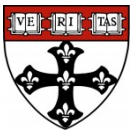

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Going Beyond GDP with a Parsimonious Indicator:

Inequality-Adjusted Healthy Lifetime Income

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Abstract

Per capita GDP has limited use as a well-being indicator because it does not capture many dimensions that imply a "good life," such as health and equality of opportunity. However, per capita GDP has the virtues of easy interpretation and can be calculated with manageable data requirements. Against this backdrop, a need exists for a measure of well-being that preserves the advantages of per capita GDP, but also includes health and equality. We propose a new parsimonious indicator to fill this gap and calculate it for 149 countries.

JEL codes: I31, I15, D63, O10, E01.

Keywords: Beyond GDP, Well-Being, Health, Inequality, Human Development, Lifetime Income.

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1. Introduction

Per capita GDP has limited use in measuring well-being. The reasons are well known,[2] for example, per capita GDP does not capture negative externalities of production, catastrophes raise GDP because of reconstruction efforts, and GDP does not include the quality of the natural environment. Most important—and partly a consequence of these shortcomings—per capita GDP disregards generally desired aspects such as living long and healthy lives and providing wide parts of the population the opportunity to share in the gains of economic prosperity (Fitoussi et al., 2009; Jones and Klenow, 2016; Fan et al., 2018; Lutz et al., 2018).

The following comparison between Germany and Iceland in 2013 illustrates the consequences of these omissions. According to the World Bank (2019), the two countries had comparable levels of GDP per capita (USD42,914 and USD42,372 adjusted for purchasing power). Thus, one would surmise that the typical German was slightly better off than the typical Icelander. However, this misses the point that life expectancy at birth in Germany was 80.49 years at the time, compared with 82.06 years in Iceland. Even when disregarding the intrinsic value of health, this implies that the *lifetime income* of the average Icelander under current conditions (calculated as life expectancy multiplied by GDP per capita) was higher than that of the average German. Similarly, the Gini index of income inequality in Germany stood at 31.1 (expressed in percent) and at 25.4 in Iceland. Considering that income distributions are skewed toward higher incomes, this implies that the median Icelander was likely to be better off financially than the median German even when disregarding differences in lifetime horizons.

Despite the stated problems, per capita GDP does have the virtues of easy interpretation and can be calculated with manageable data requirements. Against this backdrop, a need exists for a measure that combines the advantages of per capita GDP with the virtues of including health and equality. In the following, we propose inequality-adjusted healthy lifetime income (IHLI) as such an indicator. The resulting number, expressed in PPP-adjusted dollars, refers to the amount that a newborn in a certain

[2] Simon Kuznets, who is credited with the original formulation of GDP, already warned against its use as a welfare measure.

economy could expect to earn over the years in which she is in good health for the given economic and health conditions and adjusted for the level of inequality.

2. Inequality-Adjusted Healthy Lifetime Income

Several indicators have been proposed to address the problems of per capita GDP as a well-being measure, for example, the Human Development Index (HDI), the Happy Planet Index, Gross National Happiness, and the Better Life Index (ul Haq, 2003; Fan et al., 2018; OECD, 2019; New Economics Foundation, 2019). However, these indices tend to have high data requirements (on issues such as housing, civic engagement, work-life balance, etc.), are often based on subjective evaluations of life satisfaction or happiness via polling a small subset of the population, and often cannot be interpreted because different components with incompatible units of measurement are meshed together to construct an overall index.

Consider the HDI as an example. This indicator's components are income, life expectancy, and education. Because these are measured in different units, an overall index ranging from zero to one must be constructed out of the different components' sub-indices. The resulting index lacks an economic interpretation and has an upper limit by construction. The upper limit implies that further development cannot change the index value appreciably and that well-developed countries tend to cluster at high index values. Thus, at the upper end of the distribution, only marginal differences across countries may be evident in the index value, while the underlying fundamental data on life expectancy, income, and schooling could differ substantially.

To address the tradeoff of including additional dimensions of economic well-being, while keeping the indicator easy to calculate, easy to interpret, and based on readily available data, we propose the inequality-adjusted healthy lifetime income (IHLI) as a novel measure for economic well-being. This measure consists of the following components: i) GDP per capita adjusted for purchasing power (pppGDPpc) to capture a country's material living standard, ii) healthy life expectancy at birth (HALE) to capture health-related aspects such as environmental quality and access to high-quality medical

facilities, and iii) an inverse measure of the Gini coefficient (1 − Gini) as a proxy for an average person's opportunities to benefit from economic progress (Sen, 1976). The following straightforward formulation

$$IHLI_i = pppGDPpc_i \times HALE_i \times (1 - Gini_i) \quad (1)$$

is the amount that a newborn in economy *i* could expect to earn over the years in which she is in good health for the given economic and health conditions and adjusted for the level of inequality. Note that the unitary weights of the different components in this formulation follow mathematically from the underlying units of the different components: since the outcome is inequality-adjusted healthy lifetime income, it does not make sense to use a different weighting scheme in equation (1).[3]

Using the World Bank's (2019) World Development Indicators on pppGDPpc in international dollars with a base year of 2011, the World Health Organization's (2019) Global Health Observatory database on HALE in years, and Solt's (2019) Standardized World Income Inequality Database on the Gini coefficient of disposable income, we calculate this indicator for the year 2010 for all countries for which the necessary data inputs are available. Table 1 in the appendix displays the results, where the first column contains the country's rank by the IHLI indicator, the second column provides the country name, the third to fifth columns contain the three components of IHLI, and the sixth column contains the value of IHLI.

Interestingly, the IHLI indicator alters some standard rankings based solely on per capita GDP. For example, among high-income countries, the United States and Saudi Arabia exhibit a comparatively low IHLI value despite their high per capita GDP because of rather low values for healthy life expectancy and rather high inequality levels. By contrast, some European countries such as Austria, Belgium, Denmark, and Sweden exhibit a comparatively high IHLI despite their lower per capita GDP because of

[3] To see this, consider the following analogue. Assume that we would like to calculate the distance travelled by a car within a certain time span. Then we need to multiply the speed of the car by the duration of the travel. Applying a different weight to the speed of the car and the duration of the travel would be meaningless.

a rather high healthy life expectancy and a rather low inequality level. While these adjustments seem reasonable, we compare the IHLI with some obvious alternatives: the HDI and its inequality-adjusted version (UNDP, 2017) to assess whether the different well-being indicators yield country rankings that are generally in line with one another. In so doing, we need to restrict the dataset to 120 countries because the inequality-adjusted HDI is only available for this subset.

Figure 1 displays the correlation between the country rankings based on the IHLI and the HDI (left diagram; correlation coefficient: 0.9710) and between the IHLI and the inequality-adjusted HDI (right diagram; correlation coefficient: 0.9536). Altogether, this analysis shows a strong positive correlation between the rankings based on the different indicators, which is reassuring—otherwise we might not measure well-being accurately and might therefore miss important well-being dimensions that the HDI captures. Despite the fact that the different measures lead to consistent country rankings, our proposed indicator has the following advantages:

- It has a direct and immediate economic interpretation.
- It does not depend on aggregating different sub-indicators that are based on incompatible units of measurement.
- It is not restricted to a value between zero and one and thus is not bounded from above, allowing further development to be measured accurately and avoiding a clustering of countries at the upper bound of the index.
- It is parsimonious in terms of computation and data input requirements.
- It can be obtained for more countries.
- The weights of its components follow directly from the interpretation of the indicator.

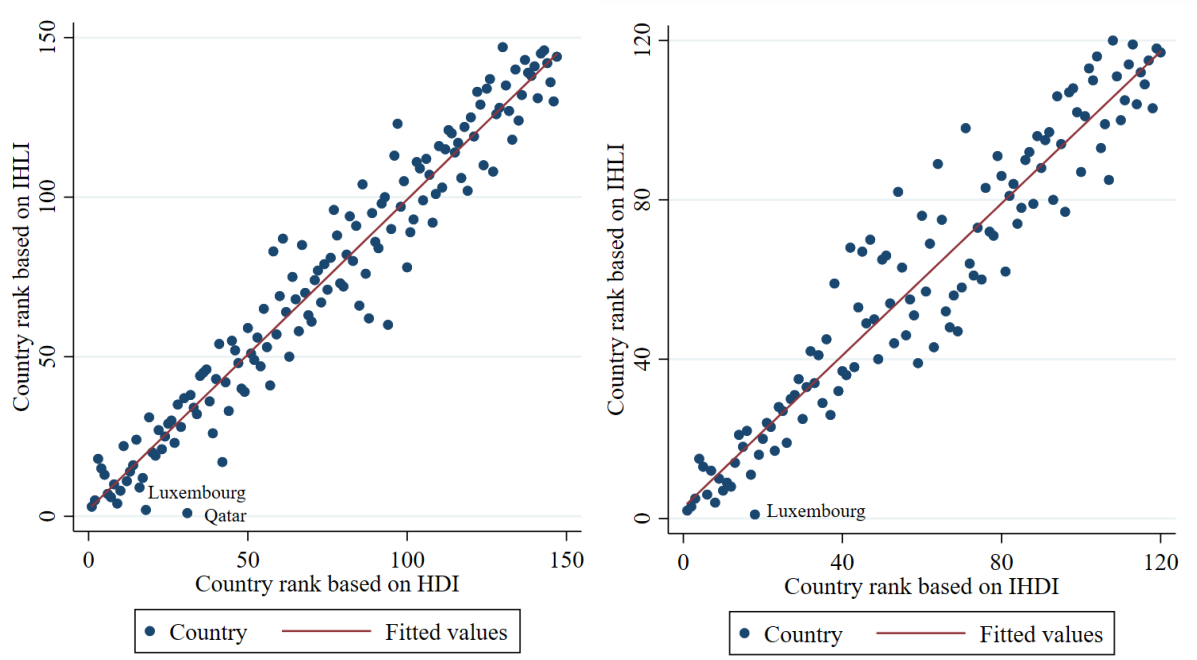

Figure 1. Comparison between IHLI and HDI rankings, 2010 (left diagram: HDI; right diagram: inequality-adjusted HDI)

3. Variants of IHLI

We view the formulation of IHLI in Equation (1) as an important improvement over per capita GDP. However, using gross national income (GNI) per capita instead of GDP per capita to measure income may prove useful because particularly small open economies such as Luxembourg are highly dependent on commuters. In this case, GNI might capture income better than GDP because GNI counts only residents' income. In this case our indicator would change to

$$IHLI_{i,gni} = pppGNIpc_i \times HALE_i \times (1 - Gini_i), \quad (2)$$

where $pppGNIpc$ is the ppp-adjusted GNI and the subscript in the indicator name signifies the use of GNI instead of GDP in the calculation.

Moreover, for some countries and for some time periods, HALE might not be readily available. Another variant of the proposed indicator could thus rely on life expectancy at birth (LEXP) instead of HALE. Life

expectancy arguably captures health less well than HALE, but it might be available for more countries and more time periods, which could allow extension of the sample when reconstructing the index over past decades. In this case the indicator would need to be renamed inequality-adjusted lifetime income (ILI) and the formula would change to

$$ILI_i = pppGDPpc_i \times LEXP_i \times (1 - Gini_i). \quad (3)$$

4. Conclusions

We propose a novel indicator for measuring economic well-being that accounts for income, health, and inequality and can be readily interpreted as inequality-adjusted healthy lifetime income. Although this indicator captures more dimensions of well-being than per capita GDP, it nevertheless remains easy to calculate and easy to interpret and requires limited data. A country ranking for the year 2010 shows some reasonable deviations from a ranking based on per capita GDP. While the IHLI-based country rankings are consistent with the rankings based on other established indicators such as the HDI, IHLI does not share HDI's shortcomings and is available for more countries (149 countries instead of 120 as in case of the inequality-adjusted HDI). Different versions of the indicator might be useful to raise the data availability further and to adjust for distortions that are caused by commuting into small open economies. Overall, our proposed indicator might prove useful for a better comparison of well-being across countries and over time.

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Appendix

Table 1. Ranking of countries according to the IHLI indicator, 2010

Rank	Country	pppGDPpc	HALE	GINI	IHLI
1	Qatar	125,141	66.7	0.397	5,033,177
2	Luxembourg	91,743	71.7	0.280	4,736,156
3	Norway	62,350	71.8	0.246	3,375,477
4	Singapore	72,116	74.8	0.393	3,274,319
5	Switzerland	55,866	72.5	0.290	2,875,718
6	Netherlands	46,102	71.4	0.265	2,419,374
7	Denmark	43,998	70.4	0.253	2,313,825
8	Sweden	42,989	71.9	0.254	2,305,808
9	Austria	43,336	71.4	0.282	2,221,639
10	Ireland	43,515	71.5	0.298	2,184,136
11	Belgium	41,086	70.8	0.257	2,161,300
12	Iceland	40,137	72.6	0.260	2,156,306
13	United States	49,479	68.7	0.370	2,141,511
14	Finland	39,848	70.4	0.254	2,092,760
15	Germany	40,429	70.9	0.287	2,043,741
16	Canada	40,699	72.2	0.311	2,024,622
17	Oman	45,336	65.5	0.319	2,022,228
18	Australia	41,464	72.2	0.329	2,008,775
19	France	36,815	72.2	0.294	1,876,574
20	Japan	35,750	73.8	0.314	1,809,896
21	Italy	36,201	72.8	0.331	1,763,112
22	United Kingdom	36,509	71.3	0.335	1,731,046

23	Cyprus	33,913	72.4	0.298	1,723,636
24	New Zealand	32,119	72.0	0.319	1,574,869
25	Spain	32,507	72.9	0.337	1,571,156
26	Saudi Arabia	45,421	64.4	0.478	1,526,916
27	Slovenia	28,678	69.2	0.247	1,494,361
28	Malta	28,359	71.6	0.272	1,478,194
29	Czech Republic	28,353	68.1	0.253	1,442,334
30	Greece	28,726	71.5	0.332	1,372,015
31	Israel	29,665	72.4	0.369	1,355,242
32	Portugal	27,238	70.8	0.337	1,278,584
33	Slovak Republic	25,159	66.8	0.257	1,248,705
34	Bahamas, The	29,222	66.4	0.439	1,088,531
35	Hungary	22,405	65.6	0.271	1,071,469
36	Estonia	22,741	66.7	0.323	1,026,889
37	Croatia	20,758	67.9	0.277	1,019,027
38	Poland	21,771	67.3	0.313	1,006,568
39	Lithuania	21,071	64.5	0.335	903,772
40	Kazakhstan	20,097	60.2	0.261	894,052
41	Malaysia	21,107	65.6	0.412	814,166
42	Seychelles	20,365	64.6	0.410	776,196
43	Belarus	16,261	62.3	0.245	764,841
44	Romania	17,469	65.2	0.331	761,983
45	Latvia	18,252	64.6	0.357	758,145
46	Argentina	18,712	67.3	0.399	756,852
47	Chile	19,442	68.9	0.453	732,738
48	Iran, Islamic Rep.	17,943	63.9	0.382	708,566

49	Uruguay	17,082	68.0	0.393	705,093
50	Lebanon	16,452	65.2	0.348	699,371
51	Turkey	17,959	64.4	0.404	689,319
52	Venezuela, RB	16,545	65.7	0.380	673,943
53	Bulgaria	15,283	65.7	0.332	670,746
54	Mauritius	15,938	64.5	0.366	651,770
55	Montenegro	14,038	67.1	0.312	648,082
56	Barbados	16,425	66.2	0.469	577,372
57	Panama	15,629	68.3	0.473	562,537
58	Mexico	15,716	66.5	0.463	561,225
59	Algeria	12,871	64.5	0.324	561,184
60	Serbia	12,688	66.2	0.339	555,208
61	Iraq	12,718	59.6	0.302	529,062
62	Thailand	13,487	65.5	0.406	524,722
63	Gabon	15,356	54.8	0.393	510,789
64	Brazil	14,539	64.5	0.463	503,583
65	North Macedonia	11,355	66.5	0.347	493,099
66	Costa Rica	13,000	69.7	0.456	492,918
67	Maldives	12,006	67.6	0.400	486,943
68	Tunisia	10,436	65.1	0.377	423,271
69	St. Lucia	11,788	65.7	0.459	419,006
70	Albania	9,927	66.4	0.383	406,705
71	Jordan	9,473	64.7	0.346	400,829
72	Bosnia and Herzegovina	9,720	66.7	0.394	392,885
73	Dominican Republic	11,133	63.8	0.455	387,090
74	China	9,526	67.6	0.430	367,049

75	Colombia	10,791	65.7	0.498	355,903
76	Ukraine	7,824	62.2	0.270	355,279
77	Egypt, Arab Rep.	9,859	60.0	0.404	352,555
78	Peru	9,957	66.3	0.469	350,524
79	Timor-Leste	8,861	57.3	0.314	348,289
80	Ecuador	9,352	66.8	0.443	347,978
81	Paraguay	9,801	64.5	0.463	339,455
82	Jamaica	7,999	66.1	0.409	312,489
83	Mongolia	7,709	60.2	0.333	309,526
84	Sri Lanka	8,530	66.1	0.488	288,668
85	Botswana	13,053	52.9	0.589	283,793
86	Armenia	6,703	65.2	0.360	279,696
87	Indonesia	8,433	60.4	0.456	277,104
88	Georgia	6,982	64.8	0.401	270,989
89	Fiji	7,352	60.4	0.393	269,548
90	Morocco	6,443	63.5	0.398	246,306
91	South Africa	11,888	50.5	0.594	243,736
92	El Salvador	6,301	64.2	0.407	239,874
93	Bhutan	6,420	58.7	0.395	227,985
94	Guatemala	6,714	62.1	0.467	222,230
95	Samoa	5,400	64.4	0.414	203,783
96	Philippines	5,597	60.6	0.416	198,074
97	Tonga	4,984	63.7	0.377	197,798
98	Cabo Verde	5,828	63.1	0.481	190,869
99	Vietnam	4,408	66.5	0.376	182,921
100	Namibia	8,461	53.4	0.600	180,724

101	Bolivia	5,407	61.0	0.453	180,431
102	Congo, Rep.	5,186	54.2	0.422	162,476
103	Pakistan	4,284	56.2	0.342	158,406
104	Yemen, Rep.	4,479	54.3	0.359	155,888
105	Lao PDR	4,219	56.0	0.351	153,327
106	Moldova	3,911	61.3	0.362	152,951
107	Nicaragua	4,029	65.5	0.429	150,676
108	Myanmar	3,721	56.3	0.328	140,787
109	India	4,463	57.4	0.469	136,035
110	Nigeria	5,083	46.2	0.421	135,969
111	Honduras	3,971	65.5	0.498	130,576
112	Mauritania	3,317	54.5	0.358	116,058
113	Micronesia, Fed. Sts.	3,298	60.3	0.417	115,929
114	Vanuatu	2,948	62.0	0.374	114,419
115	Kyrgyz Republic	2,790	61.1	0.341	112,346
116	Sao Tome and Principe	2,642	59.0	0.302	108,783
117	Bangladesh	2,443	60.7	0.339	98,009
118	Ghana	3,059	54.1	0.412	97,321
119	Cambodia	2,523	58.5	0.343	96,967
120	Senegal	2,725	56.1	0.392	92,931
121	Cameroon	2,930	48.3	0.431	80,520
122	Kenya	2,476	55.5	0.442	76,677
123	Zambia	3,279	50.1	0.540	75,574
124	Nepal	1,986	59.2	0.362	75,010
125	Tajikistan	2,106	62.4	0.440	73,603
126	Côte d'Ivoire	2,690	46.2	0.410	73,331

127	Solomon Islands	1,871	60.6	0.419	65,888
128	Comoros	2,426	54.7	0.529	62,507
129	Afghanistan	1,694	51.6	0.302	61,004
130	Benin	1,819	51.7	0.447	51,999
131	Lesotho	2,366	45.7	0.523	51,568
132	Chad	1,925	45.1	0.414	50,880
133	Guinea	1,574	50.0	0.369	49,645
134	Gambia, The	1,644	52.5	0.426	49,549
135	Madagascar	1,386	55.8	0.417	45,078
136	Uganda	1,516	50.4	0.413	44,847
137	Zimbabwe	1,738	46.7	0.453	44,396
138	Burkina Faso	1,423	49.7	0.396	42,728
139	Rwanda	1,368	56.2	0.472	40,597
140	Ethiopia	1,074	54.0	0.324	39,199
141	Guinea-Bissau	1,400	48.8	0.436	38,542
142	Togo	1,226	51.1	0.421	36,285
143	Liberia	1,086	51.6	0.356	36,076
144	Sierra Leone	1,200	43.9	0.383	32,503
145	Malawi	1,033	50.4	0.435	29,415
146	Niger	814	49.4	0.359	25,782
147	Mozambique	918	47.6	0.440	24,464
148	Burundi	726	50.3	0.368	23,082
149	Haiti	1,502	32.3	0.529	22,851