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Assessing the Human Development Index through the Structure of Welfare

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Introduction

The Human Development Index

1   Researchers interested in socio-economic development and quality of life, have long sought to determine the indicators necessary for valid international comparisons. Many quality of life indices have been developed, tested and found to be useful, though not without room for improvement (Hagerty et al. 2001). The domains of quality of life may be identified through a number of different research channels: "... (a) 'elitist' scholarly identification of universal values; (b) sample surveys ofpersons in different cultures describing their QOL (Quality of Life); (c) psychological dimensions of well-being; (d) dimensions of social well-being; and, (e) satisfaction with sectors of daily life as represented by social institutions" (Ferriss 2001: 5).

2   The present study is closest to the fourth of the above listed channels: dimensions of social well-being as portrayed by international data banks of statistics on a number of items related to well-being. Previous studies in this field have generally yielded formulas by which nations can be ranked according to their level of development in such areas as health, education and economics (Kyogoku and Inoue 1965, Russett 1967, McGranahan *et al.* 1985, Mazumdar 1996 and yearly reports by the World Bank and the United Nations).

3   In their attempt to assess the progress of nations in pluralistic terms of human development, rather than a single-minded focus on economics (Sen 2000), the United Nations designed the Human Development Index (HDI), "...to capture as many aspects of human development as possible in one simple composite index and to produce a ranking of human development achievements... It is a composite index of achievement in basic human capabilities in three fundamental dimensions--a long and healthy life, knowledge

and a decent standard of living," (United Nations 1997: 28). The Human Development Index is based on three variables: life expectancy, per capita gross domestic and a combined educational indicator, consisting of adult literacy rates and primary, secondary and tertiary school enrollment rates.

A Preliminary Socio-Economic Structure of Indicators

4   In an article published in the April 2000 issue of *Social Indicators Research*, a typology of indicators was proposed. The purpose of this typology was not to rank nations, but to understand the underlying structure of the indicators themselves. The goal was to use the structure of socio-economic indicators developed in our previous analysis to evaluate the effectiveness and applicability of the HDI, and to determine its place within this structure. Since the HDI is designed to be a broad indicator of human development and welfare, it may beexpected to be located close to the semantic center of the structure.

5   In developing the typology, data was collected from several international reports for 138 nations. Data was collected for two time periods, *circa* 1992 and *circa* 1997, though not all the indicators were available for both years and the list of nations had changed considerably in the intervening five years. 17 indicators were used in 1992 and 14 in 1997, a total of 31 different items. In structural analysis, such a large number of variables reduce the significance of any single item, allowing a more fundamental and stable structure to emerge. The indicators selected and the sources of the data are shown in the key for Table I.

6   A multi-dimensional analysis was conducted on these data banks, using Monotonicity Correlations (Amar and Toledano 1997: 115) and the Smallest Space Analysis (SSA) technique (Guttman 1968, 1982; Levy 1994). The procedure was carried out for each of the two years as separate data sets, and then again on a combined data set. A structure was recognizable in three dimensions.

SSA representation of socio-economic and educational indicators 1992-1997 using MONCO correlations including HDI as external variable

Dimensionality 3 axis 1 vs. axis 3
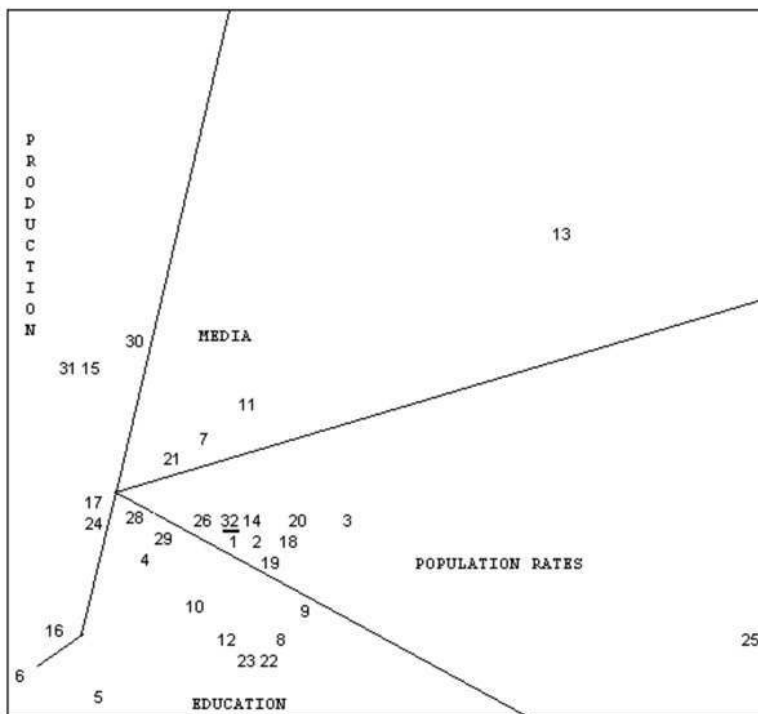
Key:
1 Male life expectancy *circa 1992*
2 Female life expectancy *circa 1992*
3 Fertility (inversed) *circa 1992*
4 Secondary school enrollment, male and female *circa 1992*
5 Graduate population *circa 1992*
6 Percentage of Gross National Product spent on education *circa 1992*
7 Televisions per 1000 residents *circa 1992*
8 Male literacy rate *circa 1992*
9 Female literacy rate *circa 1992*
10 Pupil/teacher ratio *circa 1992*
11 Per capita book production *circa 1992*
12 Number of working scientists and engineers (normalized) *circa 1992*
13 Annual growth of Gross National Product *circa 1992*
14 Infant survival rate *circa 1992*
15 Daily per capita caloric intake *circa 1992*
16 Urban population circa 1992
17 Per capital Gross National Product *circa1992*
18 Male Life Expectancy *circa 1997*19 Female Life Expectancy *circa 1997*
20 Fertility (inversed) *circa 1997*
21 Televisions per 1000 residents *circa 1997*
22 Male literacy *circa 1997*
23 Female literacy *circa 1997*
24 Per capital Gross National Product *circa 1997*
25 Annual growth of Gross National Product *circa 1997*
26 Infant survival rate *circa 1997*
27 Urban population *circa 1997*
28 Male secondary school enrollment *circa 1997*
29 Female secondary school enrollment *circa 1997*
30 Per capita daily caloric intake *circa 1997*
31 Per capita daily protein intake *circa 1997*
EXTERNAL VARIABLE32 Human Development Index

7 Despite the fact that the lists of indicators and the lists of countries were not the same for the two data sets, the same structure was found in all three of the analyses. In the maps created by the SSA procedure four content regions representing Production, Education, Media and Population Rates were found. The structure of the map is polar, meaning that there are two pairs of regions that are contiguous with each other only at a central point. These two pairs are arranged in such a way that education lies opposite media and production lies opposite population rates. These oppositions were interpreted as "...effort versus benefit, or investment versus consumption. Production and education both require work and the fruits of this work include longer life, improved standard of living and increased media consumption," (Cohen 2000: p. 101). The replicable structure found in this first analysis was quite encouraging, and prompted us to continue the search for effective indicators of welfare.

Methodology

8 In the present study,the data from the United Nations Human Development Report 1996 was used (United Nations 1997). The HDI data published in this report is circa 1995. Data for other indicators considered are from the data bank collected for Cohen (2000), circa 1992 and 1997. Data for these variables tend to be stable, with very little change within the range of time considered.

9 There are two possible means of using the structure of indicators to evaluate the HDI. One would be to add the HDI to the list of indicators collected for the first study. In this procedure, the correlation between the HDI and all the other variables would be considered at once. The HDI would therefore influence the placement of the original variables. A new map would be created, incorporating the HDI value for each of the nations. A second possible method would be to place it as an external variable in the original structure. To do this, a single line of correlations is calculated, the correlation between the HDI and the original variables. The original map is "fixed," so that the correlation between the external variable and the original variables is not considered in the placement of the original variables. The external variable, in other words, does not affect the original structure (Cohen and Amar 1993, 1999, 2002).

10 In this analysis, the external variables method is used. The goal of the study was specifically to assess the usefulness of the HDI as an indicator, using the previously constructed typology as an evaluation tool. Incorporating the HDI into a newly created map would not accomplish this goal. As already indicated, since the HDI is designed to be a broad indicator of human development and welfare, it may beexpected to be located close to the semantic center of the structure. A similar method was used by Cohen, Meir, Segal and Amar (2003) to determine whether a new group of occupations, entitled Tension, Adventure, and Risk (TAR) constitutes a separate field or a separate dimension, a differentiation within other fields.

11 The Table I, shows the correlations between the HDI and each of the 31 variables for the combined data set. For a detailed explanation of the computation of the HDI, the United Nations Development Report 1996, page 106.

Table I: MONCO correlation between HDI and original indicators

```
                       INPUT EXTERNAL MATRIX**

              1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16
         +-------------------------------------------------------------------
         I
HDI   32 I   98  99  93  95  91  34  97  96  96  98  97  92  59  98  94  93
         I

(cont.)     17  18  19  20  21  22  23  24  25  26  27  28  29  30  31
         +-------------------------------------------------------------
         I
HDI   32 I   99  99  99  95  97  97  97  97  41  99  94  97  99  94  92

**The coefficients were multiplied by 100 and rounded into integer numbers
```

Key:
1 Male life expectancy *circa 1992* (United Nations 1987)
2 Female life expectancy *circa 1992* (United Nations 1987)
3 Fertility (inversed) *circa 1992* (United Nations 1987)4 Secondary school enrollment, male and female *circa 1992* (Kurian 1988)
5 Graduate population *circa 1992* (Kurian 1988)
6 Percentage of Gross National Product spent on education
circa 1992 (Kurian 1988)
7 Televisions per 1000 residents *circa 1992* (United Nations 1987)8 Male literacy rate *circa 1992* (Kurian 1988)9 Female literacy rate *circa 1992* (Kurian 1988)10 Pupil/teacher ratio *circa 1992* (Kurian 1988)11 Per capita book production *circa 1992* (United Nations 1987)12 Number of working scientists and engineers (normalized) *circa 1992* (United Nations 1987)
13 Annual growth of Gross National Product *circa 1992* (World Bank 1990)
14 Infant survival rate *circa 1992* (World Bank 1990)15 Daily per capita caloric intake *circa 1992* (World Bank 1990)
16 Urban population *circa 1992* (World Bank 1990)17 Per capital Gross National Product *circa 1992* (Paxton 1990)
18 Male Life Expectancy *circa 1997* (United Nations 1991)19 Female Life Expectancy *circa 1997* (United Nations 1991)20 Fertility (inversed) *circa 1997* (United Nations 1991)21 Televisions per 1000 residents *circa 1997* (United Nations 1994)22 Male literacy *circa 1997* (United Nations 1994)23 Female literacy *circa 1997* (United Nations 1994)24 Per capita Gross National Product *circa 1997* (World Bank 1997)25 Annual growth of Gross National Product *circa 1997* (World Bank 1997)26 Infant survival rate *circa 1997* (World Bank 1997)27 Urban population *circa 1997* (World Bank 1997)28 Male secondary school enrollment *circa 1997* (World Bank 1997)29 Female secondary school enrollment *circa 1997* (World Bank 1997)30 Per capita daily caloric intake *circa 1997* (United Nations 1994)31 Per capita daily protein intake *circa 1997* (United Nations 1994).

Results

12 In general, the correlation between the HDI and the other variables is high, indicating that it is well integrated into the larger field of welfare represented by the 31 indicators. For example, see in Table I the correlation between the HDI and life expectancy and infant survival rates.The three exceptions with low correlations are the percentage of the gross national product spent on education circa 1992, and the average annual growth rates of the gross national product circa 1992 and 1997. This is initially surprising, given that the calculation of the HDI includes economic and educational indicators. However, the weak link between the HDI and the annual growth rate of the GNP is in line with the findings of the UN's longitudinal study on welfare and development around the world. "The central message of the Human Development Report is clear: there is no automatic link between economic growth and human development" (United Nations 1997: III).

13 In the previously published analyses the variables for annual growth rate of GNP were found to be relatively weakly correlated with the other variables and therefore consistently pushed to the periphery of the maps. It was postulated that this result might

be due to "noise" created by the fact that the variable is based on data from previous years. Based on these new results which include the HDI, the possibility must now be considered that average annual growth rate of the GNP simply is not an accurate indicator of welfare. It is less clear why the percentage of the GNP spent on education is weakly linked with the HDI.

14   The HDI was placed midway between the regions representing education and population rates. Though it is close to the central point of the structure, it seems to be more distantly related to the regions of media and production. As stated earlier, the HDI is meant to serve as a single indicator that represents a wide range of conditions. Its position in the structure shows that it is effective in doing so, but that it emphasizes certain areas of quality of life more than others.

Conclusion

15   It seems that the HDI as designed by the United Nations is a quite effective indicator of quality of life, which could be of great use to researchers in the field. The three representative categories: life expectancy, literacy and income, cover a wide range of socio-economic indicators. Considered together, they are close to the heart of the structure of welfare on a national or international level. The analysis presented here helps to answer critics of the HDI who, "...have said that not only are the weights of the three components[1] arbitrary, but so are what is excluded and what is included," (Streeten 2000).[2] Additional research could be carried out to find other variables that could be added to the HDI to expand its range to the regions of production and media, which were found to be basic components of welfare. However, it seems that the HDI as it stands is a good indicator of the welfare of nations. The goal of the creators of the HDI was to find an indicator that would give a broader picture of life in developing nations than has been provided by strictly economic indicators. The location of the HDI at the center of a structure of 31 different indicators is a testament to its wide applicability and representation as an index for the field of development research.

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NOTES

1. Life expectancy, per capital gross domestic product and the combined educational indicator, consisting of adult literacy rates and school enrollment rates.

2. In addition, in the course of working on this study, a number of exercises with different components and differently weighted components were tried (those interested may contact the author for a copy of these exercises), and no significant change in the location of the HDI was found.

ABSTRACTS

In this study, we assess the validity of the United Nations' Human Development Index (HDI), a multi-faceted indicator of national welfare. For this purpose, the HDI is introduced into a previously published typology of welfare indicators (Cohen, E. H. 2000). The HDI appears to be a well-balanced indicator of welfare, close to the semantic center of the structure. However, it is somewhat more strongly correlated with the education and population rates regions of the structure than with the production and media regions.

Évaluation de l'indice de développement humain à travers la structure du bien-être social : Dans cet article, nous étudions la validité de l'indice de développement humain (HDI) des Nations Unies, un indicateur multidimensionnel du bien-être national. Pour le faire, le HDI est intégré dans une typologie de bien-être déjà publiée (Cohen, 2000). Le HDI apparaît comme un indicateur bien équilibré de bien-être, proche du centre sémantique de la structure. Néanmoins, il est un peu plus fortement corrélé avec l'éducation et taux de croissance de la population qu'avec la production et les média.

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