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**Composite Indicators –  
An Assessment of Development  
Really Multidimensional?**

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## **Composite Indicators – An Assessment of Development Really Multidimensional?**

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### **Abstract**

Development is a complex and multidimensional phenomenon. Therefore, the measurement of development should involve the quantification of its constituent dimensions. Composite indicators have been the favored approach to measuring development. Based on a sample of 54 composite indicators of development, we have analyzed whether these indicators reflect the multidimensionality underlying the phenomenon they seek to measure. We conclude that, in general, the indices of development include only a restricted number of development dimensions. We have also found that education and health are among the dimensions most frequently present in composite indicators of development.

**Key words:** Composite indicators; development; multidimensionality.

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## **Introduction**

Development is undoubtedly one of the most discussed concepts in economics. Since the end of the Second World War, the development of countries has been closely evaluated in terms of their level of economic growth. Economic growth was seen as a necessary and sufficient condition to development and, therefore, improvement in the well-being of the population relied on it. The more immediate implication of this narrow connection between the two concepts for the quantitative assessment of a country's level of development is the systematic use of indicators on the economic activity, in particular, the level of income per capita.

However, the turning point in the practices and approaches to development since the 1970s allows for the emergence of new and wider concepts of development. The new concepts are mainly laid out in an interdisciplinary and multidimensional perspective and they have led to the current concepts of sustainable development, human development, and local development.

Correspondingly, several attempts have emerged to amend, complement, or replace the income per capita as a summary measure of development and, in turn, the measurement approach to development has progressively changed from uni- to multidimensional. In this context, composite indicators of development aimed at a wider assessment of the phenomenon of development have gained greater importance, and many have appeared in recent years (Booyesen, 2002; Bandura, 2008; Saisana, 2008; Soares and Quintella, 2008).

The present paper has two goals: (i) to assess the comprehensiveness of a broad set of composite indicators of development based on the nomenclature of the main constituent dimensions of development; (ii) to determine which dimensions of development are more frequently used in the prevailing multidimensional indices of development.

The remainder of the paper is structured as follows. Section 2 proposes a nomenclature of the main constituent dimensions of development and selects a broad set of composite indicators of development. Section 3 evaluates their comprehensiveness using the proposed nomenclature and verifies if the quantification of development has followed the conceptual enlargement trend of development. Section 4 presents some final remarks.

## **2. The measurement of development**

### *2.1 Main dimensions of development*

Development is now consensually recognized as a phenomenon eminently multidimensional. As a result, the adequate measurement of the phenomenon requires a quantitative assessment of its main constituent elements. The understanding of the phenomenon may vary in time, among countries or even among individuals. However, a range of dimensions transcending the material standard of living of individuals usually underlies the concept of development and its meaning, such as freedom, equity, health, education, and a healthy environment, among others.

The disaggregation of development into its main dimensions has been followed by many authors. In a survey of composite indicators of development, Booyesen (2002) illustrates the multidimensionality of the indices, classifying them according to twelve different dimensions of development: (i) demographic dynamics; (ii) education, training, and knowledge; (iii) health, food, and nutrition; (iv) human settlement, infrastructure, and communication; (v) political and social stability; (vi) culture, social fabric, and family values; (vii) environmental resources and pressures; (viii) political and civil institutions; (ix) income and economic growth; (x) unemployment and labor utilization; (xi) poverty and inequality; (xii) economic freedom.

On the other hand, Boidin (2004) asserts that international indicators of well-being and development should integrate the different dimensions seen as consensual, namely, the economic dimension, the human dimension (in a broad sense), the environmental dimension, and the inequalities and poverty.

The development nomenclature proposed here in order to fulfill the two objectives stated above encompasses structural dimensions that most directly affect a country's aggregate level of development. That nomenclature includes the following crucial dimensions: (i) income; (ii) income distribution; (iii) education; (iv) health; (v) employment; (vi) infrastructure; (vii) values; (viii) environment. The choice of those dimensions is driven by criteria of intrinsic importance of each dimension and their recurrent inclusion in alternative attempts of development disaggregation. In Table 1, the dimensions mentioned above are disaggregated into their most important sub-dimensions.

**Table 1.** *Development nomenclature*

<b>Income</b>	<b>Income distribution</b>	<b>Education</b>	<b>Health</b>
	Poverty	Knowledge	Longevity
	Inequality	Educational infrastructures	Health infrastructures
		Others	Others
<b>Employment</b>	<b>Infrastructures</b>	<b>Values</b>	<b>Environment</b>
Volume	Energy	Economic freedom	Atmosphere
Quality	Transport	Socio-political freedom	Land
	Communication		Water
	Housing		Nature and biodiversity
	Money and finance		Others
	Justice		
	Culture, sport, and recreation		
	Others		

## 2.2 Composite indicators of development

Composite indicators are mathematical combinations (or aggregations) of a set of indicators. Even though there are many conceptual and methodological

arguments against the use of such indicators, there are also important elements in favor of composite indicators, among which are mainly the following: (i) composite indicators synthesize complex or multidimensional issues; (ii) they are easier to interpret than a battery of separate indicators; (iii) they facilitate the task of comparing the performance across countries and their progress over time and thereby attract public interest; (iv) they reduce the size of a list of indicators without losing basic information (Booyesen, 2002; Saisana and Tarantola, 2002).

Composite indicators constitute the most immediate approach in the quantification of a country's level of development. A number of index proposals are currently available in the development literature and connected domains.<sup>1</sup>

**Table 2. Composite indicators of development**

Author/Organization <sup>(*)</sup>	Composite Indicators of Development <sup>(**)</sup>	Surveys and other similar studies including lists of indices and indicators									
		Singh <i>et al.</i> (2009)	Afa <i>et al.</i> (2008)	Bandura (2008)	Eurostat (2008)	Saisana (2008)	Soares and Quintella (2008)	Godrey and Jany-Catrice (2007)	Goossens <i>et al.</i> (2007)	Morse (2004)	Booyesen (2002)
Bennett (1951)	Index of relative consumption levels						X				X
Beckerman and Bacon (1966)	Index of relative real consumption per head						X				X
McGranahan <i>et al.</i> (1972)	General index of development				X		X				X
Nordhaus and Tobin (1972)	Measure of Economic Welfare (MEW)	X	X					X	X	X	
Morris (1979)	Physical Quality of Life Index (PQLI)	X			X		X				X
Zolotas (1981)	Economic Aspects of Welfare (EAW)	X	X					X		X	
Ram (1982)	Indices of 'overall' development	X					X				X
Commission of the European Communities (1984)	Relative intensity of regional problems in the community	X					X				
Ginsburg <i>et al.</i> (1986)	World standard distance scales						X				X
Camp and Speidel (1987)	International human suffering index				X	X	X				X
Slotje (1991)	Aggregate indexes of quality of life						X				X
Diener (1995)	Quality of life indices		X		X		X	X			X
Estes (1998)	Weighted Index of Social Progress (WISP)	X		X		X	X	X			X
Goedkoop and Spiensma (2001)	Eco-indicator 99	X				X	X				
Prescott-Allen (2001)	Wellbeing Index (WI) e Wellbeing/Stress Index (WSI)	X		X	X	X					
Randolph (2001)	G-Index			X		X					
UNDP (2001)	Technology Achievement Index (TAI)	X		X		X		X			
Tarantola <i>et al.</i> (2002)	Internal Market Index World (IMI)	X		X		X					
Smith (2003)	Index of Economic Well-Being (IEWB)		X		X			X			
Tsvokals and Mackenzie (2003)	Personal Security Index (PSI)		X					X			
UN <i>et al.</i> (2003)	Green GDP ou Environmentally adjusted NDP (eaNDP)	X						X	X	X	
Hagén (2004)	Welfare index			X		X					
NISTEP (2004)	General Indicator of Science and Technology (GIST)	X				X					
Porter and Stern (2004)	National innovative capacity index	X		X		X					
The Economist (2004)	Quality-of-life index			X	X			X	X		
European Commission (2005)	Investment in the knowledge-based economy	X		X		X					
European Commission (2005)	Performance in the knowledge-based economy	X		X		X					
Marks <i>et al.</i> (2006)	Happy Planet Index (HPI)		X	X	X				X		
Sbilanciamoci (2006)	Regional Quality of Development Index (QUARS)			X		X			X		
World Bank (2006)	Adjusted net saving ou Genuine saving	X	X	X	X			X	X		
ATK/FP (2007)	A. T. Kearney/FOREIGN POLICY Globalization Index			X		X					
Gwartney and Lawson (2007)	Economic Freedom of the World (EFW) index			X		X	X				X
Miringoff and Opdycke (2007)	Index of social health		X		X		X				
Talberth <i>et al.</i> (2007)	Genuine Progress Indicator (GPI)	X	X		X	X	X	X	X	X	
UNDP (2007)	Human Development Index (HDI)	X	X	X	X	X	X	X	X	X	X
UNDP (2007)	Human Poverty Index (HPI-1) for developing countries			X	X	X	X	X	X	X	X
UNDP (2007)	Human Poverty Index (HPI-2) for selected OECD countries			X	X	X	X	X	X	X	X
Bertelsmann Stiftung (2008)	Bertelsmann Transformation Index (BTI)			X		X					
Dreher <i>et al.</i> (2008)	KOF index of globalization			X		X					
EU (2008)	E-readiness rankings			X		X					
Esty <i>et al.</i> (2008)	Environmental Performance Index (EPI)	X	X	X	X	X	X	X	X	X	
Holmes <i>et al.</i> (2008)	Index of economic freedom			X		X	X				X
IMD (2008)	World competitiveness scoreboard			X		X					
Porter and Schwab (2008)	Global Competitiveness Index (GCI)			X		X	X				X
Roodman (2008)	Commitment to Development Index (CDI)			X		X					
SiC (2008)	Mothers' index			X		X					
van de Kerk and Manuel (2008)	Sustainable Society Index (SSI)	X		X	X						
Dutta and Mia (2009)	Networked Readiness Index (NRI)			X		X					
EU (2009)	Business environment rankings			X		X					
UNU-MERIT (2009)	Summary Innovation Index (SII)	X		X		X					
Centre for Bhutanese Studies - website	Gross National Happiness (GNH) index				X				X		
Friends of the Earth - website	Index of Sustainable Economic Welfare (ISEW)	X	X		X	X		X	X	X	
Réseau d'Alerte sur les Inégalités (RAI) - website	Baromètre des Inégalités et de la Pauvreté (BIP40)		X					X			
Social Indicators Department [s.d.]	Index of individual living conditions				X	X					

<sup>(\*)</sup> In the case of revised indices, the last revision available was used. In the case of indices periodically published, the last version available (at table construction date) was used. For some indices, the only information available is on the website, namely, the following: (i) GNH index - <http://www.grossnationalhappiness.com/>; (ii) ISEW - <http://www.foe.co.uk/community/tools/isew/>; (iii) BIP40 - <http://www.bip40.org>.

<sup>(\*\*)</sup> The list encompasses indices that capture, at least, two dimensions of the development nomenclature (one of them might be the dimension "others") - and are, thus, multidimensional indices of development - and, in addition, are mentioned in, at least, two of the selected studies.

<sup>1</sup> Indices of development might be uni- or multidimensional in nature. The first type captures only a specific dimension of development (usually, sub-dimensions of it) as opposed to the second type of indices.



The following procedure was adopted in order to undertake the evaluation that motivates this paper: (i) identification of ten surveys or other recent studies including lists of composite indicators of development; (ii) establishment of a selection criterion for the indicators mentioned in those studies; (iii) analysis of the selected indicators and corresponding classification according to the development nomenclature proposed in Section 2.1.

Regarding the inclusion criterion mentioned in (ii), the development indices presented here not only include at least two of the different dimensions proposed in the development nomenclature, but are also mentioned in at least two of the selected studies.

The end result is a selection of 54 multidimensional indices associated with the concept of development and other closely related concepts that can, thus, be interpreted as measures of development. Table 2 presents, in chronological order, these composite indicators of development.

**Table 3. Multidimensionality of composite indicators of development**

Author/Organization	Composite Indicators of Development	Number of Dimensions	Dimensions of Development								
			Income	Income Distribution	Education	Health	Employment	Infrastructure	Values	Environment	Others <sup>(*)</sup>
Bennett (1951)	Index of relative consumption levels	4			X	X		X			X
Beckerman and Bacon (1956)	Index of relative real consumption per head	3				X		X			X
McGranahan <i>et al.</i> (1972)	General index of development	5			X	X	X	X			X
Nordhaus and Tobin (1972)	Measure of Economic Welfare (MEW)	5			X	X	X	X			X
Morris (1979)	Physical Quality of Life Index (PQLI)	2			X	X					
Zelotas (1981)	Economic Aspects of Welfare (EAW)	6			X	X	X	X		X	X
Rain (1982)	Indices of overall development	3	X		X	X					
Commission of the European Communities (1984)	Relative intensity of regional problems in the community	2	X		X	X					
Ginsburg <i>et al.</i> (1986)	World standard distance scales	3	X			X		X			
Camp and Speidel (1987)	International human suffering index	5	X		X	X			X		X
Slootje (1991)	Aggregate indexes of quality of life	5	X		X	X		X	X		
Diener (1995)	Quality of life indices	6	X	X	X	X		X	X	X	
Estes (1998)	Weighted Index of Social Progress (WISP)	5	X		X	X		X	X		X
Goodkoop and Spriensma (2001)	Eco-indicator 99	2				X				X	
Prescott-Allen (2001)	Wellbeing Index (WI) e Wellbeing/Stress Index (WSI)	9	X	X	X	X	X	X	X	X	X
Randolph (2001)	G-Index	2						X			X
UNDP (2001)	Technology Achievement Index (TAI)	2			X			X			
Tarantola <i>et al.</i> (2002)	Internal Market Index World (IMI)	3						X	X		X
Smith (2003)	Index of Economic Well-Being (IEWB)	7	X	X	X	X	X	X	X	X	X
Tsoukalas and Mackenzie (2003)	Personal Security Index (PSI)	5	X	X		X	X				
UN <i>et al.</i> (2003)	Green GDP or Environmentally adjusted NDP (eaNDP)	2	X							X	
Hagén (2004)	Welfare index	3	X			X				X	
NISTEP (2004)	General Indicator of Science and Technology (GIST)	2			X						X
Porter and Stern (2004)	National innovative capacity index	2			X				X		
The Economist (2004)	Quality-of-life index	5	X			X	X		X		X
European Commission (2005)	Investment in the knowledge-based economy	2			X			X			
European Commission (2005)	Performance in the knowledge-based economy	3	X		X			X			
Marks <i>et al.</i> (2006)	Happy Planet Index (HPI)	2				X				X	
Sblanciamaci (2006)	Regional Quality of Development Index (QUARS)	8		X	X	X	X	X	X	X	X
World Bank (2006)	Adjusted net saving on Genuine saving	3			X					X	
ATK-FP (2007)	A.T. Kearney/FOREIGN POLICY Globalization Index	2						X			X
Gwartney and Lawson (2007)	Economic Freedom of the World (EFW) index	2							X		X
Miringhoff and Opdycke (2007)	Index of social health	6	X	X	X	X	X		X		X
Talberth <i>et al.</i> (2007)	Genuine Progress Indicator (GPI)	7	X	X	X	X	X	X	X	X	X
UNDP (2007)	Human Development Index (HDI)	3	X		X	X					
UNDP (2007)	Human Poverty Index (HPI-1) for developing countries	2			X						
UNDP (2007)	Human Poverty Index (HPI-2) for selected OECD countries	4			X	X	X				
Bertelsmann Stiftung (2008)	Bertelsmann Transformation Index (BTI)	9	X	X	X	X	X	X	X	X	X
Dreher <i>et al.</i> (2008)	KOF index of globalization	3						X	X		X
EU (2008)	E-readiness rankings	6	X		X		X	X	X		X
Esty <i>et al.</i> (2008)	Environmental Performance Index (EPI)	2				X				X	
Holmes <i>et al.</i> (2008)	Index of economic freedom	2							X		X
IMD (2008)	World competitiveness scoreboard	9	X	X	X	X	X	X	X	X	X
Porter and Schwab (2008)	Global Competitiveness Index (GCI)	6	X		X			X	X	X	X
Roodman (2008)	Commitment to Development Index (CDI)	3							X	X	X
SiC (2008)	Mothers' index	3			X	X				X	X
van de Kerk and Manuel (2008)	Sustainable Society Index (SSI)	7		X	X	X	X		X	X	X
Datta and Mia (2009)	Networked Readiness Index (NRI)	4			X			X	X		X
EU (2009)	Business environment rankings	7	X		X	X	X	X	X		X
UNU-MERIT (2009)	Summary Innovation Index (SII)	4			X		X	X			X
Centre for Bhutanese Studies - website	Gross National Happiness (GNH) index	9	X	X	X	X	X	X	X	X	X
Friends of the Earth - website	Index of Sustainable Economic Welfare (ISEW)	7	X	X	X	X	X	X	X	X	X
Réseau d'Action sur les Inégalités (RAI) - website	Baromètre des Inégalités et de la Pauvreté (BIP40)	7	X	X	X	X	X	X	X	X	X
Social Indicators Department (n.a.)	Index of individual living conditions	7	X		X	X	X	X	X	X	X
	Total (number of indices per dimension)		24	14	37	35	22	27	26	19	33

<sup>(\*)</sup> "Others" is a residual dimension, including aspects of development not reflected in the previous dimensions such as gender equality, cultural diversity, macroeconomic context, and political and social stability.

### 3. The multidimensionality of the development indices

Taking into consideration the 54 composite indicators of development identified in Table 1, the final task in the present analysis consists of classifying them according to the development nomenclature. Table 3 shows the result of this process, presenting the dimensions of development included in

each indicator and, thus, allowing the evaluation of the multidimensional nature of the indices.

A closer inspection of Table 3 reveals some important insight into the multidimensionality of composite indicators of development. First, many multidimensional indices of development are not as wide in terms of dimension coverage and, therefore, they provide a partial vision of the phenomenon. Indeed, almost half of the indices presented in Table 3 (26 out of 54) include only two (15 indices) or three (11 indices) of the different dimensions of development identified here. Only four indices (Wellbeing Index and Wellbeing/Stress Index, Bertelsmann Transformation Index, World Competitiveness Scoreboard, and Gross National Happiness Index) encompass the nine dimensions, while another (Regional Quality of Development Index) includes eight of them.

Second, apart from the residual dimension “others”, education (present in 37 out of 54) and health (included in 35 indices) are among the dimensions more frequently considered in the available indicators. This finding highlights the social dimension of development, and both aspects of development, in addition to income, are reflected in the most popular indicator for measuring development in a composite nature – the Human Development Index (HDI).

Third, the income dimension, surprisingly, is represented in only 24 indices. One possible reason is that a number of composite indicators of development appear as a reaction to the reductive perspective, centered on the use of income per capita. However, insufficiency rather than irrelevance is the main criticism inherent in the assessment of development through income per capita. The finding of a large number of indicators excluding that dimension comes as a surprise.

Fourth, the infrequent inclusion of the dimension related to income distribution should also be pointed out (14 indices), given the undeniable importance of phenomena like unequal income distribution and poverty for the analysis of a country's development.

Fifth, the same applies to the environment dimension (present in 19 indices). This finding is surprising, because the importance of environment has been emphasized in the process of development, namely in the context of sustainable development. On the other hand, it may be due to the large number of one-dimensional indicators centered on this specific dimension of development, such as the ecological footprint (Wackernagel and Rees, 1996; Ewing *et al.*, 2009) and the living planet index (Hails *et al.*, 2008).

Sixth and last, even though many of the composite indicators of development presented here fall short of the desirable outcome in terms of multidimensionality, a few incorporate that characteristic. They thus constitute complementary measures to the indicators most frequently used in the assessment of development – the income per capita and the HDI.

#### 4. Final Remarks

Development is a complex and multidimensional phenomenon that has no clear and unequivocal definition. Given this, the most widely used indicator for the assessment of development – the GDP per capita – is clearly insufficient. A wide range of composite indicators of development have been advanced as a response to this inadequacy.

In this study, we have focused on multidimensional indices of development. Based on a sample of 54 composite indicators of development, we have evaluated their dimension coverage. One of the major findings from this analysis is the limited number of development dimensions incorporated in the majority of the indices and, thus, the partial vision of the phenomenon they provide as a result. Moreover, the dimensions most commonly considered in this context are education and health.

In light of these findings, there seems to be room for additional contributions on the subject. Given its comprehensiveness in terms of dimension coverage, these new contributions would provide the necessary complement to development assessments centered exclusively on summary measures like the income per capita or the more widely used composite indicator, the HDI. The relevance of an adequate quantification of the development phenomenon and its constituent items should be further explored in the development literature framework in order to accomplish this imperative goal.

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