Population Structure and the Human Development Index

CARMEN HERRERO, UNIVERSIDAD DE ALICANTE

RICARDO MARTINEZ, UNIVERSIDAD DE GRANADA

ANTONIO VILLAR, UNIVERSIDAD PABLO DE OLAVIDE

WITTGENSTEIN CENTRE CONFERENCE 2019. DEMOGRAPHIC ASPECTS OF HUMAN WEEL-BEING. VIENNA, 11-11-2019

Introduction

Improving life conditions is in the agenda of governments and international institutions.

Basic question: How to measure living standards and future possibilities?



For very long, it was made using **GDP** or **per capita GDP**. Too coarse indicator.

'The welfare basis of policy evaluation is a topic which should receive greater priority in economics.' 'The Strange Disappearance of Welfare Economics' 2001. (Atkinson)

Introduction: Happiness

In 1972 the King of Buthan coined the term GDH (Gross Domestic Happiness) with the idea of incorporating non-economic variables closest to individuals well-being perceptions (happiness)

First historical attempt at moving beyond GDP.

This is a multidimensional concept incorporating *economic, social, political and spiritual aspects, enhances solidarity and is aware of future generations possibilities.*

Sen: Happiness is not the only thing that matters, but it matters, and may help us to see whether we are moving in the right direction

Introduction: Beyond GDP

 Going from GDP to Happiness is too long a way but there are interesting intermediate paths.

Warning: Any initiative should face two major challenges:

1. To do justice to the richness of the idea (relevance)

2. The approach must be practical and usable for assessment (usability)

UN launched the Human Development Reports (1990): HDI

Stiglitz, Sen, Fitoussi report (1999)

Changes in HDI 2000.

Source States And Sta

- OECD: How's Life
- European Commission: Beyond the GDP
- MDG (Millenium Development Goals)
- Social Development Indicators

HDI

Variables selected:

HEALTH: *Life expectancy at birth:* **LEB**

EDUCATION: Expected years of schooling (children entering): **EYS,** mean years of schooling (adults): **MYS**

MATERIAL WELL-BEING: Per capita GDP: pcGDP

Problem: None of those variables take into account the population structure

HDI and Population Structure

Why should we be concerned about demographics in the HDI?

1. *Differences in the demographic structure among countries are huge*, in particular regarding the shares of young and old people

2. The *population structure affects the capacity of societies* to keep or improve their living standards

3. UN has shown concern for the effects of demographic changes, in particular about population ageing



Figure 1: Population pyramids of several countries in 2015.





Outline of our proposal

To introduce demographics in the HDI, by

minimum changes in the variables

No change in the aggregation formula Robust normalization Instead of LEB, LP

Consider the full population in education, with weights given by the demographics, EP

Substituting GNIpc by GNIpa

Health

HDI Selected Variable: *Life Expectancy at Birth*

LEB: Number of years a newborn in a society expects to live.

It does not consider the demography.



It is good if we do not want to take demographics into account

It favours developed countries, with an ageing population

Health. Our proposal

Instead of LEB, LP (Life potential)

 n_i^{χ} = number of individuals in country i with age x

 n_i = total population



$$LP = \frac{1}{n_i} \sum_x n_i^x e_x \qquad LEB = e_0$$

LEB and LP in Spain (evolution)

Esperanza de vida y de potencial de vida per cápita. España. 1900-2007





Health

LP and LEB behave very differently

Statistic	LP	LEB
Min	37.4	49.0
Median	47.5	73.4
Mean	46.9	71.4
Max.	54.9	85.3
Coeff. of Variat.	0.08	0.11

Descriptive statistics for LP and LEB.



Continent · Africa · Americas · Asia · Europe · Oceania

Figure 2: Correlation between LP and LEB.

Education

HDI: a mixed variable made out of two others:

Mean Years of Schooling, MYS

Expected Years of Schooling, EYS

MYS: Average number of years of education received by people aged 25+ EYS: expected years of schooling of a child of school entrance age

$$E_i = \frac{1}{2} \left(EYS_i / 15 + MYS_i / 18 \right)$$

Education: Our Proposal

Instead of previous composite variable, EP, Education Potential

Information about population over 25 is condensed in MYE_i .

By analogy with health we construct WEYS, by combining all education levels, school life expectancy at any education level, and enrolment rates.

1

$$EP_{i} = \frac{1}{n_{i}^{EAP_{i}+}} \left[n_{i}^{(EAP_{i},24)} WEYS_{i} + n_{i}^{25+} MYE_{i} \right]$$

Takes demographics into account

Education

E and **EP** are not that diferent

Statistic	EYS	MYS	EP
Min	4.1	1.4	1.8
Median	13.3	8.5	7.5
Mean	13.0	8.2	7.2
Max.	20.2	13.1	12.3
Coeff. of Variat.	0.21	0.37	0.37

Descriptive statistics for EYS, MYS, and EP.





Figure 3: Correlation between EI and EI_{UN} .

Material Well-being

HDI variable: $I_i = GNI_i^{pc}$

Best strategy: households adjusted by size. Under no information, using the adult population, is the second best. It permits taking into account in a very simple way the demographic differences and is justified because the command over the family resources is typically in the hands of the adults.

GNI_i^{pc} and GNI_i^{pa} are fairly similar

Statistic	GNIpa	GNIpc
Min	1095	581
Median	15920	10980
Mean	22840	16820
Max.	144200	123100
Coeff. of Variat.	0.98	1.06





Figure 4: Correlation between the GNI per adult and per capita.

Descriptive statistics for GNI per adult and per capita.

HDI and DAHDI

Comparative between both alternatives

Same aggregation formulae

Different normalization

Change in variables

$$\mathrm{DAHDI} = \begin{bmatrix} \mathrm{LP} & \mathbb{P} \\ \overline{56} & 13 \end{bmatrix}^{\frac{1}{3}} \cdot \frac{\mathrm{log}(\mathrm{GNIpa})}{\mathrm{log}(85000)} \end{bmatrix}^{\frac{1}{3}}$$

HDI	DAHDI
0.34	0.44
0.72	0.75
0.69	0.72
0.94	0.91
0.21	0.15
	HDI 0.34 0.72 0.69 0.94 0.21

Descriptive statistics HDI and DAHDI.

$$\text{HDI} = \left[\frac{\text{LEB} - 20}{85 - 20} \cdot \frac{1}{2} \left(\frac{\text{EYS}}{18} + \frac{\text{MYS}}{15}\right) \cdot \frac{\log(\text{GNIpc}) - \log(100)}{\log(75000) - \log(100)}\right]^{\frac{1}{3}}$$

Development Groups (HDI)

Development	Countries
Very high	Argentina, Australia, Austria, Bahrain, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Qatar, Republic of Korea, Saudi Arabia, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, United States of America.
High	Albania, Algeria, Antigua and Barbuda, Armenia, Azerbaijan, Bahamas, Barbados, Belarus, Belize, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Gabon, Georgia, Grenada, Guyana, Indonesia, Iran (Islamic Republic of), Iraq, Jamaica, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Libya, Malaysia, Maldives, Mauritius, Mexico, Micronesia (Federate States of), Mongolia, Montenegro, Oman, Panama, Paraguay, Peru, Philippines, Republic of Moldova, Romania, Russian Federation, Saint Lucia, Sait Vincent and the Grenadines, Samoa, Serbia, Seychelles, South Africa, Sri Lanka, Suriname, Tajikistan, Thailand, The former Yugosicav Republic of Macedonia, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Ukraine, Urosicav, Uzbekistan, Venezuela (Bolivarian Republic of), Viet Nam
Medium	Bangladesh, Bhutan, Cabo Verde, Congo, Equatorial Guinea, Ghana, Guatemala, Honduras, India, Lao Peoples Democratic Republic, Maldives, Morocco, Namibia, Nicaragua, Syrian Arab Republic, Timor- Leste, Vanatou, Zambia.
Low	Afghanistan, Angola, Benin, Burkina-Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Guinea, Haiti, Kenya, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Nigeria, Pakistan, Papua New Guinea, Rwanda, Sao Tome and Principe, Senegal, Sudan, Swaziland, Uganda, United Republic of Tanzania, Yemen, Zimbabwe.

Table 4: Distribution of countries in four groups according to the HDI

Cluster Analysis (DAHDI)

Development	Countries
Very high	Albania, Argentina, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Belarus, Belgium, Brunei Darussalam,
	Iceland, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Latvia, Lithuania, Luxembourg, Malaysia,
	Montenegro, Netherlands, New Zealand, Norway, Oman, Panama, Poland, Qatar, Republic of Korea,
	Romania, Russian Federation, Saudi Arabia, Slovakia, Slovenia, Spain, Sri Lanka, Sweden, Switzerland, Turkey,
	United Arab Emirates, United Kingdom, United States of America, Venezuela (Bolivarian Republic of)
High	Algeria, Antigua and Barbuda, Armenia, Barbados, Belize, Bolivia, Bosnia and Herzegovina, Botswana, Brazil,
	Bulgaria, China, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Gabon, Georgia,
	Grenada, Guyana, Indonesia, Iran (Islamic Republic of), Iraq, Jamaica, Kuwait, Kyrgyzstan, Lebanon, Libya,
	Mauritius, Mexico, Micronesia (Federate Sintes of), Mongolia, Paraguay, Peru, Philippines, Portugal,
	Republic of Moldova, Saint Lucia, Sait Vincent and the Grenadines, Samoa, Serbia, Seychelles, South Africa,
	Suriname, Tajikistan, Thailand, The former Yugoslav Republic of Macedonia, Tonga, Trinidad and Tobago,
	Tunisia, Turkmenistan, Ukraine, Uruguay, Uzbekistan, Viet Nam
Medium	Bangladesh, Cabo Verde, Cameroon, Congo, Equatorial Guinea, Ghana, Guatemala, Honduras, India, Kenya,
	Lao Peoples Democratic Republic, Maldives, Morocco, Namibia, Nicaragua, Sao Tome and Principe,
	Swaziland, Syrian Arab Republic, Timor-Leste, Vanuatu, Zambia, Zimbabwe.
Low	Afghanistan, Angola, Benin, Bhutan, Burkina-Faso, Burundi, Cambodia, Central African Republic, Chad,
	Comoros, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Guinea, Haiti, Madagascar, Malawi,
	Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Nigeria, Pakistan, Papua New Guinea, Rwanda,
	Senegal, Sudan, Uganda, United Republic of Tanzania, Yemen

Table 5: Distribution of countries in four groups according to the DAHDI

Final Remarks

- A development index following the capability approach should take into acount the population structure.
- This is because not only current achievements but future possibilities matter.
- Our proposal is very conservative: Minor changes in the current version of the HDI.
- Nevertheless, these minor changes greatly influence the results. Major impact of LP.
- Types of population pyramids: expansive, constrictive, near-stationary. Expansive do better in terms of LP, and constrictive do better in LEB.
- A way of opening the discussion of the importance of population structures in welfare/ development/ well being evaluation protocols.

Thanks for your attention