

Intercountry Inequality in Some Measures of Well-Being:1960-1992

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Abstract: In this paper three important inequality measures with convenient decomposition properties are used to compare trends in intercountry inequality in two measures of well-being, namely, the Human Development Index and real income (measured by real GDP per capita in 1985 international dollars). To this end, internationally comparable data on the two measures of well-being for the years 1960, 1970, 1980, and 1992 are used. The results indicate that despite the near perfect positive correlation between the two measures of well-being, the intercountry inequality trends are different, with inequality in HDI exhibiting a downward trend over the four years and that in real income exhibiting an inverted U-curve pattern.

Key Words: Human Development Index, Intercountry Inequality, Human Well Being

Introduction

An empirical examination of trends in intercountry (international) inequality in indicators of well-being is important in light of theories and recent debates about the widening gap between the rich and poor countries¹. As a consequence, several recent papers have examined trends in intercountry inequality in income or consumption measures of well-being². For example, Theil (1979; 1989), Ram (1979 and 1984), Summers, Kravis and Heston (1981 and 1984), Berry, Bourguignon and Morrison (1983), Maasoumi and Jeong (1985), Theil and Seale (1994) and Chotikapanich, Valenzuela and Rao (1997), among others.

Since the 1960's, there has been a proliferation of composite indicators of well-being, such as the Physical Quality of Life Index (PQLI), the Human Development Index (HDI), the Gender Development Index (GDI), the Gender Empowerment Measure (GEM), the Human Poverty Index (HPI), etc., to supplement real GDP per capita (RGDP), an income measure of well-being, whose limitations are well documented. The appeal of composite indicators of well-being stems from the fact that they attempt to incorporate attributes of human well-being other than income. Their appeal has been further reinforced by the popularization of the Basic Human Needs (BHN) approach to development, which is concerned with the satisfaction of basic needs, as an alternative to traditional growth strategies that emphasize increasing per capita GDP³. The BHN

approach is rationalized on the grounds that direct provision of essential aspects of living such as good nutrition, health, sanitation and education is essential for utmost labor utilization, higher productivity and growth. Accordingly, BHN performance yardsticks proposed by Hicks and Streeten (1979) have been incorporated into several composite indicators of well-being.

Of all the hitherto proposed composite indicators, the HDI, which has been compiled by the United Nations Development Program (UNDP) in its annual issues of the Human Development Report (HDR) since 1990, has probably received the greatest attention from academics, Governments, non-governmental organizations and international agencies such as UNESCO, UNICEF, WHO, etc. The HDI, which lies between 0 and 1, is credited with shifting focus back into quality of life issues following the 1980's when the debt crisis and structural adjustment policies appeared to have temporarily shifted focus away from quality of life issues to economic issues such as budget deficits, balance of payments and foreign currency reserves. Furthermore, the HDI is already being widely used as a basis for setting development goals by policy makers. In some cases, development assistance has been tied to HDI performances and/or human development goals of certain countries and efforts are already being made to calculate regional HDIs for some countries and to use HDI as a basis for developing a 'people-centred' approach to project appraisal.

¹The increasing gap between the rich and poor countries constituted the basis for the search for the New International Economic Order (NIEO) called for by the UN General Assembly in 1974. Recent dependency theories (e.g. Frank, 1978) view the widening gap as an artifact of the capitalist mode of development. It would, therefore, be interesting to see if there is any empirical evidence in favour of the widening gap proposition.

²The concept of well-being is very broad. For a fairly comprehensive review of issues pertaining to the definitions and measurement of well-being, see Paim (1995).

³For recent attempts to incorporate political and civil liberties into composite indicators of quality of life, see, for example, Dasgupta and Weale (1992). For arguments for and against the incorporation of political and civil liberties in HDI, see, for example, Streeten (1994, P.236).

If we accept that composite indicators are conceptually more appealing measures of well-being, it would be interesting to compare trends in intercountry inequality in the composite indicators to those in intercountry inequality in real income and other measures of well-being. To this end, Ram (1992) and Pillarasetti (1997) have examined intercountry inequality in HDI using data for 1987, taken from the 1990 HDR and for 1992, taken from the 1994 HDR, respectively. They found that intercountry inequality in HDI is smaller than that in real income as measured by real GDP per capita adjusted for purchasing power parity, in spite of the high positive correlations between the two variables. However, the two studies are based on non-comparable data sets, due to differences in the composition of the underlying samples and in the methods of computing HDI for the two years, that preclude us from deducing trends in intercountry inequality in HDI between 1987 and 1992 from these studies.

At the outset, UNDP recognized the need to continue to refine HDI so as to capture the concept of human development as adequately as possible, to improve the quality of the underlying data and to present the estimates for as many countries as possible. The most recently available and improved version of HDI published by UNDP (1997), contains comparable data for the years 1960, 1970, 1980 and 1992 that allow us to meaningfully analyze trends in intercountry inequality in HDI between 1960 and 1992. The purpose of this paper is to use these data to compare the trends in inter-country inequality in HDI with those in intercountry inequality in real income (measured by real GDP per capita in 1985 international dollars), for the four years⁴. To this end, we employ three intercountry inequality measures that are widely acceptable on theoretical, normative and computational grounds.

The format of the rest of the paper is as follows. Section "Materials and Methods" presents further details about HDI. The methodology and data are presented in section "Results and Discussion". Section "Conclusion" contains the empirical results and the concluding remarks are made in section "References".

The HDI: The inaugural version of HDI, reported by the UNDP (1990), is a composite index comprising of life expectancy, literacy and real GDP per capita adjusted for purchasing power parity. The three dimensions of HDI are chosen in recognition of three important aspects of human development, namely, longevity (measured by life expectancy), knowledge (measured by adult literacy) and access to resources (measured by real GDP per capita adjusted for purchasing power parity). Specifically, the HDI is based on the premise that human beings strive to lead a long healthy life, to acquire knowledge and to have access to resources needed to attain a decent standard of living, in which case the focus of development policy should be on the expansion of capabilities of people in these areas.

The inaugural version of HDI, reported in the 1990 HDR, is constructed as one minus the average of three

deprivation indices associated with the three components. The deprivation index for each component associated with a particular country is obtained by dividing the difference between the maximum value of that component (for all the countries considered) and the actual value of the component for that country by the range of the values associated with that component (i.e., the difference between the maximum and minimum values of the component for all the countries considered).

As noted above, UNDP has made several changes in the methodology for computing HDI, since its inauguration in 1990, in an attempt to capture the concept of human development as adequately as possible. One notable change, adopted in the 1991-1994 HDRs, is the replacement of the literacy index by an index of educational attainment which is a weighted average, in the ratio 2 to 1, of adult literacy and mean years of schooling. In the 1995 and recent HDRs, the educational attainment index is computed as a weighted average (in the ratio 2 to 1) of adult literacy and combined primary, secondary and tertiary enrolment ratios. Another notable change, adopted in the 1994 HDR, is the fixing of the minimum and maximum values of each of the three components of HDI, at extreme values observed or expected over a long period, to allow for meaningful comparisons of HDI values over time (UNDP, 1994). The third notable change is with respect to the method used to aggregate the three components of HDI. In the 1991 and recent HDRs, HDI has been computed directly as a simple arithmetic mean of the three scaled components instead of as one minus the average of three deprivation indices. There have also been changes in the method of discounting the income component above specified threshold income levels, in accordance with the principle of diminishing marginal utility of incomes, prior to computing HDI.

The most recently available and improved version of HDI for 175 countries reported in the 1997 HDR combines three indicators, namely, longevity (measured by life expectancy at birth), educational attainment (measured by a weighted average, in the ratio 2 to 1, of adult literacy and combined primary, secondary and tertiary enrolment ratios) and standard of living (measured by real GDP per capita adjusted for purchasing power parity). Each of the three components is first scaled to lie between 0 and 1 and a simple arithmetic mean of the three scaled components is then taken to yield HDI⁵. Accordingly, HDI lies between 0 and 1 with higher values signifying higher levels of human development. For further details regarding the construction of HDI reported in the 1997 HDR, UNDP (1997).

Materials and Methods

To assess the degree of intercountry inequality in the two measures of well-being, we consider three measures of inequality: the square of the coefficient of variation and two entropy-based inequality measures proposed by Theil (1967). The three measures are

⁴ It would have been nice to compute intercountry inequality in HDI for all the years from 1960 to 1992. However, there are currently no comparable data for all the 23 years. Furthermore, year-to-year fluctuations in intercountry inequality in HDI are expected to be very small.

⁵ Note that taking a simple arithmetic mean of the three components amounts to assigning equal weights to the components.

chosen because of their convenient group decomposition of overall inequality into intracountry inequality and intercountry inequality, appealing normative properties, computational convenience and the need to avoid relying on a single inequality measure in light of lack of compelling evidence in favour of selecting a single inequality measure⁶. As pointed out by Shorrocks (1980 and 1984), the three measures belong to a one parameter 'Generalized Entropy' family of additively decomposable inequality measures. Hereafter, we will designate the square of the coefficient of variation by CV². Theil's first (income-weighted) measure will be designated by THEIL-1 and Theil's second (population-weighted) measure will be designated by THEIL-2⁷.

It is well known that CV² is relatively more sensitive to income transfers at the top end of the income spectrum, whereas the two inequality measures proposed by Theil (THEIL-1 and THEIL-2) are relatively more sensitive to income transfers at the bottom end of the income spectrum. For further details about these measures, Bourguignon (1979) and Shorrocks (1980 and 1984), where in both the normative properties and the decompositions are also discussed. Note that computing the intercountry inequality measures amounts to equalizing the indicator level for the entire population at the mean level, in which case the intracountry inequality component vanishes and an overall inequality index is then computed for the resulting overall distribution⁸.

In the case of THEIL-1, the intercountry inequality estimates are computed as

$$T = \sum_{i=1}^n s_i \ln(s_i / p_i) \tag{1}$$

where s_i is the i -th country's share in total income (or total value of the indicator concerned); p_i is the corresponding share in total population; n is the number of countries in the sample; and \ln denotes the natural logarithm throughout the paper⁹.

For THEIL-2, the intercountry inequality estimates are computed as

$$L = \sum_{i=1}^n p_i \ln(p_i / s_i) \tag{2}$$

where n , s_i and p_i are as defined in equation (1).

The estimates of intercountry inequality based on CV² are computed as

$$CV^2 = \frac{\sum_{i=1}^n p_i (I_i / \bar{I} - 1)^2}{\bar{I}^2}$$

where I_i is the value of income (or the indicator concerned) for country i ; \bar{I} is the mean income (or mean value of the indicator concerned); and n and p_i are as defined in equations (1) and (2).

The UNDP (1997) reports data on HDI for the years 1960, 1970, 1980 and 1992 in the case of 111 countries. However, the present analysis of inequality trends is based on data for 81 countries for which comparable data on HDI, RGDP and population are available for all the four years (1960, 1970, 1980 and 1992). The cross-classification of the 81 countries, given in the appendix, shows that they span all the three HDI categories (22 low human development, 24 medium human development and 35 high human development countries) and geographic regions and are therefore highly representative. It is also noteworthy that the 81 countries account for more than 70 percent of the world population.

The data on HDI for 1960, 1970, 1980 and 1992 for the 81 countries are obtained from UNDP (1997). The corresponding data on real GDP per capita in 1985 international dollars (RGDP) are obtained from the most recently available and improved version of the Penn World Tables Mark 5.6 (Summers and Heston, 1991). Note that internationally comparable data on real GDP per capita in 1985 international dollars are used instead of conventional real GDP per capita converted at official exchange rates which does not take into account differences in relative purchasing powers and is known to significantly overstate the degrees of intercountry inequality. The estimates of population size for the 81 countries and for the four years are also taken from the Penn World Tables Mark 5.6 and are complemented by estimates reported in various issues of the World Development Report, published by the World Bank.

Results and Discussion

Table 1 shows Spearman's rank correlation coefficients between HDI and RGDP for all the four years considered in this study. Two main points emerge from the table. First, all the correlations are positive and very close to unity, indicating near perfect positive correlation between the two measures of well-being in all cases. Second, the correlations exhibit a general upward trend for the years 1960, 1970 and 1980, followed by a slight decline between 1980 and 1992.

⁶ The normative properties include scale independence (i.e., a proportional change in all incomes should not affect the value of the inequality measure), symmetry/anonymity (i.e., the inequality measure is based solely on the information provided by the incomes in a distribution and not, for example, by the identities of the people that have particular incomes) and Pigou-Dalton Principle of Transfers (i.e., transfer of income from a richer person to a poorer person that does not alter the ranking of the two individuals should reduce the inequality), among others. All the three indicators are scale independent and satisfy the Principle of Transfers and symmetry conditions.

⁷ Note that Theil's population weighted measure (THEIL-2) is identical to the inequality measure, L, considered by Bourguignon (1979).

⁸ Accordingly, the indicator share of the entire population of the i -th country is computed as $s_i = P_i I_i / \sum_{i=1}^n P_i I_i$ and

the corresponding population share is computed as $p_i = P_i / \sum_{i=1}^n P_i$, where P_i is the i -th country's population and I_i is its indicator value.

⁹ Note that although the three inequality measures considered here are traditionally used to measure inequality in income, they can easily be adapted to measure inequality in HDI (and other indicators of well-being), as is done in the present study.

Thus, on the basis of these results, it can be concluded that the strength of the relationship between RGDP and HDI increased then decreased over the four years considered, in spite of the near perfect positive correlation between the two measures of well-being in all cases.

Table 1: Trends in Spearman's Rank Correlation Between HDI and RGDP

Year	Rank Correlation
1960	0.915
1970	0.926
1980	0.963
1992	0.960

The intercountry inequality estimates in both HDI and RGDP, reported in Table 2, lead to the following observations. First, intercountry inequality in RGDP is greater than its counterpart in HDI irrespective of the measure used. These results are consistent with the findings of Ram (1992) and Pillarasetti (1997). Second, the intercountry inequality in HDI, as measured by all the three indicators, consistently decreased over the four years. Thus, if we accept that HDI is a conceptually more appealing measure of well-being and that a lower degree of intercountry inequality is desirable (e.g., Streeten, 1994), then the picture regarding the status of intercountry inequality in HDI over this period is a very positive one. Third, the intercountry inequality in RGDP increased between 1960 and 1970 and decreased between 1970 and 1980 and between 1980 and 1992, irrespective of the measure of intercountry inequality employed. Fourth, despite the decrease in inequality in RGDP between 1970 and 1980, the 1980 level of inequality is still higher than the 1960 level, which indicates a net increase in intercountry inequality between 1960 and 1980. Fifth, it is interesting to note that the 1992 intercountry inequality levels for RGDP are very close to the 1960 levels.

Table 2: Trends in Intercountry Inequality in HDI and RGDP*

	1960	1970	1980	1992
HDI				
CV ²	0.411 (0.0)	0.262 (-36.3)	0.180 (-56.2)	0.107 (-73.9)
THEIL -1	0.184 (0.0)	0.122 (-33.7)	0.087 (-52.7)	0.055 (-70.1)
THEIL -2	0.178 (0.0)	0.120 (-32.6)	0.089 (-50.0)	0.059 (-66.9)
RGDP				
CV ²	1.490 (0.0)	1.549 (4.0)	1.504 (0.9)	1.495 (0.3)
THEIL -1	0.571 (0.0)	0.616 (7.9)	0.595 (4.2)	0.568 (-0.5)
THEIL -2	0.575 (0.0)	0.649 (12.9)	0.617 (7.3)	0.546 (-0.5)

* The numbers in parentheses are the percentage changes in intercountry inequality in the indicator concerned over the corresponding 1960 levels.

Thus, in spite of the near perfect positive correlation between RGDP and HDI over the four years, intercountry inequality estimates associated with the two measures followed different paths, with the inequality in HDI following a downward pattern and that in RGDP, an inverted U-curve pattern.

To provide further insights into the relative degrees of intercountry inequality in the two indicators over the four years, we have presented estimates of the ratio of intercountry inequality in RGDP to that in HDI, in Table 3. It is apparent from the table that intercountry inequality in RGDP consistently increased from about 3 to 4 times the inequality in HDI in 1960 to about 9 to 14 times the inequality in HDI in 1992, depending on the inequality measure used. Furthermore, CV² shows the greatest relative differences between the two indicators of well-being, with the two entropy-based measures, THEIL-1 and THEIL-2, exhibiting fairly similar relative degrees of inequality.

Table 3: Trends in the Ratio of Intercountry Inequality in RGDP to that in HDI

Year	Ratio of intercountry inequality in RGDP to that in HDI		
	CV ²	THEIL-1	THEIL-2
1960	3.625	3.120	3.230
1970	5.912	5.049	5.408
1980	8.356	6.839	6.934
1992	14.252	10.327	9.254

Conclusion

As evidenced by a spate of recent papers, there is considerable interest in the trends of intercountry inequality in various measures of human well-being. In this paper we have compared the trends in intercountry inequality in HDI with those in intercountry inequality in RGDP using the best available and internationally comparable data for 81 countries for the years 1960, 1970, 1980 and 1992. To this end, three inequality measures with convenient decomposition properties are used. The results indicate that despite the near perfect positive correlations between the two measures of well being, the intercountry inequality trends depicted in the results are different, with the inequality in HDI discerning a consistent downward trend and that in RGDP discerning an inverted U-Curve pattern over the four years. Finally, if one accepts that HDI is a conceptually better measure of human well being and that a lower degree of intercountry inequality is desirable, then the results of this study present a very positive picture regarding the status of intercountry inequality in HDI over the period 1960 to 1992.

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Appendix: Countries Included in the Sample

Region	Low human development*	Medium human development*	High human development*
Sub-Saharan**	Ghana, Cameroon, Kenya, Lesotho, Nigeria, Cote D'Ivoire, Togo, Central African Republic, Madagascar, Uganda, Malawi, Guinea Bissau, Chad, Mozambique, Guinea, Burundi, Burkina Faso, Rwanda, Sierra Leone	South Africa, Gabon, Zimbabwe, Congo	Mauritius
East Asia**		China	Hong Kong
South Asia **	India, Pakistan, Bangladesh	Sri Lanka	
South East Asia and Pacific **		Philippines, Indonesia, Papua New Guinea	Singapore, Thailand, Malaysia
Latin America and Caribbean**		Brazil, Ecuador, Dominican Republic, Peru, Paraguay, El-Salvador, Bolivia, Honduras, Guatemala	Chile, Costa Rica, Uruguay, Panama, Venezuela, Mexico, Colombia
Arab states**		Iran, Tunisia, Algeria, Egypt, Morocco	
OECD***		Turkey	Canada, France, Norway, USA, Iceland, Netherlands, Japan, Finland, New Zealand, Sweden, Spain, Austria, Belgium, Australia, United Kingdom, Switzerland, Ireland, Denmark, Germany, Italy, Luxembourg
Others***			Israel, Cyprus

* According to the Classification Adopted in UNDP (1997)

** Developing Countries

*** Industrial Countries