2014), the methods of aggregating dimensions depend on the users of the data set. Most of the aggregating methods proposed in several literatures are based on national-level data that gives countries' comparable index. Therefore, this paper prefers to use the method provided by Decanq and Neumann (2016) for measuring the well-being at an individual or household level.

The third measure of well-being called GNH index (GNHI) is an inclusive approach for measuring development with values. The Fourth King of Bhutan, Jigme Singye Wangchuck, declared that "GNH is more important than GNP for Bhutan" in 1972. The Fifth King of Bhutan, Jigme Khesar Namgyel Wangchuck, stated that GNH is "a development with values." Bhutan officially started measuring happiness by calculating the GNH index in 2007 similar to HDI and MPI. In the HDI measurement, people are the real wealth of the nation (Streeten, 1994; UNDP, 2015). According to Alkire and Santos (2010), MPI is an improved version of HDI measurement. The GNH index also gives importance to people of the nation like HDI and MPI. Moreover, what extricates the GNH index from the other conventional concepts and measurements is its holistic development which includes not only multidimensional economic gauges but also physical environment and spirituality. Bhutan measures the happiness of the people through GNHI. However, GNHI does not directly include subjective happiness in its

calculation. GNH is a wider concept that includes all possible indicators that lead to the happiness of people (Centre for Bhutan & GNH Studies [CBS], 2016).

The fourth measure for this study is Subjective Well-Being Measures (SWI). There are different approaches to obtaining individual information on the hedonic variant of subjective well-being. Subjective well-being is primary information on life satisfaction and happiness level. Bhutan GNH survey collects data using the similar method of the Cantril (1965) famously known as the Cantril Ladder, which asks an individual to rate happiness on a scale of 0 to 10. Similarly, the world happiness report used data from Gallup that collects information using the Cantril Ladder. However, in BLSS 2017, information was collected using five ordered scales in which individuals are asked to rate their happiness level in general, 1 being very unhappy to 5 being very happy. The SWI can be measured by either life satisfaction, happiness, and or affect which depends on the subjective state of mind. Considering life satisfaction, affect, and eudaimonia as the three main types of measuring subjective well-being, Clark (2015) found that they are strongly related to each other and correlated to explanatory variables in a much similar manner in three European surveys.

Methods

Transformation of BLSS Data

BLSS 2017 data is originally maintained in eleven blocks based on different dimensions like household detail, education, health, consumption, etc. For the purpose of this study, it has been merged into one data set using the household number. The survey on happiness data is available only for the head of households and therefore, the overall observation of 48639 individuals has been reduced to the total household observation of 11660. From the 11660 heads of households, six household heads are within the age of 15 to 17. However, due to an insignificant number of minors, all 11660 household heads are the sample population for this study.

Consumption Expenditure

From the data, the consumption expenditure is available for households whereas the data on happiness is available only for the household head. To determine individual well-being, PCE is calculated using the adult equivalence scale. The method for giving weights in obtaining the adult equivalence is the one used in poverty assessment by the World Bank in its Living Standard Measurement Survey (LSMS).

Number of Adult Equivalence = Number of adults above 17 + 0.5 number of children 13 to 17 + 0.3 number of children 7 to 12 + 0.2 number of children 0 to 6.

This measure is intuitive to compare age groups without the gender disparity and the measure is of empirical questions and not necessarily arbitrary (Janvry & Sadoulet, 2016). After obtaining the adult equivalence, per capita expenditure is calculated by dividing total household expenditure by the number of adult equivalents.

Other Variables

The variables are uniformly transformed to binary depending on the sufficiency thresholds, and some of the discrete and continuous variables are normalised between 0 and 1 using the standard formula as follows:

$$n_i = \frac{x_i - x_{min}}{x_{max} - x_{min}}$$

Where, n_i is normalize variable, x_i is the variable to be converted for individual i, x_{min} is the minimum value for the variable across all individuals, and $x_{max}$is the maximum value for the variable across all individuals.

Selection of Indicators for Multidimensional Indices

In calculating both CWI and GNHI, eighteen variables are selected from the list of variables to find the significance in relation to happiness level. These eighteen variables are more related to well-being indicators. The variable selection also includes the indicators of the original GNH work of Bhutan, which are analogous to the happiness factors that are explained by Stiglitz et al. (2009). Happiness level is used as a proxy for selecting the significant multidimensional well-being variables. Table 1 shows the summary statistics of threshold-applied indicators used in measuring CWI and GNHI.

Table 1

Eighteen Indicators of Multidimensional Indices

Indicators	Sufficient		Not-sufficient		Total	
	Heads	%	Heads	%	Heads	%
In a married relationship	9,569	82.07	2,091	17.93	11,660	100
Six years & more of school education	2,725	23.37	8,935	76.63	11,660	100
Can read and write the national language	6,275	53.82	5,385	46.18	11,660	100

Can read and write English	5,187	44.49	6,473	55.51	11,660	100
Can read and write Lhotshamkha	1,299	11.14	10,361	88.86	11,660	100
Can read and write other languages	655	5.62	11,005	94.38	11,660	100
Not sick within last four weeks	9,813	84.16	1,847	15.84	11,660	100
All senses being able	11,342	97.27	318	2.73	11,660	100
Not having death within the last 12 months	11,109	95.27	551	4.73	11,660	100
Being Employed	11,621	99.67	39	0.33	11,660	100
Have own dwelling	6,685	57.33	4,975	42.67	11,660	100
Electricity connection from a grid	11,476	98.42	184	1.58	11,660	100
Piped water connection inside a dwelling	5,795	49.7	5,865	50.3	11,660	100
Toilet with flush to a piped sewer system	1,948	16.71	9,712	83.29	11,660	100
Monthly PCE is => than Nu. 2195.95	11,489	98.53	171	1.47	11,660	100
Having 3.4 acres and more of land	2,304	19.76	9,356	80.24	11,660	100
Having one-third of 36 appliances	4,469	38.33	7,191	61.67	11,660	100
Having 5 of any livestock animal	2,562	21.97	9,098	78.03	11,660	100

The 18 variables are transformed to a binary base on the thresholds given in Table 3, where 0 is sufficient and 1 is deprived. The individual's happiness level is tested as the dependent variable. The result of the estimates is presented in Table 2. From the list of 18 variables, 14 of the variables are significant in both the OLS and OLOGIT estimates, and therefore, they are used in calculating the multidimensional indices (i.e., CWI and GNHI). The effect size of the OLS estimate is used in determining the data-driven weights on variables to calculate the multidimensional indices.

Four of the variables which are insignificant in Table 2 are omitted from computing multidimensional indices because the weights on indicators based on regression results will become insignificant as well.

Table 2

The Effect of Applied Sufficiency Levels of Variables on the Report of Subjective Levels of Happiness - OLS and OLOGIT Estimates

Sufficiency Variables	Mean	Dependent variable: Happiness Level			
		OLS		OLOGIT	
In a married relationship	NA	-.108***	(.024)	-.193***	(.047)
Six years & more of school education	4.070	-.124***	(.026)	-.314***	(.054)
Can read and write the national language	NA	-.059**	(.025)	-.121**	(.052)
Can read and write English	NA	-.033	(.028)	-.033	(.057)
Can read and write Lhotshamkha	NA	-.047	(.030)	-.101	(.063)
Can read and write other languages	NA	-.089**	(.041)	-.260***	(.089)
Not sick within last four weeks	NA	-.033	(.024)	-.079	(.049)
All senses being able	NA	-.245***	(.063)	-.425***	(.120)
Not having death within the last 12 months	NA	-.107**	(.043)	-.188**	(.083)
Being Employed	NA	-.213	(.152)	-.402	(.286)
Have own dwelling	NA	-.063***	(.024)	-.153***	(.049)
Having 3.4 acres and more of land	1.999	-.048**	(.023)	-.089*	(.047)
Having one-third of 36 appliances	10.423	-.132***	(.020)	-.303***	(.042)
Having 5 of any livestock animal	3.129	-.117***	(.024)	-.249***	(.050)
Monthly PCE is => than Nu. 2195.95	11832.03	-.240***	(.081)	-.434***	(.149)
Electricity connection from a grid	NA	-.213***	(.079)	-.362**	(.157)
Piped water connection inside a dwelling	NA	-.123***	(.021)	-.263***	(.043)
Toilet with flush to a piped sewer system	NA	-.185***	(.025)	-.444***	(.054)
/cut1				-5.284***	(.144)
/cut2				-4.327***	(.136)
/cut3				-2.685***	(.131)
/cut4				-0.821***	(.129)
District		Y		Y	

R-squared	0.092	0.044
N(Observation)	11660	11660

Note: Robust Standard Errors are in the parentheses. Here *** indicates significant at 1%, ** indicates significant at 5%, and * indicates significant at 10 percent level. Mean is the summary statistic before dichotomizing the variables to 0 and 1. NA implies not applicable due to predefined binary values of the variables.

Thresholds and Weights of Multidimensional Indicators

The fourteen significant variables for determining the multidimensional well-being indices are grouped under five domains and are more importantly dogged by thresholds and weights as presented in Table 3. The variables are transformed to 0 and 1 dichotomy depending on the level of sufficiency thresholds as explained earlier. Threshold levels are disputable and the intuition behind setting a specific threshold for a few variables can be eccentrical as it depends largely on the authors' arbitrary.

Table 3

Threshold and Weights for Variables Used in Calculating Multidimensional Indices

Domain	Variables	Thresholds	Normative Weights	Regression Weights
1. Marital Status	Marital Status	Married	1/5	0.058413447
2. Education	Schooling year	6 years of schooling	1/15	0.06685702
	Read and write dzongkhag	Able to read and write Dzongkhag	1/15	0.031659285
	Read and write others	Able to read and write others	1/15	0.047890267
3. Health	Death Occurrence	No dead during last 12 months	1/10	0.057975896
	Disability	Abled	1/10	0.132202418
4. Living Standards	Dwelling ownership	Having dwelling ownership	1/15	0.034115246
	Asset ownership	(At least one of the three)	1/15	0.025930058
	1. Land Ownership	Having 3.4 acres of land		0.071416225
	2. Appliances	Having twelve of thirty-six		0.063056406
	3. Livestock	Having 5 of any animals		

	Per capita expenditure	Nu. 2195.95 per person per month (As per poverty line).	1/15	0.129427523
5. Utility services	Electricity connection	Having electricity connection from a grid	1/15	0.114700337
	Pipe water connection	Having pipe water connection in dwelling	1/15	0.066479695
	Having standard toilet	Having flush to a piped sewer system	1/15	0.099876177

The normative thresholds are most likely to be biased in the authors' unlimited discretion. Therefore, an utmost attempt was made ideally to set thresholds and weights as per the interactions of data themselves and as per the practised standards. Here the weights used as normative are equally set to give equal importance to all variables and to infer analysis without bias. The data-driven weights are empirical and beyond the arbitrary.

In setting thresholds, some of the variables are directly categorised as achieved and deprived based on the natural dichotomy of 'yes or no,' 'have or have not,' and 'do or don't.' The more careful threshold setting turns out to be necessary for schooling years, land ownership, number of types of appliances, number of livestock animals, and per capita expenditure. Hence, the thresholds were set as per the data interactions and found to deviate from a few of the normative and standard practices. For instance, the land ownership threshold is 5 acres for Bhutan GNH report, whereas this paper finds it significant at 3.4 acres. Bhutan 2015 GNH survey report essentially mentioned that the national average land ownership is approximately 3.2 acres (Ura et al., 2015) which is lower than the set threshold. This is most likely another paradox where people's happiness level remains the same or instead increases over time with a decrease in landholdings or any other scarce resources, as opposed to the Easterlin Paradox. Easterlin Paradox explains that people's happiness level remains unchanged or decreases as the income level increases (Easterlin, 1994). However, due to the lack of appropriate time series data for this paper, the presumable paradox remains a caveat.

For other variables, data interaction remains analogous to that of international standard practice and Bhutan's practice. Therefore, the

primary education threshold is maintained at 6 years of schooling, and the number of types of appliances at one-third of the total. The threshold of 5 of any livestock means a 5 of any individual or a collective number of pigs, cattle, yaks, buffaloes, horses, sheep, and goats.

The threshold for the per capita expenditure is set at Nu. 2195.95 per person per month as per the poverty threshold of Bhutan 2017 reported by the National Statistical Bureau of Bhutan. The threshold for household income as per the GNH report was Nu. 15000 per year in 2010 and considering inflation for December 2009 to December 2014 based on CPI reported by National Statistics Bureau (NSB, 2017), the threshold was set at Nu. 23127 in 2015 (Ura et al., 2015). While the same approach could have been used for 2017 but in adjusting inflation from December 2014 to December 2016, the threshold amounted to Nu. 2155 per person per month which is lower than the poverty line at the time. Calculation on CPI and inflation-adjusted threshold is as follows:

$CPI_{December2014} = 118.96$ and $CPI_{December2016} = 133.05$

Inflation = $((133.05 - 118.96)/118.96) * 100 = 11.84\%$

Therefore, supposing threshold for 2017 could be, Nu. 23127 * (1+0.1184) = 25865.24 which is approximately 2155 per person per month

The normative weights assign equal weights to all domains and variables under the same domains. The final column of Table 3 is empirical weight derived from the OLS estimates' effect size. The coefficients of significant variables which are uniformly binary become comparable irrespective of domains. Therefore, weights of each variable are assigned using the fraction of the total coefficient of all significant variables. In this way, variables with larger effect sizes will receive higher weights and vice versa.

Calculations of Indices

PCE

$$\text{Per Capita Expenditure (PCE)} = \frac{\text{Total Household Expenditure}}{\text{Number Adult Equivalence (AE)}}$$

where, AE = Number of adults above 17 + 0.5 number of children 13 to 17 + 0.3 number of children 7 to 12 + 0.2 number of children 0 to 6. The level of PCE determines the individual level of material well-being.

However, in order to report the level of well-being in the index, this paper uses the mathematical transformation function as below;

$$PCEI_i = \frac{PCE_i - PCE_{min}}{PCE_{max} - PCE_{min}}$$

where, $PCEI_i$ is the normalized individual PCE index, PCE_i is the PCE to be converted for individual I, PCE_{min} is the minimum value of the PCE across all individuals, and PCE_{max} is the maximum value of the PCE across all individuals.

The overall index is the average of all individuals which can be calculated as follows:

$$\text{PCE index} = \frac{\sum_{i=1}^{11660} PCEI_i}{n},$$

where, n is the total number of the sample population, i.e., equal to 11660.

Normative and empirical CWI

After setting the thresholds and assigning weights, CWI is directly calculated using mathematical structure as suggested by Decanq & Neumann (2016) as follows:

$$CI\ (\ell_i) = \left[w^0\left(f^0(y_i)\right)^\beta + w^1\left(f^1(x_i^1)\right)^\beta + \cdots + w^m\left(f^m(x_i^m)\right)^\beta\right]^{\frac{1}{\beta}}$$

Where the composite index (CI) of the vector of life aspects (ℓ) of an individual *(i)* is the sum of the product of relative weights *(w^0, w^1,…, w^m)*, dimension specific transformation function *(f^0, f^1, …, f^m)*, and individual life aspects *(y_i, x_i^1, …, x_i^m), where, y_i* being expenditure aspect of life, and x_i^n being n non-expenditure aspect of life.

This structure remains meaningful as long as the standardization transformation function f^n has standard exogenous cutoff to categorize into 0 and 1, and a weighting *scheme* w^n is coherent. In this structure, when the variables are binary where 0 represents an individual above the exogenous cutoff and 1 otherwise, the higher the value of the composite index connotes the severity of deprivation in the society. Therefore, to connote higher index values for higher well-being and vice versa, this paper will calculate CWI by subtracting from 1 as follow;

$$CWI\ (\ell_i) = 1 - \left[w^0\left(f^0(y_i)\right)^{\beta} + w^1\left(f^1(x_i^1)\right)^{\beta} + \cdots + w^m\left(f^m(x_i^m)\right)^{\beta}\right]^{\frac{1}{\beta}}$$

The weights are determined using normative and empirical approaches. In normative approach, all domains are equally weighted and all variables under each domain are equally weighted. Given the equal importance to domains and variables under each domain, the β which is the degree of substitutability depending on the utility is also considered unitary. The calculation base on variables and weights is as follows:

$$\begin{aligned} CWI\ normative(\ell_i) = \\ 1 - \big[1/15\left(\mathrm{pce}_{\mathrm{suf_I}}\right) + 1/5\left(\mathrm{marital}_{\mathrm{suf_I}}\right) + 1/15\left(\mathrm{schooling}_{\mathrm{suf_i}}\right) \\ + 1/15\left(\mathrm{readwritedzo}_{\mathrm{suf_i}}\right) \\ + 1/15\left(\mathrm{readwriteoth}_{\mathrm{suf_i}}\right) + 1/10\left(\mathrm{ability}_{\mathrm{suf_i}}\right) \\ + 1/10\left(\mathrm{mortality}_{\mathrm{suf_I}}\right) + 1/15\left(\mathrm{dwelling}_{\mathrm{suf_I}}\right) \\ + 1/15\left(\mathrm{asset}_{\mathrm{suf_i}}\right) + +1/15\left(\mathrm{electcon}_{\mathrm{suf_i}}\right) \\ + 1/15\left(\mathrm{drinkingwater}_{\mathrm{suf_I}}\right) \\ + 1/15\left(\mathrm{toilet}_{\mathrm{suf_i}}\right)\big] \end{aligned}$$

where $CWI\ normative$ is the normative composite well-being index, $\mathrm{pce}_{\mathrm{suf_I}}$ is the binary value of the per capita expenditure of individual life aspects, $\mathrm{marital}_{\mathrm{suf_I}}$ is the binary value of the marital status of individual life aspects, $\mathrm{schooling}_{\mathrm{suf_I}}$ is the binary value of the years of schooling of individual life aspects, $\mathrm{readwritedzo}_{\mathrm{suf_i}}$is the binary value of the ability to read and write 122verall122g language of individual life aspect, $\mathrm{readwriteoth}_{\mathrm{suf_I}}$ is the binary value of the ability to read and write other language (other than 122verall122g, English, and Lhotshamkha) of individual life aspect, $\mathrm{ability}_{\mathrm{suf_i}}$is the binary value of the disability of individual life aspect, $\mathrm{mortality}_{\mathrm{suf_I}}$ is the binary value of the mortality of individual's household aspect, $\mathrm{dwelling}_{\mathrm{suf_I}}$ is the binary value of the dwelling ownership of individual life aspect, $\mathrm{asset}_{\mathrm{suf_I}}$ is the binary value of the asset ownership of individual life aspect, $\mathrm{electcon}_{\mathrm{suf_I}}$ is the binary value of the election connection of individual's household aspect, $\mathrm{drinkingwater}_{\mathrm{suf_I}}$ is the binary value of the dwelling water connection of individual's household aspect, and $\mathrm{toilet}_{\mathrm{suf_I}}$ is the binary value of the standard toilet of individual's household aspect.

The overall index Is the average of all individuals which can be calculated as follows:

$$\text{CWI normative} = \frac{\sum_{i=1}^{11660} CWI\ normative(\ell_i)}{n},$$

where, n is the total number of the sample population, i.e., equal to 11660.

In the normative approach, domains and variables under domains are not equally important. The data-driven weights capture the importance of variables from the data itself. The calculation base on empirical weights is as follows;

$$CWI\ empirical(\ell_i) =$$
$$1 - \left[0.129\left(\text{pce}_{\text{suf}_\text{I}}\right) + 0.058\left(\text{marital}_{\text{suf}_\text{I}}\right) + 0.067\left(\text{schooling}_{\text{suf}_\text{i}}\right) + 0.032\left(\text{readwritedzo}_{\text{suf}_\text{i}}\right) + 0.048\left(\text{readwriteoth}_{\text{suf}_\text{i}}\right) + 0.132\left(\text{ability}_{\text{suf}_\text{i}}\right) + 0.058\left(\text{mortality}_{\text{suf}_\text{I}}\right) + 0.034\left(\text{dwelling}_{\text{suf}_\text{I}}\right) + 0.026\left(\text{land}_{\text{suf}_\text{i}}\right) + 0.071\left(\text{items}_{\text{suf}_\text{i}}\right) + 0.063\left(\text{livestock}_{\text{suf}_\text{i}}\right) + 0.115\left(\text{electcon}_{\text{suf}_\text{i}}\right) + 0.066\left(\text{drinkingwater}_{\text{suf}_\text{I}}\right) + 0.100\left(\text{toilet}_{\text{suf}_\text{I}}\right)\right]$$

where $CWI\ empirical$ is the empirical composite well-being index, $\text{land}_{\text{suf}_\text{I}}$ is the binary value of the land ownership of individual life aspect, $\text{items}_{\text{suf}_\text{I}}$ is the binary value of the types of item ownership of individual life aspect, $\text{livestock}_{\text{suf}_\text{I}}$ is the binary value of the livestock ownership of individual life aspect.

The123veralll index is the average in of all individuals which can be calculated as follows:

$$\text{CWI empirical} = \frac{\sum_{i=1}^{11660} \text{CWI empirical}(l_i)}{n},$$

where, n is the total number of the sample population, i.e., equal to 11660.

Normative and Empirical GNHI

In calculating GNHI, the weighted aggregate of threshold sufficiency is calculated and then further identifies the people into the happy and not-yet-happy base on an arbitrary level of 0.34. People who are deprived in more than 0.34 of the thresholds are considered not-yet-happy and otherwise, happy people are indexed 1. Further, the not-yet-happy people's deprived

value is subtracted from 1 to get the GNHI of deprived people. The mean value of both the happy and the not-yet-happy persons' index is the GNHI of the country.

The abstract of the GNHI formula is as follows:

$$\text{GNHindex} = 1 - \text{Total Deprivation}$$

Alternatively, it can be presented in partial indices at an aggregate level as,

$$\text{GNHindex} = 1 - H_n A_n$$

Where, H_n represents the percentage of people who have not achieved sufficiency in 66 percent of domains or not-yet-happy people, and A_n is the average proportion of dimensions in which those not-yet-happy people lack sufficiency (Ura et al., 2012).

SWI

The subjective well-being index is a direct transformation of the self-reported happiness ranking based on five levels (i.e., Very unhappy-1, Moderately unhappy-2, Neither happy nor unhappy-3, Moderately happy-4, and Very happy-5). Values from 1 to 5 are transformed directly between 0 and 1 using the mathematical formula,

$$\text{SWI}_\text{I} = \frac{\text{Happiness}_\text{I} - \text{Happiness}_{\text{min}}}{\text{Happiness}_{\text{max}} - \text{Happiness}_{\text{min}}}$$

where, SWI_i is the normalizing individual SWI, $Happiness_i$ is the happiness level to be converted for individual I, $Happiness_{min}$ is the minimum value of the happiness level across all individuals, and $Happiness_{max}$ is the maximum value of the happiness level across all individuals.

The overall index is the average of all individuals which is calculated as follows:

$$\text{SWI} = \frac{\sum_{i=1}^{11660} SWI_i}{n},$$

where, n is the total number of the sample population, i.e., equal to 11660.

Results and Discussion

Overall Findings

The different indices and their dimensions are compared by means of their outcomes. The ascertained outcomes are cascaded into diverse groups and segments at a disaggregate level.

Summary Indices of All Measures

Summary statistics in Table 4 shows the difference of the overall indices. All indices have a larger variance compared to the variance of PCE. But the mean index of PCE is much lower compared to all other indices. The two multidimensional measure predicts different overall index; the normatively weighted GNHI predicts higher well-being than SWI and empirically weighted GNHI predicts little lower well-being than SWI, whereas, CWI by both weighting schemes predicts lower well-being than GNHI and SWI. The empirically weighted multidimensional measures are predicting lower indices with lower standard deviation than normative multidimensional measures.

Table 4

Summary Statistics of the Outcome of Different Index Measures from the Given Sample of 11660

Measures	Mean	Std. Dev	Min	Max
PCE	.06	.05	0	1
GNHI normative	.84	.23	.2	1
GNHI empirical	.72	.22	.11	1
CWI normative	.67	.13	.20	1
CWI empirical	.62	.10	.11	.93
SWI	.76	.24	0	1

Correlation Among Well-Being Measures

The correlation among well-being measures presented in Table 5, shows the way in which all measures are measuring progress though the degree of progress varies. From the given Table 5, it is evident that they are positively correlated with the 1 percent significance level. Among the relations, GNHI and CWI in both normative and empirical weighting schemes are highly correlated to each other.

Table 5

Pearson Correlation (Pairwise) With the 1 percent Significant Level

Variables	1	2	3	4	5	6
(1) Per Capita Expenditure	1.000					
(2) CWI normative	0.199 (0.000)	1.000				
(3) CWI empirical	0.322 (0.000)	0.861 (0.000)				
(4) GNHI normative	0.096 (0.000)	0.864 (0.000)	0.687 (0.000)	1.000		
(5) GNHI empirical	0.325 (0.000)	0.750 (0.000)	0.895 (0.000)	0.586 (0.000)	1.000	
(6) SWI	0.096 (0.000)	0.174 (0.000)	0.197 (0.000)	0.142 (0.000)	0.179 (0.000)	1.000

p-value in parenthesis indicating the level of significance

Scatter Plot Between All Measures

Figure 1

Showing the Relationship Between Well-Being Measures and PCE

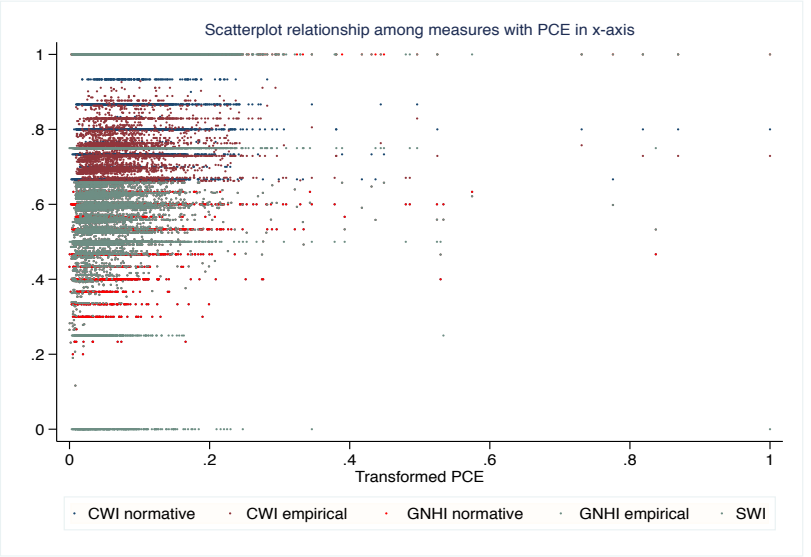
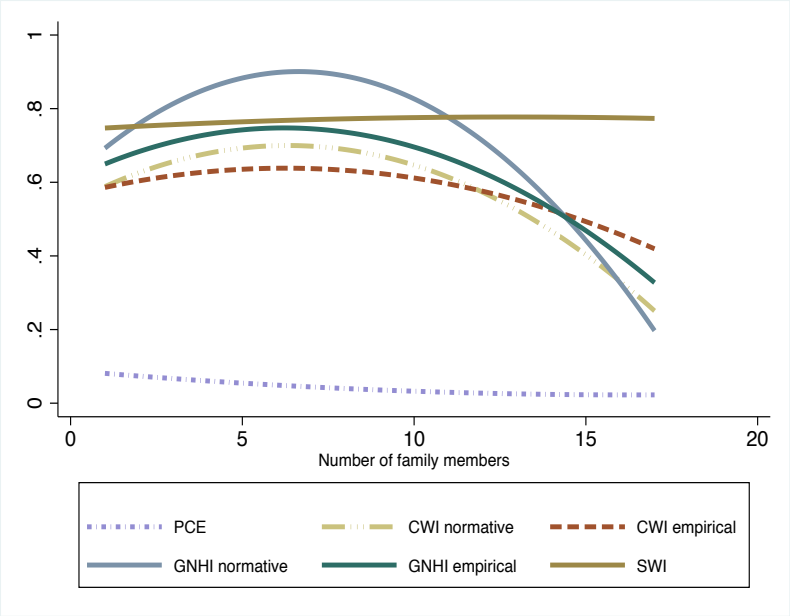


Figure 1 illustrates the relationship of well-being measures with PCE. The figure shows that the well-being of the people measured by CWI, GNHI, and SWI are higher even at the lower level of PCE. We can infer that material well-being is not necessarily a driving factor for happiness. It confirms the Easterlin Paradox at one point of time, where income does not necessarily lead to increased happiness. However, this gives contrasting evidence compared to National Statistical Bureau (2017) survey which finds that there is a positive relationship between happiness and per capita household consumption expenditure.

Number of Family Members

Figure 2

Correlation Between Size of Family and Their Well-Being



The size of the family member is understood as one of the important factors in determining different well-being measures. PCE is constantly decreasing as the number of family members increases. This gives some basis that all family members are not equally productive, and there is every chance that the number of economically inactive members increases with the increase in the family size. This could also be due to an increase in the number of children and schooling going family members. The effect of the number of increasing children is explained in the next section. Given in Figure 3, all four

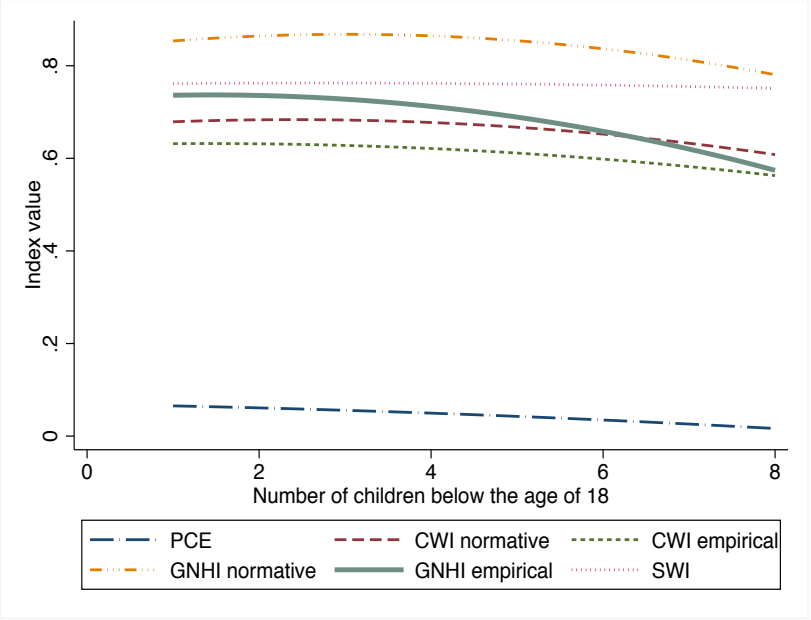
multidimensional measures indicate the well-being of the head of household increase with the increase in the number of members till six or seven and then decreases sharply with the increase in family members thereafter. But the SWI indicates a constant increase in the well-being or happiness of a household head with every increase of family member. This is also one indication that different measures are diverging into measuring a different aspect of an individual's life.

Number of Children

From the given Figure 3, it confirms that the number of children in a family is an enormous contributing factor that reduces all the well-being measures after a certain number of family members. Children in this study are considered below the age of eighteen. In the figure, it shows that the well-being of the head of household started to decrease at an increasing rate after two to three children. In this case, all the well-being measures show a similar pattern. Even the SWI slightly decreases after a certain limit with an increase in the number of children members in the family.

Figure 3

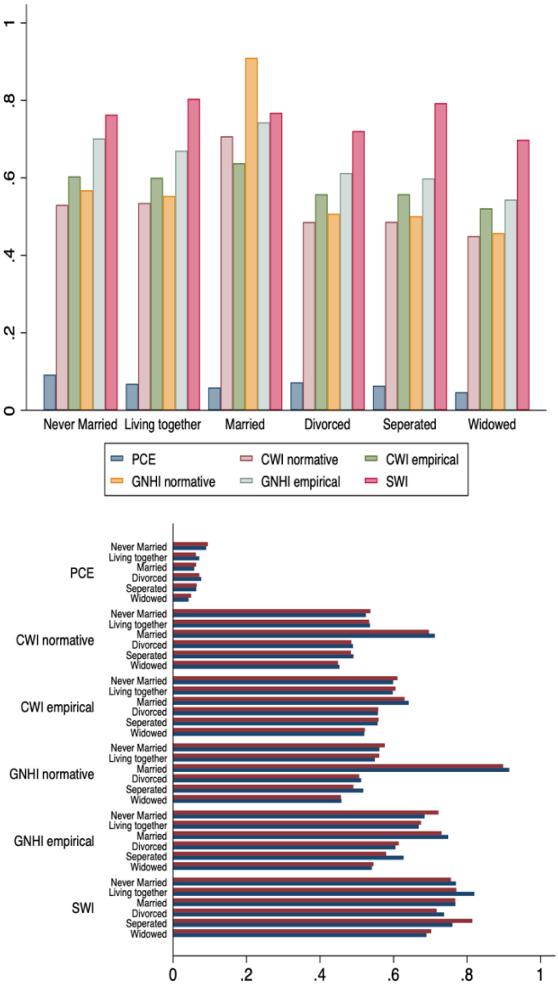
Number of Children Versus the Well-Being of the Head of the Family



Marital Status and Well-being

Figure 4

Marital Status and Well-Being (Gender Base)



Lately, there is a contrasting view on the relationship between marital status and well-being. Some literature found a very strong relationship (Haring-Hidore et al., 1985; Martin, 1976), while some argue that there is a weaker and declining relationship between marital status and well-being (Glenn & Weaver, 1988; Lee et al., 1991). However, this study finds that there still exists

a strong relationship between marital status and well-being irrespective of gender (see Figure 4). Both male and female household heads having their partner are seen to be at higher well-being than other relationships under study. Nevertheless, never married and living together are also in better well-being compared to divorced, separated, and widowed. Therefore, never married and living together are at the intermediate position and divorce, separated, and widowed are generally worse off. And at the end of the worst off are widows. Widowed are at the depriving end of well-being indices and therefore, require immediate policy intervention.

Age and Well-being

There are well-established empirical findings that happiness depends on age in a roughly U-shape-like parabolic trend (Baetschmann, 2014; Beja, 2018). Figure 5 explains the differences in well-being measures on age. While SWI and PCE confirm that happiness and income have a U-shape-like relationship, four multidimensional measures show otherwise. The sharp distinction of the relationship between age and well-being is presented in Figure 6. Since the age distribution of household heads starts from 15 completed years only, to demonstrate the clear shape of the relationship, the age of the household heads is squired. The reason behind the U-shape-like parabolic trend for SWI and PCE is due to a greater number of family members at around mid-age.

Figure 5

Age and the Pattern of Well-Being Measures

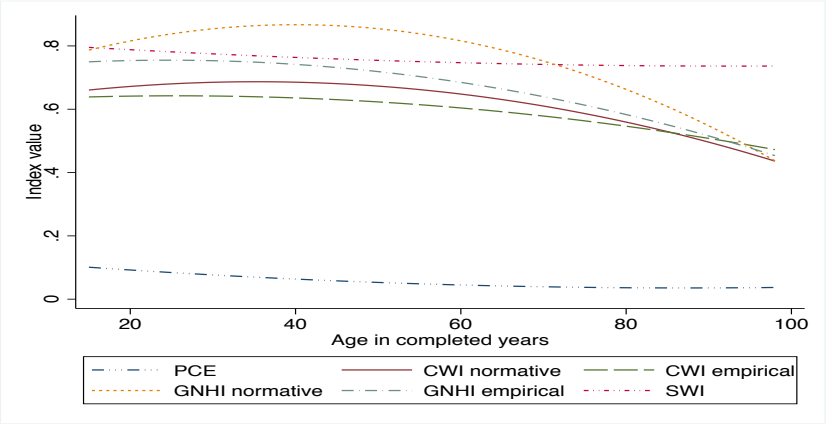
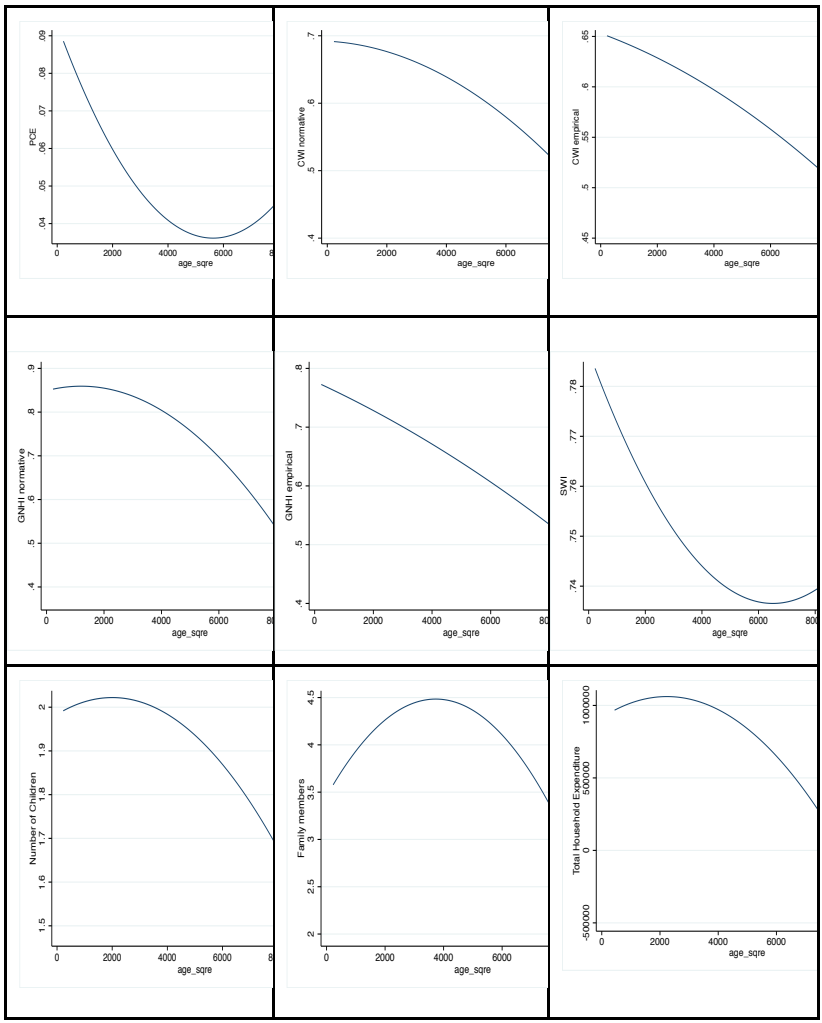


Figure 6

Fitted Relationship Between Well-Being Indices and the Age Square

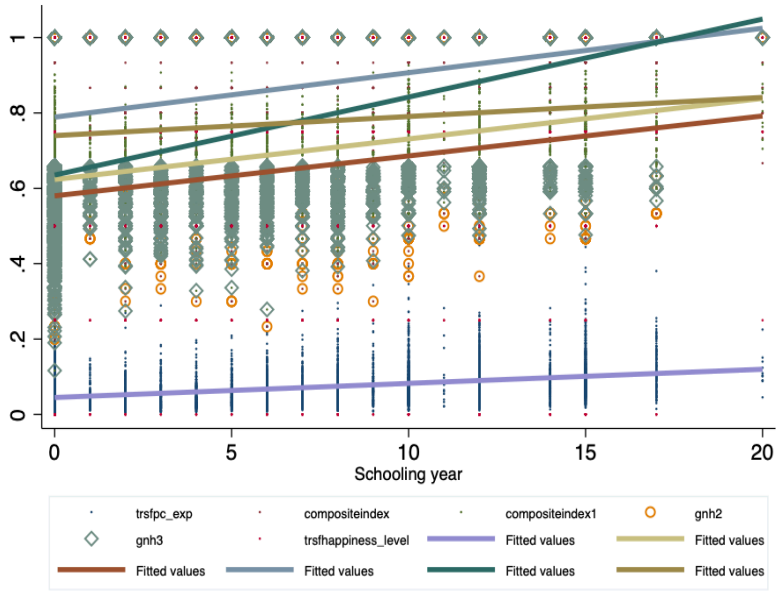


Education and Well-being

Education is one of the most important factors in any development. The educational sector is considered one of the primary sectors in promoting skills and the provision of knowledge for well-being (Rojas, 2020). Maniar (2019) also expressed a similar finding that schooling enables people to lead a good life. The empirical evidence from BLSS 2017 data also strongly confirms that, with the increase in formal schooling years, all well-being measures constantly increase (see Figure 7). This evidence shows that all well-being measures are related to individual education life aspects.

Figure 7

Relationship Between Well-Being Measures and Year of Schooling

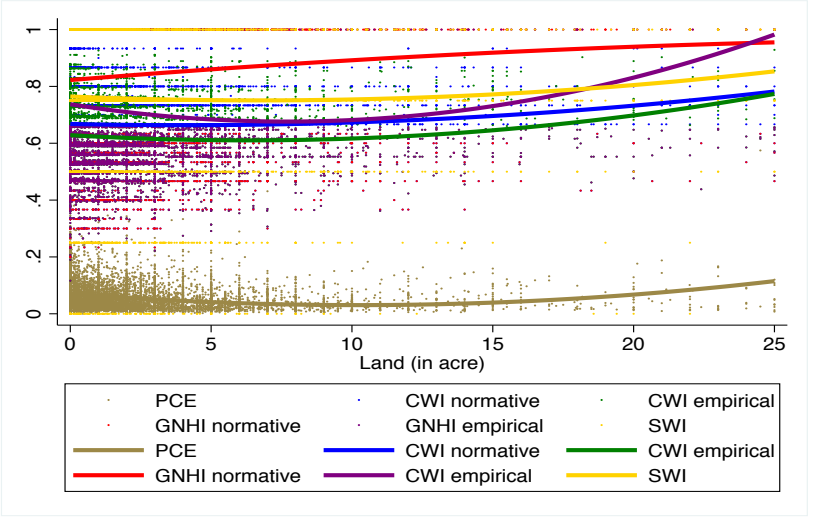


As discussed earlier on the paradox of land or scarce resources and individual happiness, from the given in Figure 8, we can further argue that an increase in land holdings does not necessarily increase well-being. Except for the normative weighting index of GNH, all other measures expose that well-being decreases with the increase in land holding up to 9 to 10 acres.

Land Ownership and Well-being Indices

Figure 8

Land Ownership and Their Relationship with the Well-Being Indices



Findings From the Bottom Decile and Their Distribution

The bottom decile group is selected based on the bottom 10 percent percentile values provided by the detailed summary statistics of all measures. The bottom deciles are the ones who are living barely below the bottom percentile threshold as provided in Table 6. One of the remarkable observations from the bottom decile is that both CWI and GNHI measures identify the same individuals, given the degree of substitutability between variables is unitary.

A single measure can identify 10 percent or more of individuals in the group in the bottom decile, whereas all measures in total identify less than 1 percent only of the sample population. This signifies how different measures, categorically monetary measures, multidimensional measures, and subjective measures depend on various aspects of life in measuring the well-being of the people.

Table 6

Number of Individuals Identified in Bottom Decile by Different Indices and Six Indices Altogether

Distribution	PCE	CWI normative	GNHI normative	GNHI empirical	SWI	All six indices
Bottom Decile	1166	1258	1258	1208	2779	50
Bottom threshold	<=.017	<=.467	<=.467	<=.493	<=.5	NA

From the calculated mean and maximum values provided in Table 7, we can see that the people in the bottom decile are the ones who are severely deprived in most of the conditions compared to the general population. There is a huge gap arising from per capita expenditure and the number of types of items they own. The mean monthly per capita expenditure of the bottom decile group is approximately Nu. 2444 while the general population enjoys Nu.11832 which is almost five times higher. Even the maximum expenditure of the bottom decile, i.e., Nu. 3700 is almost three times lower than the general population's average expenditure. The mean number of the types of items owned by the bottom decile is almost three times lower than the general population. This gives strong evidence that monetary measure still reserves an important role in determining the well-being of the people since the bottom group by all measures are the ones who have minimal money to spend and a lesser number of items to use.

Similarly, schooling years and the total acres of land they own also have some significant difference between bottom decile and sample population. In the case of education, the bottom decile hardly has one year of formal education while the average formal education of the population is 4 years. As per the UNDP (2015) Human Development Report, Bhutan's mean schooling year stands at 4.1 from 2017 to 2019 which sourced the data from UNESCO Institute for Statistics (2020) and UNICEF Multiple Indicator Cluster Surveys and OECD (2019b).

Table 7

Summary Statistics of Bottom Decile and Sample Population

Variable	Bottom Decile (50 observations)				Sample population (11660 observations)			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
- Monthly per Capita Expenditure	2444	736	601	3700	11832	9362	537	187986
- Schooling years	0.32	1.42	0	8.00	4.07	5.39	0	20.00
- No. of types of items owned	3.60	2.38	0	11.00	10.42	4.91	0	29.00
- Total livestock own	2.58	3.76	0	19.00	3.13	9.92	0	602.00
- Total acres of land	1.79	2.07	0	8.66	2.00	3.08	0	25.00

However, the lowest spending individual does not necessarily fall in the bottom decile in all measures because the minimum expenditure of Nu. 537 to Nu. 601 of the general population does not fall in the common bottom decile.

Conclusion

The four well-being measures of PCE, CWI, GNHI, and SWI have fewer similarities and sizable differences in most cases. The two multidimensional well-being indices of CWI and GNHI reveal some relativeness, but there is a sizable difference in the people classified in the bottom decile and quartile by the four measures. Even the two multidimensional measures predict a different overall index. The lower indices from the empirical weights show the poorer achievement in the variables that have higher significance in the subjective level of happiness because empirical weights assign higher weights to the higher effect size of the significant variables.

These inconsistencies among measures indicate the availability of different measurement methods for diverse policy choices. However, such uniqueness in the measure remains dubious and unreliable without fulfilling some of the important standards like the right concept and consistent with central theories, empirically analysed and valid, and predominantly applicable for the benefit of the whole of the society.

To provide the policy makers with a reliable measure requires further examination of the measures. The finding shows that the four-well-being

measure agree on few of the variables and disagree on some of the other variables. Therefore, this study suggests further analysis with maximum variables to check for consistency, and modelling new statistical methods that would help in representing the more valuable choices of the society.

Nevertheless, effective measures should offer a latitude of a paradigm shift to challenge the more varied worldview depending on the time horizon. Its implication on the policy decisions should be geopolitical, ideological, and intellectually inspiring. The measures are more likely applicable when they can offer solutions to the impasses of the greatest contradictions and human complexities.

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