From Gender Inequality to Women's Quality-of-Life Index

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Abstract

Using Sen's capability approach and an aggregation method based on the totally fuzzy analysis, this article attempts to move beyond the main criticisms of the Gender-related Development Index (GDI) and the Gender Empowerment Measure (GEM) developed by the UNDP for analysis of gender inequality. In so doing, the first index the study proposes is a composite Gender Gini index (GG), which directly measures gender inequality. It addresses the conceptual issues related to the inequality concept imbedded in the UNDP's gender indices. The second one – the Women's disadvantage-related gender index (WDG) – is independent of human development since it is based on female-male ratios. Moreover, in contrast to the symmetric treatment of gender gaps favouring females and males in the GDI, WDG involves only gaps hurting females. The third one – the relative women disadvantage index (RWD) – addresses the criticism related to the inclusion of an income component in the UNDP indices. RWD is additively decomposable into three domains (health, education, participation), and excludes all monetary indicators. These three indices add new information about gender inequalities. They are complemented by the Women Quality of Life index (WQL). This fourth index involves indicators capturing the well-being of women and children. However, it is strongly correlated to gender inequality indices.

Keywords - Africa, Multidimensional Indices, Gender Inequalities, Quality of life, Totally Fuzzy Analysis, Sen's Capability Approach

1. Introduction

The combination of different dimensions of gender inequality into a single index to measure the performance of countries is no mean task. It is

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tied to the question of the choice of relevant indicators and their weighting within a reliable and comparable calculation formula. The GDI (Gender-related Development Index) and GEM (Gender Empowerment Measure), defined by UNDP to measure gender inequalities, did not address the challenge. The aggregation method for the different indicators and the use of international databases are problem areas that have led to errors in interpretation and limited the use of these indices.

This article attempts to give an overview of the different indices that have already been defined and the criticisms they have faced. We will then highlight the difficulties associated with the construction of gender-related indices. This leads us to define several original indices for analysing gender inequality. The first one is a composite Gender Gini index (GG). It directly measures gender inequality. The second is the Women's disadvantage-related gender index (WDG) and the third one is the relative women disadvantage index (RWD). These three measurements of gender inequality are complemented by the Women's Quality-of-life Index (WQL), which presupposes a negative relationship between gender inequality and women's well-being. The WQL comprises two components in order to take into account the specific role of women – that of motherhood. Thus, women's well-being is determined not only by their own quality of life, but also by the well-being of their children to take the altruistic dimension into account. The concern here is to capture a particularity of women, and that is their role in reproduction.

Sections 2 and 3 of this paper relate to UNDP's indices and to alternative measures of gender inequality respectively. Section 4 presents the indicators selected and justifies the concepts and methodology used for the design of these four original indexes.

2. UNDP's gender- related indices

The construction of GDI and GEM has served to highlight gender inequalities in international policy debates. While the first index evaluates progress in basic human development corrected for inequalities between men and women, the second measures inequalities between men and women in terms of economic and political opportunities. However, there have been several criticisms of the two indices.

2.1. Construction of GDI and GEM

GDI and GEM were introduced in the 1995 edition of the UNDP *World Human Development Report* (UNDP 1995).

GDI was designed by Sen and Anand (1995) to correct the HDI (Human Development Index) by considering the inequalities between men

and women. It is a composite index and has the same variables as HDI[1], but "penalises" the average obtained by the degree of gender inequality for the variable considered. The greater the gender disparities, the lower the GDI and the nearer it is to zero[2]. UNDP has used the assumption that e, the inequality aversion coefficient, is equal to 2, which makes GDI a harmonic mean and attributes more weight to low values. The arithmetic mean (e = 0) would be biased towards high values and would not take account of inequality. Nonetheless, GDI is not a measure of gender inequality because it does take account of the absolute level of achievement of each country in the three dimensions considered. Moreover, GDI takes into account the inequality between men and women, irrespective of which gender is disadvantaged.

GEM is a composite index that measures the level of human development in the light of the disparities that exist between men and women in the political and economic domains, using three criteria: (1) Women/men's participation and decision-making power in political life measured by their share of parliamentary seats; (2) Men and women's participation and decision-making in the economic life as measured by two indicators: The share of men and women in positions as legislators, senior officials, and managers; and the share of men and women holding professional and technical jobs; and (3) Their power over economic resources (measured by using their respective estimated earned income).

2.2. Criticisms of the UNDP Indices

Objections to the GDI and GEM indices can be grouped into three categories. The first concerns the choice of indicators and their weighting. The second has to do with the concept of "inequality" that they convey and the attached interpretation errors. The third category emphasises the limited use of these indices.

2.2.1. *The Choice of Indicators and Weighting System*

Broadly speaking, the same criticisms of HDI apply to GDI as regards the choice of indicators and the weighting method. The concept of "human development" to which the indices refer is much wider than the three variables covered in HDI or GDI[3]. The integration of the earned income is the most frequent criticism. The UNDP indices are therefore highly correlated with GDP per capita, and income is a highly simplistic indicator of human development. Klasen (2006) also affirms that the person who "produces" the

1. These are life expectancy, education and access to knowledge (as measured for 2/3 by the adult literacy rate and for 1/3 by the combined primary, secondary, and tertiary enrolment ratio), and standard of living measured by the logarithm of estimated earned income in dollars at purchasing power parity.
2. For a detailed description of the construction of the two UNDP indices, see Bérenger and Verdier-Chouchane (2008).
3. For a review of criticisms of HDI, see Bérenger and Verdier-Chouchane (2007).

income is not necessarily the beneficiary. In other words, the income-gap between men and women does not necessarily denote a gap in development between the two. Similarly, the unpaid work that women do helps to improve their level of development. For Dijkstra (2000), absolute level of income per capita weighs too heavily on the GDI. Thus, it is very difficult for "poor" countries to do better than "rich" states on gender equality, even if they were to re-adjust income more equitably. That is the consequence of mixing absolute levels of human development and gender inequality within the same index.

The components of GDI or GEM are not necessarily adequate indicators for measuring gender disparity in developing countries. However, in the case of Spain, Peinado and Cespedes (2004) demonstrate that the GDI indicators do not permit any better analysis in industrialised countries. Schüler (2006) believes that income can be reasonably taken into account in calculations of GDI and GEM only in industrialised nations. In countries such as Mali, where agriculture provides a livelihood for the vast majority of the workforce and accounts for almost half of GDP, agricultural income should be integrated in calculations of indices. In the same vein, Chant (2006) regrets that only paid work and the formal sector are considered. This bias tends to "privilege" the elite among women at the expense of those who work in food crop farming or in the informal sector.

For Dijkstra and Hanmer (1997), life expectancy as an indicator is too insensitive to the status of women. Child mortality by gender would have further reflected the "value" that society attaches to baby girls or boys. Klasen (2006) also states that life expectancy is problematic for the calculation of GDI. First of all, under similar conditions, women live three to seven years longer than men, but their longevity is lower in countries where population mortality is high. The question arises whether this feminine advantage should be treated as "normal" or if this masculine disadvantage amounts to gender inequality. Then, where life expectancy is the same for men and women, it is paradoxical to consider that there is no gender inequality. Equality can be obtained only where men enjoy preferential treatment or women are discriminated against. Moreover, since women have an advantage in terms of life expectancy, contrary to the other two indicators (education and income), the GDI actually aggregates three indicators that can offset one another. Gaps can be to the advantage of men as much as women.

Some authors, like Saith and Harriss-White (1999), proposed more relevant indicators for developing countries, especially for health and education. Similarly, for Morrison and Jütting (2005), GDI and GEM do not give enough consideration to institutional constraints (economic and social) that women face, and which can be captured by various indicators, such as the percentage of genital mutilations, percentage of women married before the age of 20, the existence of authorised polygamy, parental authority over women, freedom of movement, inheritance rights, access to property, etc. With regard to GEM, Cueva Beteta (2006) emphasises decision-making

power and control in the private sphere, especially women's control over their bodies and their sexuality. Therefore, for the author, the number of women holding parliamentary seats is not relevant because only better-off women who have had access to education and have political and economic influence are represented. She suggests including women's presence in local government, for example.

Moreover, weighting indicators consists of attributing the same value for the penalty coefficient. Bardhan and Klasen (1999) have shown that this weighting led to attributing a high weight to the income component comparatively to the other indicators, and for some countries, to underestimate gender inequality in health and education. They suggest giving different values to the penalty index (life expectancy $\epsilon = 6$, education $\epsilon = 3$, and income $\epsilon = 2$). Klasen (2006) demonstrates that GDI gives on average, 66 percent of total penalty to income, 22.4 percent to education, and 11.6 percent to life expectancy. Interestingly, Klasen (2006, p 251) notes that the penalty for life expectancy is very high, especially in Southern Africa, where there is a high incidence of HIV and AIDS[4].

2.2.2. *The Concept of Inequality and Misinterpretations*

These criticisms target more conceptual aspects and the shortcomings of GDI as an indicator of gender equality. For Djisktra and Hanmer (2000), the GDI takes account of both absolute levels of well-being (human development) and gender inequality. Analysing its construction more closely, the countries which have a low level of human development also have a low GDI. This means that it does not give enough consideration to inequality. Furthermore, these indices do not offer any new information about development, since they remain strongly correlated with GDP per capita. Klasen (2004), and Bardham and Klasen (1999) regret that the two indices fail to establish a link between gender and poverty. GDI is actually a measure of human development weighted with inequality and not a measure of inequality.

The harmonic mean applies a penalty to gender inequality irrespective of the gender that is disadvantaged. Dijkstra (2000) stresses that a country where women do better than men can score lower than one in which men and women do equally well. Similarly, female advantage in one dimension cannot compensate for women's disadvantage in another dimension.

For its part, GEM is interpreted as a measure of uneven representation between the two sexes in the political and economic domains. However, the calculation takes consideration of the income level and not the share in total income (Schüler 2006). In other words, neither GDI nor GEM corresponds to a real measure of gender inequality.

4. Against a mean of 11.6 percent at the international level, penalty imposed on life expectancy is 84.8 percent in Kenya, 69.8 percent in Botswana and 69.4 percent in Zimbabwe.

2.2.3. Limited Use and Reach of the Indices

Cueva Beteta (2006) is of the view that the dearth of data in developing countries limits analysis of the two indices to Western countries. This criticism applies particularly to GEM, which is impossible to calculate in 60 percent of middle-income countries and in 90 percent of low-income countries because of the choice of indicators. Many other authors (Klasen 2006; Chant 2006; Cueva Beteta 2006) consider the indices to be biased because they tend to exclude the poorest. Schüler (2006) finds that both GDI and GEM are minimally exploited in economic literature. When they are used, it is usually in relation to rankings rather than as the subject of study, particularly because of the misinterpretations they cause.

3. Alternative indices and difficulties in their construction

The list of criticisms of GDI and GEM is not exhaustive. With regard to the deficiencies of GDI as a measure of inequality, some authors have been keen to influence a reduction or elimination of the absolute level of human development. For example, White (1997) suggested the ratio GEQ = GDI / HDI, and Forsythe *et al.* (1998) used GI defined by GI = (HDI – GDI) / HDI. The "development" element is cancelled out but the original objective of GDI – that of being a gender-sensitive human development index – is completely lost. Other authors have sought to construct new indices by selecting new indicators and/or a new method of aggregation.

3.1. Gender-Sensitive Indices

In addition to the two UNDP indices and the two combinations of indices presented here, we have identified six other indices of gender inequality, which do not use the same indicators or the same methodology. The first four were developed by individual authors, while the last two, namely the African Gender Development Index and the Global Gender Index, were established recently by two institutions – the United Nations Economic Commission for Africa (UNECA) in 2004 and the World Economic Forum in 2005 respectively. They reflect the importance these institutions attach to measures of gender inequality, especially for assessing progress towards the MDGs.

Table 1 presents gender-specific indices that are different from those of the UNDP. The list is not exhaustive. The aim is not to present each index[5] in detail, but to note the developments since the first index (proposed in 1988) and the one developed by the World Economic Forum in 2005.

5. For a more detailed presentation on each of the indices, see Bérenger and Verdier-Chouchane (2008).

Table 1. ***Alternative gender-related indices***

Authors	Name of Index	Number of Indicators	Aggregation Method	Number of Countries	Remarks
Population Crisis Committee (1988)	PCC (Population Crisis Committee)	5 dimensions of 4 indicators = 20 indicators	Attribution of a maximum score of 20 for each for a total over 100	99	Combines different types of indicators (rates, ratios and gaps)
Mohiuddin (1996)	AC (Alternative Composite Index)	8 dimensions of 2 indicators = 16 indicators	Attribution of a score over 100 for each indicator then division of the total by 16	112	Combines gender ratios gender gaps
Dijkstra and Hanmer (2000)	RSW (Relative Status of Women)	3 indicators (those of GDI)	Arithmetic mean	136	Male-female ratio only
Dijkstra (2000)	SIGE (Standardised Index of Gender Equality)	5 indicators	Arithmetic mean of z-scores	115	Male-female ratio only
Economic Commission for Africa (2004)	AGDI (African Gender and Development Index) - GSI (Gender Status Index) - AWPS (African Women's Progress Scoreboard)	3 dimensions – 42 indicators 4 dimensions – 31 indicators	Redistribution of weight by sub-group to give each of the 42 indicators the same weight Scoring system (0, 1 and 2) converted to percentage	12	Male-female ratio only Qualitative measure
World Economic Forum (2005)	Global Gender Gap	4 dimensions – 17 indicators	Arithmetic mean of indicators whose limit is fixed at 1.	115	Male-female ratio only

To start with, while the first indices have combined different types of indicators (levels, ratios, and gender-gaps) since 2000, they have used only female performance to male performance ratios. Thereafter, aggregation methods have also evolved from a simple arithmetic mean of indicators without weighting, to more developed methods.

For example, Dijkstra (2000) uses z-scores for the calculation of SIGE (Standardised Index of Gender Equality). Whereas GDI or GEM uses extreme values (minimum and maximum) to transform each of these variables, the transformation established by SIGE is less perturbed by isolated aberrant values. Most sub-Saharan countries rank between 50 and 100 out of 115 countries, whereas North African countries are ranked between 103 and 112. Countries in Southern Africa top the list: Botswana (33), Swaziland (37), Lesotho (38), and Rwanda (44), which has the highest score in Africa for representation of women in the labour market.

In 2004, UNECA launched the AGDI (*African Gender and Development Index*). The choice and justification of indicators were particularly well thought-out, and AGDI was developed specifically for Africa.[6] However, since the data are obtained nationally from ministries, the civil society, or through surveys conducted for the purpose, AGDI is only available for 12 countries. Lastly, the Global Gender Gap Index of the World Economic Forum showed gender gaps for 115 countries in 2006, among which 28 were in Africa[7]. The scales are fixed between 0 and 1 for each indicator. In other words, whereas the ratio could be higher than 1 when more girls than boys attended school, the 2006 index fixes a high bracket of 1. North African countries show weak performance levels. Tunisia has the highest ranking (90) and has the best political power sub-index in the Arab world, ahead of France and the US. In sub-Saharan Africa, situations vary widely and range between South Africa (18) and Tanzania (23) on the one hand, and Benin (110) and Chad (113) on the other hand.

3.2. Problems Related to the Construction of Gender-related Indices

Whatever the gender-related index, there are problems concerning whether or not to take the level of development into account in building a relative or an absolute women's well-being index. Several questions arise when it comes to measuring gender gaps. The first concerns the use of a ratio or a difference. This question is tied to another problem, which is whether or not to take rope in the level of development to construct a gender index. A priori, it appears necessary to take account of it, not in the sense of the GDI, but relatively, as Djisktra and Hanmer (2000) have done. From this perspec-

6. The report is available on: www.uneca.org/ca_programmes/acgd/publications/AGDI_book_final.pdf
7. For further details, go to: http://www.weforum.org/en/initiatives/gcp/Gender%20Gap/index.htm

tive, obtaining a measure of gender inequality can be captured either by the use of ratios or by absolute differences related to the average value of the indicator.

The second question is about combining two types of indicators, either concerning women exclusively or by taking into consideration the relative status of women in comparison to that of men. In other words, should the construction of a composite index of well-being be sensitive only to gender gaps or be a status of women index? The difficulty at this level is the absence of an exhaustive list of gender-based indicators that could be used to assess the relative status of women. To include women's advantage or disadvantage in a particular dimension comparatively to men, the indicators must be available for both genders. Yet, availability of data makes it impossible to take gender gaps into account. On the other hand, there are domains, such as health, for which indicators apply only to women. An example is maternal mortality. By factoring these indicators into the construction of an index, we are comparing the absolute status of women across countries. If we include them alongside indicators of gender gap, the index obtained is likely to be influenced by poverty and tied to country income. In particular, there is a strong likelihood of a significant correlation between poverty and the status of women. Thus, factoring in specific indicators on women alongside indicators for which we have gendered data is less a measure of gender inequality than a measure of women's status or their well-being. It is therefore a comparison of the performance of countries in terms of human development captured from the feminine perspective. These difficulties suggest that the two aspects should be separated into a measure of gender inequality on the one hand, and a measure of the absolute level of well-being on the other.

These two problems of construction lead us to propose three original indices.

4. Towards a better analysis of gender inequality

The non-availability of data came up as a major challenge as we designed new measures of gender inequality. The problem seriously limits the reach of the results, since the objective is to obtain indices that can be used to make international comparisons, such as between countries, and also between other geographical areas.

Thus, our three indices are based on the same indicators as those used in UNDP's indices. The first index – the composite Gender Gini index (GG) – takes the methodology of the Gini index as a starting point, and uses the differences in performances between men and women. The second is the Women's disadvantage-related gender index (WDG), which includes female-male ratios and for which we made calculations including and excluding monetary indicator, i.e, income. The last index is the Women's Quality of

Life index (WQL). It does not establish comparisons with men, but takes account of indicators that concern only women or children. It is also the index that complements the information provided by the Relative Women Disadvantage index.

4.1. Composite Gender Gini Index (GG)

With respect to the criticisms addressed against the GDI as a measure of inequality, we put forward a measure that does not depend on *a priori* concerning the value of aversion to inequality from the "society". In fact, the GDI does not lead to a measure of inequality *per se*, but only to an adjustment of the HDI consisting in penalising by gender disparities, the performances reached by the various countries.

Among the indices of inequality most usually used, the Gini index is regarded as neutral in comparison with the preceding index. Traditionally used to measure inequalities in the distribution of income, this index knows various formulations that can be adapted in order to measure gender inequalities using gender-related indicators for each country. In addition, its formulation suggests taking into account the differences, and not the ratios.

We suppose $i \in [1, N]$ countries and $j \in [1, M]$ gender indicators. We consider $X_{jM} = \{ x_j / j = 1 \ldots M\}$ and $X_{jF} = \{x_{jF} / j = 1 \ldots M'\}$ vectors of indicators respectively for males and females. Variables x_j^{iM} and $x_{j'}^{iF}$ denote the values taken by the indicator j for men and women in the country i. In a general way, by considering the distribution of an indicator j, like the income, within a population of size N, the Gini index is defined as follows:

$$G_j = \left(\frac{1}{2\mu_j N^2} \right) \sum_i \sum_l \left| x_j^i - x_j^l \right| \tag{5}$$

μ is the overall average of the indicator j and N the total number of individuals in the population.

In the simplest case, by admitting that $N^i=2$ in country i and that the proportion of males and females is identical ($n^i_F = n^i_M$) in the population, then the Gini index is the ratio of the gender gap to the overall average of the indicator:

$$G_j^i = \left(\frac{1}{4\mu_j^i} \right) \left| x_j^{iM} - x_j^{iF} \right| = \left(\frac{1}{2} \right) \frac{\left| x_j^{iM} - x_j^{iF} \right|}{\left(x_j^{iM} + x_j^{iF} \right)} \tag{6}$$

When the shares of men and women differ in the population, the preceding formula requires to be adjusted. From this point of view, we use the

matrix formulation of the Gini index (cf. Silber, 1989), which gives the following formula:

$$G_j^i = \frac{\left| \left(n_M^i / N^i \right) n_M^i x_j^{iM} - \left(n_F^i / N^i \right) n_F^i x_j^{iF} \right|}{\left(n_M^i x_j^{iM} + n_F^i x_j^{iF} \right)} \tag{7}$$

While the traditional Gini index admits a value of 1 in the case of a total inequality, the upper limit for our index is (n^i_M / N^i) or (n^i_F / N^i). Thus, on the assumption that $n^i_F = n^i_M$, maximum inequality would be reached for a value of 0.5. Although the measure considers the differences in sizes of population, the preceding approximation can be used to adjust the Gender Gini index in order to obtain a value of 1 for perfect inequality by multiplying it by 2.

For each indicator *j*, we obtain a vector $G_j = \{G_j^i / i = 1 \ldots N\}$.

In order to obtain a composite Gini index of gender inequalities on the various dimensions considered, it is necessary to choose a weighting method. Following Desai and Shah (1988), who suggested a system of weights used in multidimensional poverty studies, we suppose that the weight ω_j attributed to an indicator *j* is inversely proportional to the average level of inequality reached for this indicator:

$$\omega_j = \frac{\ln\left(\frac{1}{\overline{G}_j}\right)}{\sum_{j=1}^{M} \ln\left(\frac{1}{\overline{G}_j}\right)} \quad \text{avec} \quad \overline{G}_j = \frac{1}{N} \sum_{i=1}^{N} G_j^i \tag{8}$$

In other words, the higher the inequality reached in a given country the more significant it will be as the level of inequality is low for the overall countries considered.

From this assumption, it follows that the composite Gender Gini index (GG) for country *i* is:

$$G^i = \sum_{j=1}^{M} \omega_j G_j^i \tag{9}$$

The application of the proposed methodology using the same indicators that compose the GDI makes it possible to obtain the results presented in Table 2.

Table 2. ***Statistical indicators of the Gender Gini index and its dimensions***

	Mean	Standard Deviation	Minimum	Maximum
Gini Life expectancy	0.0677	0.0753	0.0002	0.64929
Gini Literacy	0.11075	0.11827	0.00097	0.61627
Gini School Enrolment	0.10991	0.13035	0.00105	0.82512
Gini Income	0.10083	0.09557	0.00223	0.77811
Gini Total	**0.093951**	**0.085**	**0.01232**	**0.7152**

Source: Authors' calculations based on UNDP data (UNDP, 2002)
NB: The weights ω_j *are* the following: 0.28430 for life expectancy, 0.24111 for school enrolment, 0.23234 for literacy, and 0.24224 for income.

Generally, gender inequalities are very weak for the various indicators. Their averages are very far from the value of 1. Relative comparisons show that it is in education (school enrolment and literacy) that the inequalities are the highest.

By gathering the two indicators relating to education, the results by geographical area are presented in Table 3. The list of countries is in Annex 1.

Table 3. ***The GG index by geographical area***

	Life expectancy	Education	Income	Total
Africa (48 countries)	0.061677	0.18252	0.108407	0.130262
Middle-East (10)	0.177336	0.245438	0.307524	0.241087
Latin America (26)	0.0457	0.041	0.1175	0.060848
Asia (21)	0.059747	0.114307	0.11744	0.099489
Other countries (48)	**0.071221**	**0.038581**	**0.039844**	**0.04849**

Source: Authors' calculations based on UNDP data (UNDP, 2002)

Although the values obtained are relatively low, the Middle Eastern countries cumulate the strongest inequalities in all dimensions considered, followed by African countries. Appendix 2 presents the top 10 and the bottom 10 countries from the ranking. In the case of Africa, four countries (Cote d'Ivoire, Zambia, Malawi, and Niger) appear among the 10 most unequal countries by considering the Gender Gini index.

As a pure measure of inequality, the Gender Gini index (GG) presents a weaker correlation with the GDP per capita and the HDI, in comparison with GDI (*see Appendix 3*). Whereas the GDI has a correlation coefficient of 0.93 with the log of GDP per capita and of 0.99 with the HDI, the GG index is most strongly correlated with the GDI, but with a low coefficient (-0.55). If we exclude the 43 African countries and calculate the correlations matrix, the results are even weaker. In particular, the correlation coefficient between GG index and GDI is then equal to -0.42. In other words, the GG is different from the GDI in terms of the information it provides, and has no biases in

relation to the level of development of the countries (measured by the HDI and the GDP per capita). Thus, strong inequalities between men and women would not be necessarily related to the level of development of the countries.

However, like the HDI, the Gender Gini index is based on a symmetrical treatment of gaps favouring females and males, and accumulates gender gaps in opposite directions. On the other hand, the RSW index of Dijkstra and Hanmer (2000) takes into account the ratios of the achievements in the same components of the GDI. It thus makes it possible to identify in each dimension, if the gender gap is to the detriment of women or men, and to allow for compensation in opposite directions. In the same line, we devise a gender related index based on female-male ratios.

4.2. Indices of Women's Disadvantages

Women continue to be the primary victims of inequality in the different areas of life (Sen 1992). Thus, like the gender-gap index (GGI) of the World Economic Forum, taking into account cumulative gender disparities that disadvantage women will give an indication of the extent of inequality that they face. In keeping with the previous literature, we shall consider the female-male ratios of the different indicators.

We define $R_j = \{r_j = x_j^F / x_j^M / j = 1 \ldots M\}$ vector of male-female performance ratio for each indicator. The variable $r_j^i = x_j^{iF} / x_j^{iM}$, which represents the value of indicator j for country i, is defined as follows:

$$r_j^i = \frac{x_j^{iF}}{x_j^{iM}} \quad avec \quad r_j^i = 1 \, si \, x_j^{iF} \geq x_j^{iM} \tag{10}$$

To take account of inequality towards women, the ratios are truncated to 1 when inequality affects men (the ratio would, in this case, be higher than 1). Value 1 also corresponds to perfect equality. Thus, as in the case of GGI, the performance of countries that have attained or exceeded the level of equality is identical to those that have achieved equality when gender disparity that disadvantages women is highest. The indices obtained take a theoretical value between 0 (a high disparity that disadvantages women) and 1 (a low disparity that disadvantages women).

To obtain an aggregate measure, the procedure used draws on Desai and Shah (1988), applied by Cheli and Lemmi (1995) in the fuzzy set approach to Multidimensional Poverty Analysis. Thus, for the construction of an index for which 1 represents the absence of gender disparity that disadvantages women, the weighting method used is the following:

$$w_j = \frac{\ln\left(1 + \bar{r}_j\right)}{\sum_{j=1}^{M} \ln\left(1 + \bar{r}_j\right)} \quad avec \quad \bar{r}_j = \frac{1}{N} \sum_{i=1}^{N} r_j^i \tag{11}$$

4.2.1. *The Women's Disadvantage-related Gender Index (WDG)*

As for the Gender Gini Index and despite the criticisms addressed against the components of the GDI, the methodology exposed previously is applied using the same components of the GDI. What we want is to be able to measure inequality independently of the level of human development because it is based on ratios. Also, we want to capture inequalities against women, which cannot be done with the GDI. The statistical indicators of the WDG are presented in Table 4.

Table 4. ***Statistical indicators of WDG***

	Mean	Standard Deviation	Minimum	Maximum
WDG	0.8937477	0.0895686	0.5853326	0.9847564

Source: Authors' calculations based on UNDP data (UNDP, 2002)
NB: The weights ω_j *are* the following: 0.26229 for life expectancy, 0.2574 for school enrolment, 0.24511 for literacy and 0.23486 for income.

We note that the interval of variation of the index is weak. Its values range between 0.585 and 0.985, and they are very close to each other for the countries best classified, compared with the countries less better classified (*see appendix 4 for the top 10 and the bottom 10 rankings*). Overall, the results indicate that the inequalities against women are weak. At the same time, no country reaches equality in various dimensions. The women's disadvantage-related gender index (WDG) shows that the African countries registered bad performances. Among the bottom 10 ranks, seven are countries in sub-Saharan Africa. The other three are Nepal, Pakistan, and Yemen.

As for the preceding index, we obtain a measure independent of the level of development by analysing its correlations with the GDP per capita and the HDI (*see Appendix 5*). Respectively, the coefficients of correlation are 0.56 and 0.85. The index is less strongly correlated with the GDP per capita as with the HDI, than the latter is with the GDI (respectively of 0.769 and 0.994). However, its correlation with the HDI is relatively strong. Such a result could be explained by the inclusion of "the income component". Indeed, the income variable of the UNDP's indices was the subject of many criticisms (*see Bérenger and Verdier-Chouchane 2007*). It leads us to conceive a non-monetary index of gender inequality. This new index is based on a broader design of gender inequalities.

4.2.2. *The Relative Women Disadvantage Index (RWD)*

Criticisms of HDI and GDI's reductionist nature in the choice of components, in particular income, lead us to design an index that can be decom-

posed into dimensions, these being health, education, and participation. Monetary components are excluded from the index for several reasons. First, in Sen's capability approach (1992), gender inequality cannot be reduced to income inequality because it manifests itself in the various functionings or capabilities that define the life of an individual. Income is merely an indicator of means. On the other hand, although income disparity can be used as an approximation of gender gaps in terms of nutrition and consumption, its treatment introduces a bias into the composite index through the rough estimation used to compensate for lack of data in some countries, and the failure to recognise within-household income distribution.

With reference to the work carried out by Sen (1992, 1999), and in particular the distinction between the concepts of well-being and agency, the UNDP proposed two indices: The GDI and GEM. However, since the objective is to measure inequality in the different functionings, there is no reason why indicators of capability, such as those related to health and education, cannot be combined with indicators of opportunity and participation, such as those that measure participation in the economic and political spheres.

The RWD index includes non-monetary indicators, which we classify into three dimensions. They are health, education, and economic and political participation. The health dimension includes gender disparity in terms of life expectancy and sex ratio. The life expectancy ratio for women in relation to men takes into account inequalities in the capability to lead a long, healthy life. The fact that there is a disparity reflects inequality in terms of nutritional status and health. However, this indicator can mask differences in mortality rate at certain specific ages. Moreover, as Djisktra (2000) points out, this indicator is calculated by using life tables, which can differ depending on data availability and on the demographic characteristics peculiar to each country. It follows that in low-income countries, life expectancy translates differences in child mortality rate without necessarily including the aspects relating to the risk of disease and illness, which, on the other hand, are factored in for high-income countries. The life expectancy index is thus complemented by the sex ratio, which, in particular, helps to capture the problem of the "missing" women in North Africa and Asia presented by Sen (1992). The female to male ratio summarises gender inequality over the long term. While women tend to live longer than men, the masculinisation of this ratio in some countries shows the differences in the way that girls and women are treated as a result of policies of gender selection, infanticide, discrimination, etc. Just like GDI, gender gaps that disadvantage women in education can be captured through the combined gross enrolment rate and literacy rates. Finally, the percentage of parliamentary seats and level of economic activity represent opportunities to integrate and participate respectively in the political and economic spheres.

Table 5. ***Statistical indicators of the RWD Index and its Dimensions***

	Mean	Standard Deviation	Minimum	Maximum
Health	0.96813	0.04342	0.74664	1
Education	0.89548	0.13904	0.43908	1
Participation	0.550165	0.144	0.19374	0.87531
GEM	**0.85512**	**0.07218**	**0.62213**	**0.97429**

Source: Authors' calculations based on UNDP data (UNDP 2002)
NB: The weights ω_j are the following: 0.4099 for health, 0.3769 for education, and 0.2031 for participation.

From the results obtained, the participation dimension records the greatest inequality that disadvantages women, followed by education and then health. With the exception of participation, the other measures record maximum values equal to 1. In other words, in some countries, women are not disadvantaged.

The results by geographical area are presented in Table 6.

Table 6. ***RWD by geographical area***

	Health	Education	Participation	Total
Africa (49 countries)	0.93067	0.774742	0.563045	0.798694
Middle East (11)	0.917041	0.858321	0.307225	0.770453
Latin America (27)	0.993704	0.975843	0.46522	0.879444
Asia (20)	0.961194	0.878677	0.571234	0.850053
Other countries (49)	0.998414	0.987131	0.630028	0.919216

Source: Authors' calculations based on UNDP data (UNDP 2002)

These figures reflect the unequal treatment between girls and boys in the different components depending on geographical area. The breakdown affirms the above categorisation by dimension, i.e, inequality is greatest in economic and political participation for all geographical areas considered. Globally, countries in the Middle East present the greatest inequalities that disadvantage women, mainly in participation and health. The health subindex is not a measure of discrimination against girls, but rather inequality in access to health care.

Africa has an index that is near that for the Middle Eastern countries, but its inequality is greatest in education. In economic and political participation, inequality is less pronounced in Africa than in Latin America. It is nevertheless comparable to that in Asia.

Appendix 6 shows the correlation coefficients between RWD and its three components. The index correlates most strongly with the education dimension (0.872), followed by the health dimension (0.606), and significantly less so with participation (0.495). On the contrary, the correlation coefficients between the three dimensions are very weak and insignificant, especially with participation. Appendix 7 shows that the RWD has a weak

correlation with GDP per capita, and also with HDI and GDI. This result may be explained by the non-inclusion of income gaps.

This study on inequality between men and women leads us to wonder about the relationship between inequality and the level of well-being, and to construct an index on women's quality of life, such as the Mothers' Index proposed by *Save the Children*.

4.3. Women's Quality-of-life-Index

The women's quality-of-life index (WQL) is based on one that *Save the Children,* a non-governmental organisation, proposed by combining indicators relating to women and children. It is however set within a precise conceptual framework, and uses a more rigorous method of aggregation.

4.3.1. *Save the Children's Mothers' Index*

Save The Children's Mothers' Index compiles a maximum of 12 indicators[8] of well-being for women and children. They are compared for 140 countries. The 2007 report indicates that nine out of the 10 lowest-ranked countries are in sub-Saharan Africa. In descending order, they are Niger, Sierra Leone, Chad, Guinea Bissau, Angola, Eritrea, Ethiopia, Burkina Faso, and Djibouti.

Like the SIGE index established by Dijkstra (2000), *Save the Children's* mothers' index uses z-scores. The indicators of ill-being (as opposed to well-being) are multiplied by -1. Table 7 below shows the weight attributed to the different indicators and sub-indices.

Table 7. ***List of indicators and weights attributed to the index on women, children, and mothers, for least developed countries***

WOMEN'S INDEX	**30 %**	**Health status of women** Risk of maternal mortality – 25 % Female life expectancy at birth – 25 % Births attended by skilled health personnel – 25 % Percentage of women using modern contraception – 25 %	**20 %**	**MOTHERS INDEX**
	30 %	**Education status of women** Expected number of years of formal schooling for females	**20 %**	
	30 %	**Economic status of women** Ratio of estimated female to male earned income	**20 %**	
	10 %	**Political status of women** Participation of women in national government	**10 %**	
CHILDREN'S INDEX	**100 %**	**Status of children** Under-5 mortality rate – 20 % Under-5 children who are underweight (moderately or severely) – 20 % Gross primary enrolment ratio – 20 % Ratio of girls to boys in primary school – 20 % Percentage of population with access to safe water – 20 %	**30 %**	

Source: Authors' calculations based on Save the Children (2007)

8. The number of indicators differs according to the country's level of development (*see Save the Children 2007, p.46*).

Thus, attribution of weight is totally arbitrary and unjustified. Also, the Mothers' Index is not tied to any conceptual framework, contrary to the women's quality-of-life index (WQL) that we are proposing.

4.3.2. *The Conceptual Framework of the WQL index*

Two trends can be identified in the literature on the construction of gender inequality indices. The first concerns attempts to obtain a measure of inequality per se. The second visits the construction of indices of well-being corrected for gender inequality or, at least, sensitive to inequality combining both absolute level of well-being and gender gap as in the GDI. These two approaches are similar in that they require gendered indicators. Although the dimensions in which disparities are most glaring can be identified through these measures, they make it impossible to evaluate aspects that are specific to women, especially as regards their role as mothers.

Indices of well-being that are gender-sensitive are thus implicitly based on the assumption of neutrality as regards being a man or a woman, thereby excluding the possibility of including indicators that capture some specificities of women, which might be due to biological differences but could also be the result of informed or consensual choices between men and women. Recognising the role of women in development policies and strategies would suggest that due account needs to be taken of these specificities and measures of inequality complemented by an index of well-being that reflects the quality of life of women.

If efforts are now being made to improve women's status through targeted programmes rather than as by-products of general development policy, then developing this type of index is justified. The WQL index makes allowance for assessing capabilities and opportunities offered to women. Its interest lies in being able to look at human development in feminine terms by explicitly giving visibility to women. Comparing such an index that captures quality-of-life for women in indices of inequality helps to identify the relationship between inequality or disadvantages to women, and women's vulnerability.

Women's well-being cannot be captured without including an intergenerational dimension tied to their role as procreators and care-givers of their children. This requires that their well-being be examined beyond individual perceptions to include their role as mothers, for example. They not only care about their own well-being but, as agents, they also seek and find fulfilment through other objectives[9]. This altruistic dimension is explicitly recognised in the literature (Sen 1990; Folbre 1994 and 2001; Himmelweit 2000; and Klasen 1998) and also by development institutions. The World Bank, for example (World Bank 2001) underscores the positive externalities of an improvement in women's status on the well-being of other members of the

9. This quality of agent is not necessarily conducive to individual well-being because it might entail self sacrifice.

community. This aspect raises a number of questions, particularly about the inclusion of agency indicators as a component of well-being[10]. Thus, for Gasper (2004), the notion of well-being defined by Sen is reduced to personal achievements and freedoms and ignores achievements recorded as agents pursuing the interests of others. However, the concept of quality-of-life covers the different notions introduced by Sen (1992), implying both personal interest (Gasper calls it 'objective' well-being) and the interest in or empathy towards others ('subjective' well-being).

The feminisation of the concept of human development is consistent with an enduring and sustainable design of human development. From this point of view, children's well-being can be included as a component of women's well-being alongside the components of their own well-being. Adopting the capabilities approach, the WQL index is defined using human results indicators, i.e, a combination of functioning and capabilities that includes the values of achievement and freedom, or of denial of freedom, from which women and children suffer.

4.3.3. *The Choice of Indicators*

The WQL index combines 10indicators of women's well-being on the one hand, and children's well-being on the other (cf. Table 8).

Table 8. ***List of WQL indicators***

Status of Women:
1. Maternal mortality rate
2. Life expectancy
3. Combined gross enrolment in primary, secondary, and higher education
4. Literacy rate
5. Rate of economic activity
6. Percentage of parliamentary seats
7. Index relating to abortion policy
Status of Children:
1. Primary gross enrolment rate
2. Child labour
3. Underweight children (or under-height)

Thus, the basic capabilities that determine the status of women consist of indicators for health, such as their ability to live a long and healthy life (life expectancy) and their ability to bear children in clean, healthy conditions (maternal mortality rate). Education indicators (enrolment and literacy rates) refer to their capability to access knowledge and education. The WQL also takes into account the availability of opportunities for women to be active in the economic sphere (female activity rate) and political sphere (percentage of

10. This aspect, in addition, poses problems of interpretation when developing gender inequality indices (*see Klasen, 2004 for further details*).

parliamentary seats occupied by women), as well as their capacity to exercise their right of procreation (abortion policy index[11]).

The status of children combines the percentage of underweight children to capture the prevalence of malnutrition. Malnutrition in children is often a reflection of poor income, given that the bulk of income earnings is usually used for securing food. The gross primary enrolment rate is an indicator of access to knowledge. This rate does not take account of absenteeism, and is complemented by child labour, which denotes deprivation of the freedom to acquire the basic capabilities required to integrate the economic and social spheres.

While the classification of the components of the WQL index is based on a distinction according to type of individual concerned (woman or child), grouping them by relevant socio-economic sphere can also be justified, given the nature of indicators. The health, education, and opportunities dimensions, which include both women and children, can also be identified.

4.3.4. Results of the WQL Index

The measurement of WQL is based on the fuzzy sets approach developed by Cerioli and Zani (1990) in the multidimensional measurement of poverty. Since the objective is to establish the level of performance in terms of functioning and capabilities, the indicators are standardized so that value 0 corresponds to a lack of capabilities. The weighting formula is based on the same principle as the Cerioli and Zani (1990) approach, but it has been adapted, as was done for the RWD (*see equation 11*).

The construction of this index is based on the *Totally Fuzzy Analysis*[12] adapted to define an index of well-being described as an increasing function of the value of the index obtained. A low value will denote some amount of deprivation. The issue here is not to compare the status of women to that of men, but to assess the level of performance of each country comparatively with the others in terms of the status of women.

Table 9. *Statistical indicators of the WQL index and its dimensions*

	Mean	Standard Deviation	Minimum	Maximum	Critical value
WQL	**0.6371295**	**0.1993427**	**0.1625696**	**0.9516896**	**0.588925**
Women	0.5747045	0.2064637	0.1572667	0.9466522	0.542805
Children	0.7506261	0.2104635	0.1529022	0.9766685	0.592755

Source: Authors' calculations based on UNDP data (UNDP 2002).
NB: The weights ω_j are the following: 0.645191 for the sub-index 'Women' and 0.35481 for the sub-index 'Child'.

11. This index can be found on the website of the United Nations (United Nations World Abortion Policies 1999): http//www.un.org/esa/population/publications/abt/babtpeu.htm. We calculate the scores obtained by country for the seven different situations. The score therefore varies between 0 and 7.
12. For a detailed review of the fuzzy sets analysis, see Bérenger and Verdier-Chouchane (2007).

From the sub-indices of WQL, we can see, on average, a lower performance regarding the status of women than for the status of children. Table 10 shows the categorisation of the index into its two components and by geographical area. From the standpoint of the WQL as well as the two sub-indices (women and children), the performance of Africa is the weakest compared to the other zones.

Table 10. ***Decomposition of WQL by geographical area***

	WQL	Women	Children
Africa(49 countries)	0.512002	0.3624495	0.544366
Middle-East (11)	0.611937	0.510249	0.801116
Latin America (27)	0.703352	0.603348	0.855485
Asia (20)	0.611969	0.562916	0.701152
Other countries (49)	0.832500	0.790457	0.908929

Source: Authors' calculations based on UNDP data (UNDP, 2002)

Another way to highlight this result is to calculate critical values that can be used to determine the percentage of countries in each geographical area, that present real deprivation from the point of view of the WQL, the status of women, and of children.

The critical value $\mu_j crit$ associated with each indicator j is defined as follows:

$$F(\mu_j crit) = 1 - \overline{\mu}_j$$

F is a function of cumulated distribution and $\overline{\mu}_j$ is the average value of indicator j.

Looking at the critical value results, we observe that Africa is the area with the highest percentage of countries showing a deficit from the point of view of the WQL index (87.8 percent of countries). The only exceptions in this zone are Algeria, Libya, Cape Verde, Mauritius, South Africa, and Tunisia.

Table 11. ***Percentage of deprived countries by geographical area***

	WQL	Women	Children
Africa	0.8775	0.8775	0.63265
Middle-East	0.2727	0.5454	0.09090
Latin America	0.1111	0.3333	0.037
Asia	0.4000	0.45	0.3000
Other countries	0	0	0

Source: Authors' calculations based on UNDP data (UNDP 2002)

The disaggregation of the WQL index into the women and children sub-indices shows that women's status is the component with the highest deficit across all geographical areas. Africa is the only area that cumulates deficits from the point of view of both women's status (87.8 percent) and the status of children (63.3 percent). In this zone, however, only Cape Verde, Ghana, Namibia, Mauritius, Tunisia, and South Africa show no deficit from the standpoint of women's status.

Some countries also either show or do not show deficiencies from the point of view of WQL, but in one of its components. Thus, the absence of deficiency in WQL in Algeria corresponds to a deficit observed in the status of women, but which is compensated for by the performance for children's status (i.e, the value of the child index is far higher than critical value). Conversely, the deficit in Ghana with regard to WQL is related to the absence of deficit under the status of women, whose value, close to the critical value, does not compensate for the deprivation under the status of children. Other countries like Botswana and Cameroon present a deficiency in terms of WQL as well as from the point of view of women's well-being, but not for children's well-being.

Correlations with other indices show some interesting results. For example, while the RWD index captures gender inequalities, the WQL reflects the relative performance of the countries in terms of human development viewed from a feminine angle. However, there is a strong correlation between RWD, the WQL, and status of women. Even though correlation does not imply causality, it suggests that inequality affects status and, by extension, the well-being of mothers and women. In the same way, correlations between the WQL and economic development indices (GDP per capita), and HDI and GDI are very high – equal to 0.844, 0.926 and 0.944 respectively. This is not surprising, considering that the WQL is a human development index seen from a feminine standpoint.

Although the WQL index is made of two sub-indices, due to the additive decomposability of the index, we can further consider breaking it down according to health, education, and the opportunities offered to the women and to the children in order to favour their participation and integration in the society.

The dimensions considered gather indicators relating to women and children. Thus, health includes the percentage of underweight children, the maternal mortality rate, and the life expectancy of the women. In the same way, the literacy rate of women, the combined enrolment in education as well as the rate of schooling in the primary education represents the components of education. Lastly, the opportunities dimension relates to the indicators of the percentage of seats held by women in parliament, the female activity rate, the child labour and the index relating to abortion policy.

Table 12. ***WQL by its socio-economic dimensions and by geographical area***

	Health		Education		Opportunities	
	Mean	%	Mean	%	Mean	%
Africa	0.371938	0.8571	0.431577	0.7755	0.471245	0.7959
Middle-East	0.776389	0.09090	0.596207	0.4545	0.481557	1
Latin America	0.78346	0.037	0.75873	0.1111	0.557113	0.5185
Asia	0.569159	0.45	0.669142	0.35	0.600483	0.40
Other countries	0.903872	0	0.835818	0.0204	0.772367	0.0408

Source: Authors' calculations based on UNDP data (UNDP 2002)

Africa again accumulates the weakest performances in all dimensions. In particular, this zone is characterised by the low level of health for women and children, whereas for the other zones, except for Asia, the lowest level reached relates to the opportunities dimension. It follows that according to the critical value, more than 85 percent of the African countries would present a deprivation in health dimension. The exceptions would be Algeria, Cape Verde, Libya, Mauritius, Morocco, and Tunisia. On the other hand, the Middle Eastern countries all present a deficiency in dimension opportunities.

Correlations obtained between the WQL and its components across Africa indicate that there is a very strong link with the education domain (*see Appendix 8*). This result has already been underscored in Bérenger and Verdier-Chouchane (2007) in the analysis of well-being. Education is a key variable in the context of African countries. It determines standard of living and quality-of-life of women.

6. Conclusion

In attempts to obtain a measurement of gender inequality, our objective has been to develop a composite index of gender inequality that would have the advantage of being free of the same criticisms as the UNDP indices. The interest of the gender Gini index is that it does not depend on normative choice relating to the degree of aversion for the inequality of the society in contrast to the GDI, and is a pure measure of inequality. This first index enables us to affirm that the gender inequalities are not necessarily related to the level of development of a country. In addition, in order to capture the inequalities to the detriment of women, a second index, WDG, based on the same components of the GDI, has been designed. It has the advantage of being less strongly correlated with the GDP per capita than the UNDP's indices. However, in response to criticisms addressed against the income variable, a new index RWD was built.

The RWD captures inequality based on non-monetary indicators and in different spheres. Thus, recognising the multiple facets of gender inequality, it attempts to operationalise Sen's capability approach without adhering

strictly to it, since it mixes capabilities and participation indicators. Its disaggregation in the different dimensions makes it possible to stress certain reforms that are needed in the different sectors (health, education, participation).

However, these measures of inequality or of gender gaps that disadvantage women are not sufficient in the sense that they give rise to bigger questions about the well-being of women and mothers. Is there a negative relationship between gender inequality and women's quality of life? Using Sen's approach and the totally fuzzy analysis, we conceptualise a women's quality of life index, which considers indicators for women and children only. The WQL is very strongly tied to measures of gender inequality. Without implying causation, this first result would seem to indicate that if there was a reduction in gender inequality, there would be an improvement in women's well-being. Moreover, the different indices show that in terms of both equality and of well-being, Africa and the Middle East are the two geographical areas with the highest deficits.

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Appendix 1. ***List of countries***

Africa	**Latin America**	**Europe, North America and Oceania**	**Middle-East**
Algeria	Argentina	Albania	Bahrain
Angola	Bahamas	Armenia	Iraq
Benin	Barbados	Australia	Iran
Botswana	Belize	Austria	Israel
Burkina Faso	Bolivia	Azerbaijan	Jordan
Burundi	Brazil	Belgium	Kuwait
Cameroon	Chile	Belarus	Lebanon
Cape Verde	Colombia	Bulgaria	Saudi Arabia
Central African, Rep.	Costa Rica	Canada	Syrian Arab Rep.
Chad	Cuba	Cyprus	United Arab Emirates
Comoros	Dominican, Rep.	Croatia	Yemen
Congo, Rep.	Ecuador	Denmark	
Congo, Rep. Dem.	El Salvador	Estonia	**Asia**
Cote d'Ivoire	Guatemala	Finland	
Egypt	Guyana	France	Bangladesh
Equatorial Guinea	Haiti	Georgia	Cambodia
Eritrea	Honduras	Germany	China
Ethiopia	Jamaica	Greece	Fiji
Gabon	Mexico	Hungary	India
Gambia, The	Nicaragua	Ireland	Indonesia
Ghana	Panama	Island	Japan
Guinea	Paraguay	Italy	Korea, Rep.
Guinea-Bissau	Peru	Kazakhstan	Lao PDR
Kenya	Suriname	Kyrgyz, Rep.	Malaysia
Lesotho	Trinidad & Tobago	Latvia	Maldives
Liberia	Uruguay	Lithuania	Mongolia
Libya	Venezuela	Luxembourg	Nepal
Madagascar		Macedonia	Pakistan
Malawi		Malta	Papua New Guinea
Mali		Moldova	Philippines
Mauritius		Netherlands	Singapore
Mauritania		New Zealand	Sri Lanka
Morocco		Norway	Thailand
Mozambique		Poland	Vietnam
Namibia		Portugal	
Niger		Romania	
Nigeria		Russian, Fed.	
Uganda		Slovak, Rep.	
Rwanda		Slovenia	
Senegal		Spain	
Sierra Leone		Sweden	
South Africa		Switzerland	
Sudan		Tajikistan	
Swaziland		Turkmenistan	
Tanzania		Turkey	
Togo		Ukraine	
Tunisia		United-Kingdom	
Zambia		United-States	
Zimbabwe		Uzbekistan	

Appendix 2. ***Best and worst performers according to the Gender Gini Index***

	10 best performers	**10 worst performers**
Life Expectancy	1. Lithuania 2. Zambia 3. Estonia 4. Ukraine 5. Belarus 6. Russian, Fed. 7. Latvia 8. Bahrain 9. Kuwait 10. United Arab Emirates	146. Benin 147. Cyprus 148. Burkina Faso 149. Vietnam 150. Venezuela, RB 151. Honduras 152. Ecuador 153. Nicaragua 154. South Africa 155. Guatemala
Education	1. Tajikistan 2. Australia 3. Mexico 4. Uzbekistan 5. Thailand 6. Trinidad and Tobago 7. Ireland 8. Vietnam 9. Cyprus 10. Azerbaijan	146. Mozambique 147. Zambia 148. Guinea 149. Pakistan 150. Bahrain 151. Malawi 152. Nepal 153. Kuwait 154. Niger 155. United Arab Emirates
Income	1. Croatia 2. Poland 3. Kazakhstan 4. Cambodia 5. Bulgaria 6. Armenia 7. New Zealand 8. Burkina Faso 9. France 10. Slovenia	146. Sierra Leone 147. Libya 148. Cote d'Ivoire 149. Jordan 150. Pakistan 151. Yemen 152. Saudi Arabia 153. Bahrain 154. Kuwait 155. United Arab Emirates
Total	1. Australia 2. Denmark 3. Sweden 4. Norway 5. Vietnam 6. Canada 7. Cyprus 8. Thailand 9. Uzbekistan 10. Island	146. Saudi Arabia 147. Cote d'Ivoire 148. Zambia 149. Malawi 150. Nepal 151. Pakistan 152. Niger 153. Bahrain 154. Kuwait 155. United Arab Emirates

Source: Authors' calculations based on UNDP data (UNDP 2002).

Appendix 3. ***Pearson correlations between various indices of development and the Gender Gini index[13]***

	Gender Gini index	GDP per capita	Log per capita GDP	HDI	GDI
Gender Gini index	1				
GDP per capita	-0.40775 < 0.0001	1			
Log per capita GDP	-0.45092 < 0.0001	0.88325 < 0.0001	1		
HDI	-0.54943 < 0.0001	0.77272 < 0.0001	0.93692 < 0.0001	1	
GDI	-0.55154 < 0.0001	0.76881 < 0.0001	0.93042 < 0.0001	0.99398 < 0.0001	1

Source: Authors' calculations, N = 140

Appendix 4. ***Best and worst performers according to the WDG***

10 best performers		10 worst performers	
Denmark	0.984756	Nepal	0.712893
Finland	0.984488	Burkina Faso	0.707735
Australia	0.984219	Mali	0.705059
Sweden	0.983262	Cote d'Ivoire	0.704636
New Zealand	0.982857	Guinea	0.696028
Norway	0.982286	Guinea-Bissau	0.682024
Latvia	0.981298	Pakistan	0.654433
United-States	0.980643	Niger	0.651374
Canada	0.980406	Sierra Leone	0.645008
Bahamas, The	0.98011	Yemen, Rep.	0.585333

Appendix 5. ***Pearson correlations between various indices of development and the WDG***

	WDG	GDP per capita	Log GDP per capita	HDI	GDI
WDG	1				
GDP per capita	0.56261 < 0.0001	1			
Log GDP per capita	0.73901 < 0.0001	0.88325 < 0.0001	1		
HDI	0.85174 < 0.0001	0.77272 < 0.0001	0.93692 < 0.0001	1	
GDI	0.85382 < 0.0001	0.76881 < 0.0001	0.93042 < 0.0001	0.99398 < 0.0001	1

Source: Authors' calculations, N = 140

13. These results are confirmed by the rank correlations for all the 140 countries for which the various indices are available.

Appendix 6. ***Pearson's correlation coefficients between RWD and its components***

	RWD	Health	Education	Participation
RWD	1			
Health	0.60650 < 0.0001	1		
Education	0.87191 < 0.0001	0.39910 < 0.0001	1	
Participation	0.49496 < 0.0001	0.15403 0.0549	0.06945 0.3890	1

Source: Authors' calculations, N = 156

Appendix 7. ***Pearson correlations between various indices of development and gender inequality***

	WGDI	GDP per capita	Log GDP per capita	HDI	GDI	Gender Gini index	RWD
WDG	1						
GDP per capita	0.56261 < 0.0001	1					
Log GDP per capita	0.73901 < 0.0001	0.88325 < 0.0001	1				
HDI	0.85174 < 0.0001	0.77272 < 0.0001	0.93692 < 0.0001	1			
GDI	0.85382 < 0.0001	0.76881 < 0.0001	0.93042 < 0.0001	0.99398 < 0.0001	1		
Gender Gini	-0.63863 < 0.001	-0.40775 < 0.001	-0.45092 < 0.001	-0.54943 < 0.001	-0.55154 < 0.001	1	
RWD	0.93692 < 0.001	0.51261 < 0.001	0.60797 < 0.001	0.72326 < 0.001	0.73219 < 0.001	-0.71001 < 0.001	1

Source: Authors' calculations, N = 140

Appendix 8. ***Correlations between WQL and its components for the African zone***

	Health	Education	Opportunities
WQL	0.84054	0.87814	0.67081

Source: Authors' calculations, N = 49