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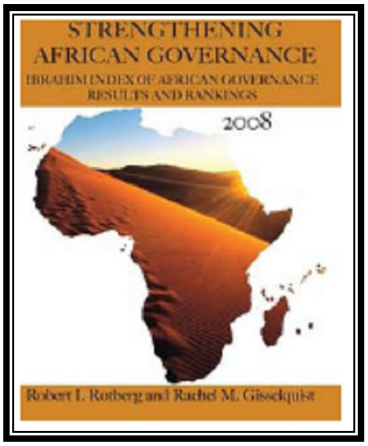

A robust model to measure governance in African countries

Michaela Saisana, Paola Annoni and Michela Nardo

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Executive Summary

Levels of performance in government do matter in determining the quality of civil society. As the UNDP (United Nations Development Program) Administrator Kemal Derviş recently stated, "*Institutions, rules and political processes play a major role in determining whether economies grow, whether children go to school, and whether development goes forward…..*"

National governance assessments are generally carried out in order to investigate and strengthen the relationship between governance and the type of any intervention and assistance given. In African countries, the need to evaluate the quality of governance is even more pronounced. For example, the African Governance Forum (www.undp.org/africa/agf/) is a governance programme of the UNDP in Africa which has been held regularly since 1997. It provides a platform for African leaders and other major players to come together for policy dialogue, mutual learning and exchange of experience on how to meet governance challenges on the continent.

The Ibrahim Index of African Governance developed by the Harvard Kennedy School (Rotberg and Gisselquist, 2008) shows how governance can be measured. The Index assesses governance issues over time (2000, 2002, 2005, 2006) for 48 African countries south of the Sahara, according to a five-pillar conceptual structure:

(a) *Safety and Security,*
(b) *Rule of Law, Transparency, and Corruption,*
(c) *Participation and Human Rights,*
(d) *Sustainable Economic Opportunity,* and
(e) Human Development.

Together these five categories of political goods are considered to encapsulate the performance of any government. The five major pillars are described by fourteen sub-pillars composed in total of fifty-seven indicators (in a mixture of qualitative and quantitative measures). The main approach for the setting-up of the final Index of

African Governance is quite straightforward: a simple average at all levels of aggregation (sub-pillar, pillar, overall Index).

This report aims to validate and critically assess the methodological approach to the 2006 Index of African Governance, by addressing two key questions:

1. *Is the Index of African Governance internally sound and consistent, from a statistical and conceptual point of view?*

2. *What scenarios could have been used to build the Index and how do the results of these scenarios compare to the original results?*

Regarding the first objective, the analysis of statistical quality and robustness of the Index is carried out at two different levels. At the first level, each of the five pillars is analysed by applying statistical techniques – adequate to both qualitative and quantitative data – to the original indicators included in the Index. The aim is to assess from a purely statistical perspective the internal validity and consistency of each pillar. At the second level, validity and consistency are assessed by applying statistical techniques at the sub-pillar and pillar level.

In line with the second objective, an *ex post* analysis is performed to evaluate the robustness of the 2006 Index ranking against alternative scenarios in which different sources of uncertainty are activated simultaneously. In these more sophisticated scenarios we deviate from the classic approach of building the Index through a simple weighted summation of indicators normalised using a Min-Max scaling. These scenarios differ from one another in the inclusion/exclusion of a sub-pillar, the weighting scheme and the aggregation rule. Such a multi-modelling approach and the presentation of the results under uncertainty, rather than as single country ranks, helps to avert the criticism frequently raised against composite measures and rankings, namely that they are generally presented as if they had been calculated under conditions of certainty, while this is in fact rarely the case.

The overall assessment of the 2006 Index by means of multivariate analysis and uncertainty and sensitivity analyses reveals no particular shortcomings in the conceptual structure. In brief, the analyses demonstrate that the 2006 Index of African Governance:

- is internally consistent, from a conceptual and statistical point of view,
- is not double-counting indicators due to correlation among them,

- has a well-balanced structure (not dominated by a single sub-pillar or pillar),
- is not strongly affected by compensability (at the sub-pillar level), and
- is a summary measure of a plurality of alternative methodological scenarios (including *inter alia* multi-criteria analysis and cross-efficiency data envelopment analysis).

These conclusions support the conceptual framework and methodological approach of the 2006 Index, which additionally has a simple form (arithmetic average of scaled indicators) that is easy to communicate to the wider public.

Data-driven narratives on governance issues in Africa are also offered in this report in order to draw attention to messages and debates that may stem from an index-based analysis of governance.

Overall, the Index of African Governance can reliably be used to identify weaknesses and possible remedial actions, to make easy spatial and temporal comparisons (benchmarking), to prioritize African countries with relatively low levels of governance, and ultimately to monitor and evaluate policy effectiveness.

Table of Contents

List of Tables

List of Figures

List of Boxes

1. Introduction

The Ibrahim Index of African Governance (henceforth Index of African Governance, IAG), developed by the Harvard Kennedy School (Rotberg and Gisselquist, 2008[1]), aims to measure the quality of political goods provided by African states to their citizens. The Index assesses governance issues over time (2000, 2002, 2005, 2006) for 48 African countries south of the Sahara, according to a five-pillar conceptual structure: (a) *Safety and Security*, (b) *Rule of Law, Transparency, and Corruption*, (c) *Participation and Human Rights*, (d) *Sustainable Economic Opportunity*, and (e) *Human Development.* The five major pillars are described by fourteen sub-pillars composed in total of fifty-seven indicators (in a mixture of qualitative and quantitative measurement scales). The main approach to the realisation of the final Index is quite straightforward: a simple average at all levels of aggregation (sub-pillar, pillar, overall Index).

Governance quality is clearly an abstract concept that cannot be measured directly. The underlying hypothesis of this kind of analysis is that the phenomenon to be measured represents a latent factor that may be observed only indirectly by several variables describing different features/aspects of the latent dimension[2]. Choosing different aspects and indicators is equivalent to choosing the 'framework' of the index. This framework may be seen as the 'measurement instrument' of the latent phenomenon.

According to the conceptual framework, which should be developed on the basis of general reasoning, expert opinion and/or practitioners' advice, data are usually collected for the set of units under investigation (i.e. countries, in the case of the African Governance phenomenon). Once data have been collected, various statistical methods can be used to:

[1] The analysis is based on the 2008 Index data set described in Robert I. Rotberg and Rachel M. Gisselquist, *Strengthening African Governance – Ibrahim Index of African Governance: Results and Rankings 2008* (Cambridge, MA: Mo Ibrahim Foundation; Kennedy School of Government, Harvard University; and World Peace Foundation, October 2008), and provided by Rotberg and Gisselquist. The 2008 Index was supported by the Mo Ibrahim Foundation and is also available on the Mo Ibrahim Foundation website at http://www.moibrahimfoundation.org/index-2008/index.asp (last accessed 7 April 2009). As of 2009, this Index will be known as the Harvard Kennedy School (HKS) Index of African Governance and its 2009 release will be available on the HKS website at http://belfercenter.ksg.harvard.edu/project/52/intrastate_conflict_program.html?page_id=223.

[2] Note that in this report the terms 'indicator' and variable' are used as synonymous and that, in the tradition of statistical literature (see for example Gifi, 1990), the term *category* is used to address the attribute that a qualitative variable can assume. Differently from original IAG terminology (Rotberg and Gisselquist, 2008), the terms 'category', 'sub-category' and 'sub-sub-category' are here translated as 'pillar', sub-pillar' and 'indicator' respectively.

- assess the validity of the conceptual framework;
- set up the final measure of the phenomenon;
- assess the robustness of the index with respect to different choices regarding either the framework or the computational method of the index (statistical methods, aggregation schemes, etc.).

This report aims to validate and critically assess the methodological approach taken by the Harvard Kennedy School to build the Index of African Governance, by addressing two key questions:

1. *Is the Index of African Governance internally sound and consistent, from a statistical and conceptual point of view?*

2. *What scenarios could have been used to build the Index and how do the results of these scenarios compare to the original results?*

Both questions are addressed by analysing the 2008 Index of African Governance based on a dataset from 2006.

Section 2 describes the conceptual framework and the methodological approach chosen by the Kennedy School to build the Index of African Governance.

Section 3 provides suggestions on the imputation method for estimating missing data, in particular in the Sustainable Economic Opportunity pillar.

Section 4 studies whether the Index of African Governance is internally sound and consistent from a statistical and conceptual point of view. We would like to stress that the statistical analysis has not the purpose of proposing an alternative framework for the Index of African Governance, but rather to support the IAG by fine tuning it and by identifying possible shortcomings. Recommendations for the optimization of data collection are also provided, such as merging categories for some qualitative variables or reducing the number of indicators.

Section 5 offers suggestions from the application of cluster analysis on how to set short-term targets for the sub-pillars of governance. In Section 6, we carry out an uncertainty and sensitivity analysis of the Index. We aim to examine to which extent the Index ranking depends on the statistical methodology chosen. The analysis involves the simultaneous activation of various sources of uncertainty (e.g. triggering the exclusion of a sub-pillar, the weighting and the aggregation rule). Section 7 discusses data-driven narratives based on the Index of African Governance and some

policy implications: it touches on what drives governance in Africa and what does not, it identifies countries with exceptional behaviour, and it studies the association between governance and population or surface size in African countries. Section 8 summarizes the aims, the main findings and the recommendations of the study.

2. Conceptual framework and methodological approach to measuring governance in Africa

Attempting to summarize a complex system such as governance in a single metric creates a number of empirical challenges, e.g. data quality, indicator selection, indicator importance. However, if done well, the exercise could yield a powerful comparative assessment tool capable of capturing the societal conditions that drive governance efforts. It could allow for comparisons across space and time by providing the technical ability to monitor change, identify problems and contribute to priority-setting and policy formulation. Thus, an index of governance in African countries could reveal new knowledge which otherwise would remain invisible.

The Index of African Governance developed by the Harvard Kennedy School (Rotberg and Gisselquist, 2008) shows how governance can be measured. As aforementioned, the Index assesses governance issues over time for 48 African countries south of the Sahara (Figure 1). The conceptual framework of the Index is based on 57 indicators which are organised into 14 sub-pillars, then grouped into five pillars and finally aggregated to an overall Index. The five pillars represent distinct aspects of governance, i.e.:

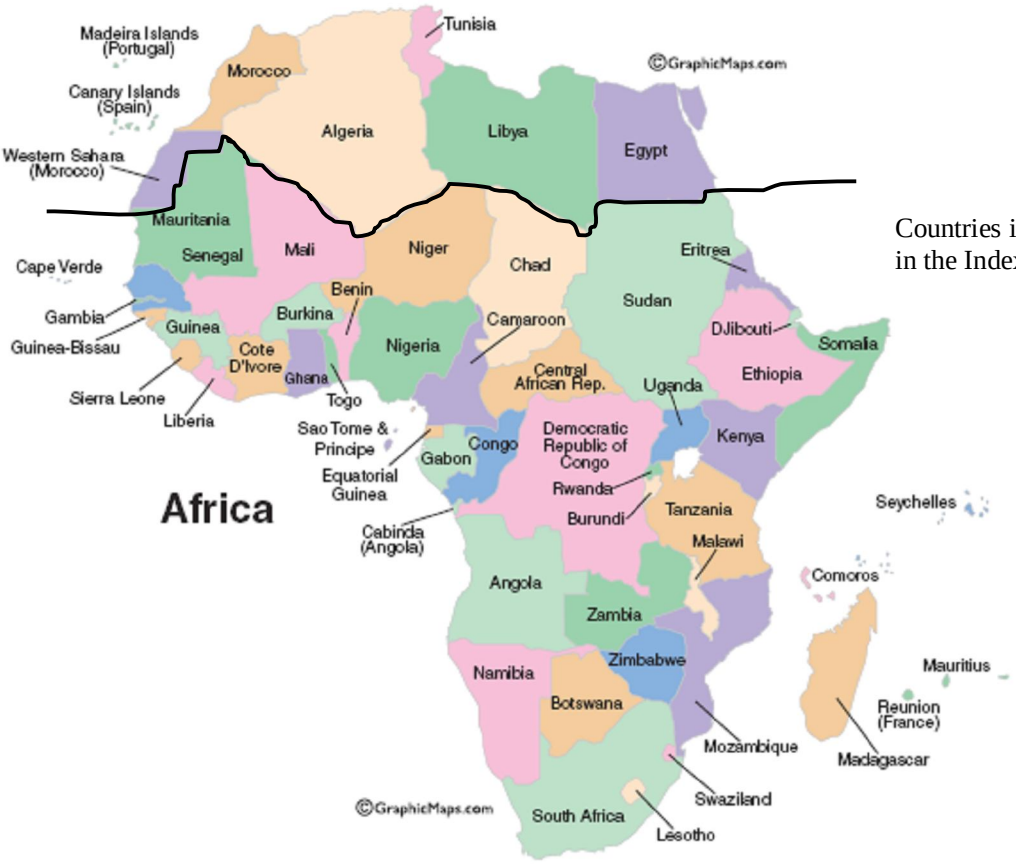
- *Safety and Security*,
- *Rule of Law, Transparency, and Corruption*,
- *Participation and Human Rights*,
- *Sustainable Economic Opportunity*, and
- *Human Development*.

The dataset combines a mixture of qualitative and quantitative indicators. Table 1 presents the full conceptual framework for the Index. These indicators reflect a wide range of governance issues ranging from freedom and the chance to prosper, to access to decent schools, well-run hospitals, and well-maintained roads. Together these five dimensions of political goods are considered to encapsulate the performance of any government.

The main approach to the realisation of the final Index is quite straightforward: a simple average at all levels of aggregation (from the underlying indicators to the sub-pillars, from the sub-pillars to the pillars, from the pillars to the overall Index). Each underlying indicator is treated as a scalar variable, regardless of its measurement level. Raw data values are then normalized by a min-max approach: all indicators are

rescaled such that the worst across all available years of the Index (2000, 2002, 2005 and 2006) receives a score of "0", and the best value across all years of the Index, a score of "100". A sub-pillar score is computed as the simple arithmetic average of the underlying indicators. Pillar scores are further calculated as the simple arithmetic averages of the sub-pillars. The only exception to the equal weighting scheme is the case of the pillar "Safety and Security", where the "National Security" sub-pillar receives a weight of 2/3 and the "Public safety" pillar receives a weight of 1/3.

Figure 1. Map of Africa



Countries included in the Index

Table 1. Conceptual framework for the 2006 Index of African Governance

Pillar	Sub-pillar	Indicator	Range
Safety and Security (1/5)	National Security (2/3)	Government Involvement in Armed Conflicts	0 (best) to 6 (worst)
		Number of Battle-Deaths	0 (best) to 3184 (worst)
		Number of Civilian Deaths	0 (best) to 1109 (worst)
		Refugees and Asylum Seekers	0.2 (best) to 10,298.4 (worst)
		Internally-Displaced People	0 (best) to 18,660.3 (worst)
		Ease of Access to Small Arms and Light Weapons	1 (best) to 5 (worst)
	Public Safety (1/3)	Violent Crime (Homicides)	1 (best) to 5 (worst)
Rule of Law, Transparency, and Corruption (1/5)	Ratification of Critical Legal Norms (1/3)	Ratification of Core International Human Rights	0 (worst) to 7 (best)
		International Sanctions	0=no (best); 1=yes (worst)
		Property Rights Index	0 (worst) to 100 (best)
	Judicial Independence and Efficiency (1/3)	Judicial Independence	0 (worst) to 14 (best)
		Efficiency of the Courts	0% (best) to 100% (worst)
		Number of Days to Settle a Contract Dispute	270 (best) to 1280 (worst)
	Corruption (1/3)	Public Sector Corruption	1.0 (worst) to 6.0 (best)
Participation and Human Rights (1/5)	Participation in Elections (1/2)	Free and Fair Executive Elections	0 (worst) to 2 (best)
		Opposition Participation in Executive Elections	0=no (worst); 1=yes (best)
		Free and Fair Legislative Elections	0 (worst) to 2 (best)
		Opposition Participation in Legislative Elections	0=no (worst); 1=yes (best)
	Respect for Civil and Political Rights (1/2)	Respect for Physical Integrity Rights	0 (worst) to 8 (best)
		Respect for Civil Rights	0 (worst) to 12 (best)
		Press Freedom	5.5 (best) to 99.8 (worst)
		Women's Rights	0 (worst) to 9 (best)
Sustainable Economic Opportunity (1/5)	Wealth Creation (1/4)	GDP per capita based on PPP	$244.3 (worst) to $28,536.2 (best)
		GDP per capita growth	-16.2% (worst) to 21.7% (best)
	Macroeconomic Stability and Financial Integrity (1/4)	Inflation	0.1% (best) to 1,016.7% (worst)
		Deficits/ Surplus as a % of GDP	-41.7% (worst) to 41.6% (best)
		Reliability of Financial Institutions	0.19 (worst) to 0.97 (best)
		Business Environment	14 (best) to 233 (worst)
	Arteries of Commerce (1/4)	Density of paved road network per 1,000 people (km)	0.03 (worst) to 5.77 (best)
		Electricity Installed Capacity per Capita (kW)	0.0029 (worst) to 1.1460(best)
		Phone Subscribers per 100 Inhabitants	0.05 (worst) to 111.96 (best)
		Computer Usage per 100 Inhabitants	0.02 (worst) to 20.91 (best)
		Internet Usage per 100 Inhabitants	0.01 (worst) to 35.67 (best)
	Environmental Sensitivity (1/4)	Environmental Performance Index	39.1 (worst) to 78.1 (best)
Human Development (1/5)	Poverty (1/3)	Poverty Rate at $1 per person per day	1.0% (best) to 76.2% (worst)
		Poverty Rate at National Poverty Line	8.0% (best) to 76.8% (worst)
		Inequality (GINI Index)	0 (best) to 100 (worst)
	Health and Sanitation (1/3)	Life Expectancy at Birth (years)	39.1(worst) to 73.2 (best)
		Child Mortality per 1,000	13.3 (best) to 263.8 (worst)
		Maternal Mortality (per 100,000 live births)	15 (best) to 2,100 (worst)
		Under-nourishment (% of population)	2.5% (best) to 75% (worst)
		Immunization, measles (% of children, 12-23 months)	0% (worst) to 100% (best)
		Immunization, DPT (% of children, 12-23 months)	0% (worst) to 100% (best)
		HIV Prevalence	0.1% (best) to 33.4% (worst)
		Incidence of Tuberculosis (per 100,000 people)	22.7 (best) to 1,155.3 (worst)
		Physicians per 100,000 People	2.1 (worst) to 146.7 (best)
		Nursing and Midwifery Personnel per 100,000 People	17.8 (worst) to 768.5 (best)
		Access to Drinking Water (% of overall population)	22% (worst) to 100% (best)
	Education (1/3)	Adult Literacy Rate	17.1% (worst) to 91.8% (best)
		Adult Literacy Rate, Female	9.4% (worst) to 92.3% (best
		Primary School Completion Rate	16.1% (worst) to over 100% (best)
		Primary Completion Rate, Female	12.5% (worst) to over 100% (best)
		Pupil-Teacher Ratio, Primary	13.7 (best) to 82.8 (worst)
		Progression to Secondary School (%)	18.8% (worst) to 99.7% (best)
		Ratio Girls/Boys in Primary and Secondary Education	55.0 (worst) to 107.2 (best)

Notes: Numbers in parenthesis indicate the weights assigned to the pillars and the sub-pillars by the developers.

3. Brief considerations on the imputation of missing data

In the Index of African Governance, missing values are present for specific indicators and specific countries. For almost all cases, the Kennedy School included specific estimates for missing value. When even rough estimates were unavailable, the IAG developers calculated sub-pillar, pillar and overall Index scores omitting the missing data points, i.e. averaging on all other available data for that indicator, or filling the missing cells with the mean of the same indicator for all other observed countries (as in the case of the Environmental Performance Index for the Sustainable Economic Opportunity pillar). This procedure is known as *mean substitution* (Rotberg and Gisselquist, 2008).

Although being a good starting point, mean substitution will artificially diminish the variance of the variable by imputing the same number for each missing value. A reduced variance can either attenuate correlation or, if the same cases are missing for two variables, can inflate it. Furthermore, with mean substitution no additional information offered by other variables is used. For the pillar Sustainable Economic Opportunity (the most affected by missing values) we propose a specific method for missing imputation.

The pattern of missing values for this pillar can be summarized as follows:

- Cape Verde, Comoros, Equatorial Guinea, Gambia, Lesotho, Liberia, Sao Tome and Principe, Seychelles and Somalia do not have observations or estimates for the Environmental Sensitivity indicator (EPI) (nine out of 48 countries).
- Somalia lacks data for seven out of twelve indicators included in this pillar.
- Liberia lacks data for two indicators.

We would recommend using the *hot-deck* method (single imputation), in which recorded units in the sample are used to substitute missing values (Little and Rubin, 2002). It involves substituting individual values drawn from "similar" observed units, "similarity" being defined as a certain distance. The distance between two countries i and j was calculated using the Manhattan distance:

$$d_{ij} = \sum_{k} \left| {}_{k}x_{i} - {}_{k}x_{j} \right| \qquad (1)$$

where ${}_{k}x_{i}$ is the value of indicator *k* observed for country i and *k* varies only across those indicators which are observed for both countries. Manhattan is used instead of classical Euclidean distance since the latter over-weights high differences (Little & Rubin, 2002).

Pairs of "most similar" countries are shown in Table 2, where squared cells indicate the estimates for missing values based on the hot-deck method. For example, the performance of Comoros in the twelve underlying indicators of the Sustainable Economic Opportunity pillar resembles most the performance of Benin (i.e. Benin is the "nearest neighbour" of Comoros in terms of performance). Therefore, the estimated EPI value for Comoros is 43.6 (equal to that of Benin). Burkina Faso is the country most similar to Sierra Leone and Somalia and therefore the missing values for the latter two countries are estimated based on those of Burkina Faso.

Table 2. Missing data imputed with hot deck method (Manhattan distance)

	Sustainable Economic Opportunity Pillar											
	Wealth Creation		Financial Integrity				Arteries of Commence					Environmental Sensitivity
	GDP per capita	GDP per capita growth	Inflation	Deficits/ Surplus as a % of GDP	Reliability of Financial Institutions (Contract Intensive Money)	Business Environment (Number of Days to Start a Business)	Density of paved road network per 1,000 people	Electricity Installed Capacity per Capita (kilowatts)	Phone Subscribers per 100 Inhabitants	Computer Usage	Internet Usage	Environmental Performance Index
Benin	3.5	45.1	99.6	49.6	59.4	92.2	3.1	1.0	11.6	2.7	4.0	43.6
Comoros	3.1	38.4	99.7	46.9	54.0	95.9	18.7	0.5	6.1	3.2	7.2	43.6
Burkina Faso	3.0	51.3	99.8	43.8	74.7	90.9	4.2	0.9	7.2	3.1	1.6	13.5
Sierra Leone	1.3	54.4	99.1	46.8	63.9	94.5	2.7	1.6	2.1	3.1	0.8	2.5
Somalia	3.0	51.3	99.8	43.8	74.7	90.9	4.9	0.6	6.8	4.3	3.1	13.5
Cameroon	6.3	46.9	99.5	56.1	83.6	86.3	3.8	4.2	17.5	5.8	6.2	63.4
Lesotho	4.1	59.6	99.4	66.1	92.6	73.1	11.3	3.1	20.5	0.3	8.0	63.4
Swaziland	15.1	46.6	99.5	50.7	96.5	78.5	16.9	11.1	25.5	19.4	11.4	57.1
Cape Verde	8.4	52.4	99.5	44.5	92.4	82.6	34.1	13.2	31.0	57.2	17.8	57.1

Gabon	47.8	41.8	99.9	61.1	75.3	79.9	12.0	27.8	50.9	15.9	16.1	97.9
Equatorial Guinea	92.2	22.3	99.6	81.5	76.6	44.3	24.2	2.1	26.0	8.5	4.3	97.9
Senegal	4.6	42.0	99.8	42.7	70.8	79.9	6.1	2.0	24.4	10.2	15.3	60.9
Gambia	3.0	47.0	99.8	42.5	72.0	94.1	7.1	1.3	25.8	9.6	14.8	60.9
Malawi	1.5	55.1	98.6	49.8	72.5	89.5	8.5	1.8	5.6	0.9	1.2	53.4
Liberia	0.3	52.4	99.3	55.1	64.5	61.2	3.1	4.5	4.1	0.9	0.8	53.4
Mozambique	1.7	57.8	98.7	48.4	86.2	54.8	4.8	9.7	10.6	6.8	2.5	38.1
Sao Tome and Principe	4.4	56.6	97.7	34.9	89.4	40.6	33.4	4.9	14.5	18.3	38.5	38.1
Mauritius	35.3	49.8	99.5	43.7	95.8	85.4	27.6	45.8	80.3	83.8	71.4	100.0
Seychelles	51.2	51.1	99.9	41.5	94.0	89.0	98.8	100.0	100.0	100.0	100.0	100.0

Various versions of the hot-deck imputation method exist, using for example different distance measures. Any of these approaches are preferred over the simple mean substitution, which was originally selected for the missing values in the indicators of this pillar.

Hot-deck imputation could also be used for the missing data in the Human Development Pillar.

4. Internal consistency of the 2006 Index

A clear understanding of the methodology used to build the Index is crucial, as this makes it possible to assess the feasibility and reliability of the Index. In other words, can the scores and ranks of the 2006 Index of African Governance be reproduced by other parties, given the data and information provided to the public? The answer is "*yes*". The relevant 2008 report (Rotberg and Gisselquist, 2008) provides enough information for the public to reproduce the results. No specialist statistical knowledge is required.

Indisputably, the "making of Index of African Governance" demands a sensitive balance between simplifying governance issues and still providing sufficient detail to detect characteristic differences. Such conflicting demands could finish by producing a complex measure that is almost impossible to verify, particularly since governance cannot be measured directly. It is therefore taken for granted that the Index cannot be tested on the basis of ground truth.

Yet, in order to enable informed policy-making and to be useful as policy and analytical assessment tool, the Index needs to be assessed with regard to its validity and potential biases. The first question to be answered is:

- *Is the Index of African Governance internally sound and consistent, from a conceptual and statistical point of view?*

4.1. Statistical dimensionality of the framework

The major goal of this *ex-ante* analysis is to let the data speak: that is, to assess whether the African Governance framework is supported by the collected data. First, we assess whether the statistical dimensions within each pillar coincide with the number of sub-pillars conceptualised. Second, we repeat this analysis at the sub-pillar level and assess whether the 14 sub-pillars are consistently described by the selected indicators.

For the first part of the analysis, we employ classical Principal Component Analysis (PCA) for quantitative indicators and non-linear PCA for qualitative (or a mixed set of) indicators. A brief methodological description of these techniques and their role in assessing the Index of African Governance is given in the Annex (Box 1). The main results are offered next. For statistical details see the Annex.

Safety and Security (two sub-pillars, seven indicators)

- The presence of two sub-pillars is confirmed by the analysis (two Principal Components have eigenvalues >1.0 and together account for more than 60% of total variance). Yet the non-linear PCA would have assigned different weights to the seven indicators than those assigned by the developers. This is usually the case given that Principal Components Analysis is essentially based on the correlation between indicators. Using weights and countries' scores calculated by the non-linear PCA it is possible to calculate an index sub-score for each sub-pillar and an overall score for the pillar. The final check consists in assessing the correspondence between the PCA based ranking and the original Safety and Security ranking. They result to be very similar. Spearman rank correlation coefficient is quite high at 0.93. The median impact is a two-position change and only one country shifts ten positions or more (Eritrea: max shift = 12).
- In the qualitative variable "Ease of access to small arms and light weapons" (scale: 1-best to 5-worst), no African country scores "1" or "2". This is also noted by Rotberg and Gisselquist (2008, p.56).

Rule of Law, Transparency, and Corruption (three sub-pillars, seven indicators)

- The presence of three sub-pillars is confirmed by the analysis: three Principal Components have eigenvalues>1.0 and all three account for more than 60% of total variance. The non-linear PCA would have assigned different weights to the seven indicators than those selected by the developers. Following the same approach as for the previous pillar, the ranking based on weights and scores retrieved from non-linear PCA appears to be similar to the original Rule of Law, Transparency and Corruption ranking but with a caveat. The Spearman rank correlation coefficient between the two is 0.77. The median impact is a five-position change and ten countries shift ten positions or more (Central Africa, Equatorial Guinea, Ethiopia, Gabon, Madagascar, Mali, Rwanda, San Tome and Principe, Sierra Leone, Swaziland and Somalia: max shift 31 positions). These results suggest that a PCA-based ranking has a more significant impact on the results of this pillar, as compared to the previous pillar.
- In the qualitative variable "Ratification of core international human rights

conventions" (scale: 0-worst to 7-best), no African country scored "0" or "1".

- Non-linear PCA also suggests that there is a scale redundancy in two qualitative variables:
  - In the "Ratification of core international human rights conventions" (scale: 0-worst to 7-best), scores 4 and 5 could be merged, also scores 6 and 7.
  - In the "Property Rights Index" (scale: 0-worst to 100-best, scores 50 and 70 could be merged).

Participation and Human Rights (two sub-pillars, eight indicators)

- The presence of two sub-pillars is confirmed by the analysis, yet the non-linear PCA would have assigned different weights to the eight indicators. The Spearman rank correlation coefficient between the ranking obtained using non-linear PCA and the original Participation and Human Rights ranking is 0.96. The median impact is a two-position change and only two countries shift ten positions or more (max shift = 13 for both Seychelles and Mali).
- The non-linear PCA also suggests that there is a scale redundancy in two qualitative variables.
  - In the "Respect for Physical Integrity Rights" (scale: 0-worst to 8-best), scores 1, 2, 3, 4 could be merged, also scores 6, 7, 8.
  - In the "Respect for Civil Rights" (scale: 0-worst to 12-best), scores 4, 5, 6 could be merged, also 8 and 9, and 10 and 11.

Sustainable Economic Opportunity (four sub-pillars, twelve quantitative indicators)

- This pillar is particularly difficult to handle due to missing data. Missing values were imputed using the hot-deck imputation method as detailed in Section 3. With imputed missing data the approach followed for the other pillars is meaningless since there missing data are assumed rare and sparse. With a relevant percentage of missing data the statistical ranks for this pillar are different from IAG baseline ranks, due to a combined effect of the imputation method and the application of the dimensionality reduction techniques. The Spearman rank correlation coefficient between the ranking obtained, after estimating 17 missing values by hot-deck imputation, and the original Sustainable Economic Opportunity ranking is 0.98. The median impact is a

one-position change and only one country shifts ten positions or more (Gambia: max shift = eleven positions).

Human Development (three sub-pillars, 21 indicators)

- Strictly according to Kaiser's rule for dimension extraction, six dimensions turn out to be relevant in the PCA (all indicators are quantitative). However, dimensions 4, 5 and 6 account for less than 7.4% of total variance each, while the first three dimensions cumulatively explain more than 60% of the total variance. Thus, the three sub-pillar structure is confirmed. The Spearman rank correlation coefficient between the ranking obtained using PCA and the original Human Development ranking is 0.94. The median impact is a three-position change and only three countries shift ten positions or more (Comoros, Congo, Eritrea: max shift = 13).

Index of African Governance (five pillars, 14 sub-pillars)

- Unlike the previous analyses at the indicator level, this analysis is conducted at the sub-pillar level. Based on the most common rule-of-thumb, the Kaiser criterion, there are four statistical dimensions in the set of 14 sub-pillars, which account for about 73% of the variance of the original set. According to a more conservative rule, the Joliffe criterion, the number of statistical dimensions is five (explaining about 78% of the total variance), as was originally conceptualized. These results confirm that the 14 sub-pillars are statistically grouped into four or five dimensions and this supports the original choice of the developers to distribute the 14 sub-pillars between five main pillars of the governance framework.
- Although the presence of five (or four) main pillars is confirmed by the analysis, PCA would have assigned different weights to the 14 sub-pillars than those assigned by the developers. The Spearman rank correlation coefficient between the ranking obtained using PCA and the original Index ranking is 0.97. The median impact is a mere one-position change and only one country shifts more than ten positions (Swaziland: max shift = 11 positions).

The analysis detailed so far for each pillar and for the overall Index is not intended to present an alternative computational method for the development of the Index. In fact, it is evident that the developers wanted to keep the Index of African Governance as simple and transparent as possible, with particular focus on the "[…] ease with which

the results could be understood by non-statisticians" (Rotberg and Gisselquist, 2008, p. 21). While more sophisticated techniques may be statistically sounder, they may also be too complex and lacking in transparency for end-users of the Index.

The aim of the statistical analysis was rather to confirm the conceptual framework and identify eventual pitfalls. In fact, some recommendations were derived on the merging of certain categorical values in four qualitative indicators: Ratification of Core International Human Rights Conventions, Property Rights Index, Respect for Physical Integrity Rights and Respect for Civil Rights. It was also confirmed that the PCA results and the conceptual framework were consistent regarding the number of main pillars and sub-pillars within each pillar.

The impact of choosing an equal weighting within each pillar versus a (linear or non-linear) PCA weighting to estimate the pillar ranking was also estimated. In the case of four of the five pillars, the impact was not particularly important. Thus, despite its computational simplicity, the original method of calculating the Index of African Governance is supported by more complex statistical analysis. Only the pillar on Sustainable Economic Opportunity needs to be treated with caution due to missing data, in particular on the Environmental Sensitivity Index. As aforementioned (Section. 3), the approach taken by the developers to estimate the missing data by mean substitution is not particularly recommended and more sophisticated missing data treatment is discusses and applied.

In the following sections, the analysis is carried out with the values imputed by the developers, unless otherwise indicated.

4.2. Associations between the Index and its components

The simplest way to study internal consistency in the framework of the Index of African Governance is to perform simple correlation analysis between the Index and its components. We will discuss next the association between the Index scores and the scores obtained at all three levels (pillars, sub-pillars and indicators) of the framework.

A simple correlation between the 2006 Index scores and the pillar scores reveals positive and strong associations, i.e. greater than 0.69 (Table 3). The Index scores have the highest association with the Rule of Law, Transparency, and Corruption scores ($r = 0.89$), followed by Participation and Human Rights and Human

Development ($r \cong 0.80$). Relationships among the pillars themselves vary. The most closely associated are the Sustainable Economic Opportunity and Human Development pillars ($r = 0.83$). The least associated pillars are "Safety and Security" and "Sustainable Economic Opportunity", whose association appears to be random. These results imply that the five pillars may account for different, yet partially overlapping and not entirely separable, aspects of African governance. The fact that all correlation coefficients are positive shows that all five pillars and the overall Index point in the same direction, which is generally desirable when designing a composite indicator, unless there is a theoretical justification for the presence of trade-offs between the main pillars of a composite indicator.

Table 3. Pearson's correlation coefficients for the CLI and its four pillars

	Safety and Security	*Rule of Law, Transparency, and Corruption*	*Participation and Human Rights*	*Sustainable Economic Opportunity*	*Human Development*
Index of African Governance	**0.69**	**0.89**	**0.80**	**0.73**	**0.81**
Rule of Law, Transparency and Corruption	0.52				
Participation and Human Rights	0.50	0.59			
Sustainable Economic Opportunity	0.24*	0.69	0.36		
Human Development	0.39	0.75	0.42	0.83	

*Coefficient not significant at 5% level ($n = 48$).

Table 4. Pearson's correlation coefficients between the Index and its sub-pillars

Safety and Security		*Rule of Law, Transparency, and Corruption*	
National Security	0.75	Legal Norms	0.70
Public Safety	0.49	Judicial Independence	0.73
		Corruption	0.83
Participation and Human Rights		*Sustainable Economic Opportunity*	
Participation	0.71	Wealth Creation	0.35
Civil and Political Rights	0.80	Financial Integrity	0.34
		Arteries of Commerce	0.62
		Environmental Sensitivity (EPI)	0.48
Human Development			
Poverty	0.47		
Health and Sanitation	0.75		
Education	0.68		

All coefficients are significant ($p < 0.01$, $n = 48$).

Correlation analysis between the Index and its 14 sub-pillars reveals that all correlations are positive and significant at the 0.01 level (Table 4). The Index scores

have high associations with the majority of the sub-pillars (>0.70). Fair to moderate associations are found between the Index and Public Safety, Wealth Creation, Financial Integrity, Environmental Sensitivity, and Poverty. The pair-wise correlations among the sub-pillars are on average low ($r = 0.36$), other than for the two sub-pillars Arteries of Commerce and Health Sanitation ($r = 0.75$), which belong to two different pillars, namely Sustainable Economic Opportunity and Human development, respectively.

Correlation analysis between the Index and its 57 underlying indicators reveals that all correlation coefficients have the expected sign (Table 5). The same holds for the associations between the main pillars and their respective indicators. This is a desirable feature of a composite indicator, and is not easily obtained. The Index scores are strongly associated ($r > 0.70$) with Judicial Independence using Freedom House's "Rule of Law", Public Sector Corruption, Respect for Civil Rights, and Property Rights Index. Of the 57 indicators included in the framework, there are nine indicators in three of the five pillars that appear to be randomly associated with either the overall Index and/or with the pillar they belong to. These indicators are:

- Number of Days to Settle a Contract Dispute in the Rule of Law, Transparency and Corruption pillar;
- GDP per capita growth, Inflation, Deficits/Surplus as a % of GDP, and Business Environment in the Sustainable Economic Opportunity pillar;
- Inequality (Gini Index), HIV Prevalence, Incidence of Tuberculosis, and Progression to Secondary School in the Human Development pillar.

The random association between the Index scores (or pillar scores) and these nine indicators should not be taken to mean that these indicators do not describe important governance issues. For example, the Gini index is often considered to be a key governmental objective, particularly in developing countries. However, these random associations imply that even if some African countries improve their Gini index scores, this improvement will not lead to an overall improvement in their Human Development score (the pillar to which Gini index belongs) or in their overall Index score. Some authors (e.g. Booysen, 2002) recommend that a weak correlation between a sub-component and an index should result in the exclusion of the respective component from the framework. An eventual revision of the framework could take this result into consideration and eventually streamline the 57 indicators to 48, without any significant impact on the performance assessment of the countries under study.

Table 5. Pearson's correlation coefficients between the Index/pillars and the underlying indicators

Pillar	Sub-pillar	Indicator	Desired direction	Correlation with Index	Correlation with Pillar
Safety and Security	National Security	Government Involvement in Armed Conflicts	-	-0.381	-0.485
		Number of Battle-Deaths	-	-0.520	-0.601
		Number of Civilian Deaths	-	-0.305	-0.510
		Refugees and Asylum Seekers	-	-0.515	-0.501
		Internally-Displaced People	-	-0.460	-0.628
		Ease of Access to Small Arms and Light Weapons	-	-0.653	-0.626
	Public Safety	Violent Crime (Homicides)	-	-0.485	-0.903
Rule of Law, Transparency, and Corruption	Ratification of Critical Legal Norms	Ratification of Core International Human Rights Conventions	+	0.210	0.343
		International Sanctions	-	-0.495	-0.600
		Property Rights Index	+	0.721	0.811
	Judicial Independence and Efficiency	Judicial Independence	+	0.849	0.766
		Efficiency of the Courts	-	-0.340	-0.488
		Number of Days to Settle a Contract Dispute	-	-0.079*	-0.265*
	Corruption	Public Sector Corruption	+	0.834	0.879
Participation and Human Rights	Participation in Elections	Free and Fair Executive Elections	+	0.681	0.886
		Opposition Participation in Executive Elections	+	0.629	0.808
		Free and Fair Legislative Elections	+	0.604	0.849
		Opposition Participation in Legislative Elections	+	0.551	0.778
	Respect for Civil and Political Rights	Respect for Physical Integrity Rights	+	0.662	0.658
		Respect for Civil Rights	+	0.720	0.824
		Press Freedom	-	-0.518	-0.687
		Women's Rights	+	0.634	0.553
Sustainable Economic Opportunity (1/5)	Wealth Creation	GDP per capita based on PPP	+	0.341	0.640
		GDP per capita growth (annual %)	+	0.021*	-0.018*
	Macroeconomic Stability and Financial Integrity	Inflation	-	-0.089*	-0.049*
		Deficits/ Surplus as a % of GDP	+	-0.097*	-0.104*
		Reliability of Financial Institutions (Contract Intensive Money)	+	0.528	0.626
		Business Environment (Number of Days to Start a Business)	-	-0.147*	-0.159*
	Arteries of Commerce	Density of paved road network per 1,000 people (km)	+	0.586	0.662
		Electricity Installed Capacity per Capita (kW)	+	0.508	0.708
		Phone Subscribers per 100 Inhabitants	+	0.628	0.864
		Computer Usage per 100 Inhabitants	+	0.492	0.713
		Internet Usage per 100 Inhabitants	+	0.572	0.708
	Environ. Sensitivity	Environmental Performance Index	+	0.593	0.862
Human Development (1/5)	Poverty	Poverty Rate at $1 per person per day	-	-0.445	-0.681
		Poverty Rate at National Poverty Line	-	-0.598	-0.812
		Inequality (GINI Index)	-	0.077*	-0.171*
	Health and Sanitation	Life Expectancy at Birth (years)	+	0.510	0.612
		Child Mortality per 1,000	-	-0.620	-0.802
		Maternal Mortality (per 100,000 live births)	-	-0.523	-0.729
		Under-nourishment (% of population)	-	-0.510	-0.579
		Immunization, measles (% of children ages 12-23 months)	+	0.526	0.573
		Immunization, DPT (% of children ages 12-23 months)	+	0.508	0.600
		HIV Prevalence	-	0.251*	0.192*
		Incidence of Tuberculosis (per 100,000 people)	-	-0.032*	-0.046*
		Physicians per 100,000 People	+	0.574	0.688
		Nursing and Midwifery Personnel per 100,000 People	+	0.488	0.594
		Access to Drinking Water (% of overall population)	+	0.657	0.671
	Education	Adult Literacy Rate	+	0.516	0.580
		Adult Literacy Rate, Female	+	0.502	0.570
		Primary School Completion Rate (% of relevant age group)	+	0.628	0.658
		Primary Completion Rate, Female (% of relevant age group)	+	0.681	0.688
		Pupil-Teacher Ratio, Primary	-	-0.394	-0.488
		Progression to Secondary School (%)	+	0.225*	0.470
		Ratio of Girls to Boys in Primary and Second-ary Educ-ation	+	0.682	0.645

Coefficient not significant ($p > 0.05$, $n = 48$).

4.3. Impact assessment of the sub-pillars on the Index results

Internal consistency in the African Governance framework can also be studied by analysing the contribution of each of the 14 sub-pillars (or the five pillars) to the variance of the Index scores. The contribution of each of the 14 sub-pillars $\mathbf{X}_i$ $(i = 1,...,14)$ to the variance of the Index scores follows directly from the formula for the variance of a sum. If the sub-pillar scores are multiplied by the corresponding set of weights w_i $(i = 1,...,14)$, and σ_i^2 is the variance associated with each sub-pillar $\mathbf{X}_i$, then the variance of the Index is given by

$$\sigma^2 = \sum_{i=1}^{14} w_i^2 \sigma_i^2 + \sum_{i=1, i\neq k}^{14} \sum_{k=1}^{14} w_i w_k \operatorname{cov}(X_i, X_k) \qquad (2)$$

While the w_i's in Eq. (2) constitute the 'nominal weights', the 'effective weight' of each indicator, according to Stanley and Wang (1968), is given by the ratio

$$\frac{w_i^2 \sigma_i^2 + \sum_{i=1, k\neq i}^{14} w_i w_k \operatorname{cov}(X_i, X_k)}{\sigma^2} \qquad (3)$$

In other words, the effective weight of each sub-pillar represents that part of the variance of the Index scores that can be attributed to the relevant sub-pillar. Eq. (3) shows that although the nominal weights do influence the effective weights, they are generally not proportional to them.

Table 6 presents the nominal and the effective weights for the 14 sub-pillars and five pillars underlying the framework. Overall, there is no dominance issue, neither at the sub-pillar nor at the pillar level, and the effective weights are consistent with the nominal weights assigned to them. Some exceptions are noted: the Participation in Elections sub-pillar weighs 10%, but accounts for about 18% of the variation of the Index scores; that is, it has a relatively high discriminating power in the performance of the countries under study. On the other hand, the Wealth Creation and Financial Integrity sub-pillars each weigh 5% in the overall Index, but their effective weights are much lower (less than 1.5%), implying a relatively low discriminating power. At the pillar level, Participation and Human Rights has a much higher effective weight (30.4%) compared to the 20% nominal weight, while the opposite is true for the pillar on Sustainable Economic Opportunity (effective weight = 11.7%, nominal weight = 20%). This result suggests that the Participation and Human Rights pillar has a higher discriminating power than the other four pillars, despite the equal weights assigned to the five. The explanation, as

discussed theoretically above, lies in the different variances of the pillar scores and/or their correlations. In this case, correlations among pillars do not seem particularly influential in determining the effective weights (this could be seen broadly in Table 4). In fact, it is the high variance in the Participation and Human Rights scores (being twice or sometimes almost five times greater than the variance of the other pillar scores – see Table A.2 in the Annex), that explains the higher discriminating power of that pillar. This phenomenon could be avoided by standardising the pillar scores (i.e. subtracting the mean value and dividing by the standard deviation) prior to finally aggregating them into an overall Index score.

Table 6. Nominal and effective weights of the sub-pillars and pillars in the African Governance framework

Sub-pillars	*Nominal weights*	*Effective weights*	*Pillars*	*Nominal weights*	*Effective weights*
National Security	13.3%	9.2%	Safety and Security	20.0%	16.9%
Public Safety	6.7%	7.2%			
Legal Norms	6.7%	7.1%	Rule of Law, Transparency, and Corruption	20.0%	22.6%
Judicial Independence	6.7%	7.2%			
Corruption	6.7%	8.5%			
Participation in Elections	10.0%	18.9%	Participation & Human Rights	20.0%	30.4%
Respect for Civil and Political Rights	10.0%	11.3%			
Wealth Creation	5.0%	1.2%	Sustainable Economic Opportunity	20.0%	11.7%
Financial Integrity	5.0%	1.5%			
Arteries of Commerce	5.0%	4.6%			
Environmental Sensitivity	5.0%	4.7%			
Poverty	6.7%	5.4%	Human Development	20.0%	18.3%
Health and Sanitation	6.7%	5.4%			
Education	6.7%	7.9%			

To complement and complete the study of internal consistency in the framework of African Governance, we calculate the impact of a sub-pillar on the Index ranking by excluding that sub-pillar and recalculating the Index scores and ranks after rescaling the weights within the respective pillar to a unity sum. Table 7 compares the country ranks obtained using the full set of 14 sub-pillars versus those obtained using the reduced set of 13 sub-pillars. In general, eliminating any of the 14 sub-pillars has no impact on half of the countries (zero- or one-position change). However, some countries are noticeably affected when a specific sub-pillar is eliminated. For example, Niger loses twelve positions in the overall classification (moves from 24 to 36) when the Participation in Elections sub-pillar is excluded. This result further confirms the previous conclusion that there is no strong dominance issue in the Index but that the Participation in Elections sub-pillar has a more notable impact on some countries compared to the other sub-pillars.

Table 7. Impact of the elimination of one sub-pillar at a time on the Index country ranks

Pillar	*Excluded sub-pillar*	*Rank shift (across 48 countries)*		
		Median	*Max (positive: improvement in the overall rank or negative)*	
Safety and Security	National Security	0	5	Burundi
	Public Safety	1	6	Ethiopia (-)
Rule of Law, Transp. & Corruption	Legal Norms	1	6	Sierra Leone
	Judicial Independence	1	6	Liberia
	Corruption	0	4	Swaziland (-)
Participation and Human Rights	Participation	1	12	Niger (-)
	Civil and Political Rights	1	8	Guinea Bissau
Sustainable Economic Opportunity	Wealth Creation	0	4	Equatorial Guinea (-)
	Financial Integrity	0	2	Gambia, Guinea Bissau, Niger (-), Zimbabwe
	Arteries of Commerce	0	2	Burundi, Ghana
	Environmental Sensitivity	1	5	Kenya (-), Sierra Leone
Human Development	Poverty	1	8	Ethiopia (-)
	Health and Sanitation	0	2	Mauritania (-), Swaziland, Zambia
	Education	1	6	Kenya (-)

5. Cluster analysis

5.1 Cluster analysis: as diagnostic tool

Several African countries may have similar Index scores but very different patterns across the fourteen sub-pillars of governance. We applied cluster analysis to help identify peer countries which are similarly situated with respect to the sub-pillars (Kaufman and Rousseeuw, 1990). Based on the information provided by the sub-pillars of governance, the 48 countries under study were grouped statistically into clusters in such a way that the degree of association between two countries is maximal if they belong to the same cluster and minimal otherwise. Consequently, the members of each cluster are more similar to each other than to members of other clusters. In merely identifying clusters, our aim is to provide cluster-specific short-term targets which could be achieved by African countries before they engage in efforts to reach longer term targets.

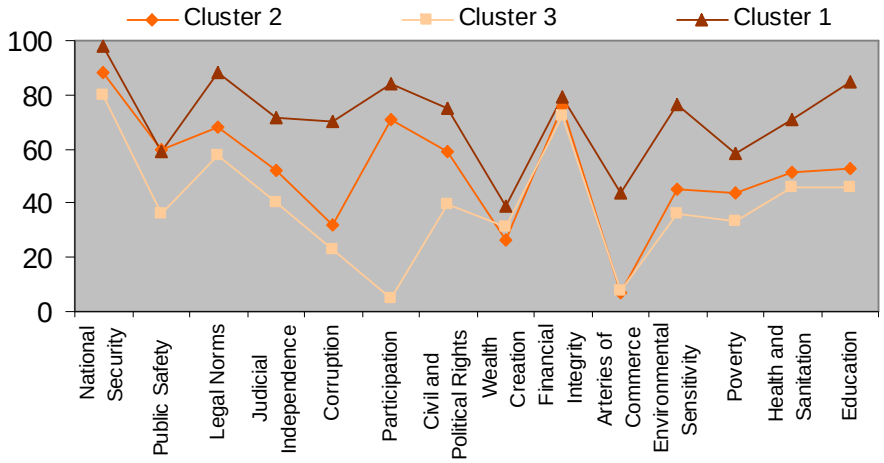
We used hierarchical clustering (Ward's method and squared Euclidean distance) across the 14 sub-pillars to identify the number of clusters and then used k-means clustering (maximum initial between-cluster distance) to allocate the countries to these clusters. This process generated three clusters that could help governments look beyond geographic peer groups or other types of groupings in order to identify success models in states facing similar challenges.

Roughly, **Cluster One** groups eight countries which have good to high performance in all sub-pillars, followed by 29 countries in **Cluster 2** with good performance in the majority of sub-pillars, and finally eleven countries in **Cluster 3** with moderate to good performance in the majority of sub-pillars. Figure 2 lists the countries included in each cluster and Table 8 presents the average performance at the sub-pillar level of the countries in each cluster. Countries in Cluster 1 (e.g. Botswana and Cape Verde) perform particularly well, compared to the countries in the other clusters, in ten of the 14 sub-pillars, namely Legal Norms, Judicial Independence, Corruption, Participation, Civil and Political Rights, Arteries of Commerce, Environmental Sensitivity, Poverty, Health and Sanitation and Education. The sub-pillars in which the countries in Cluster 2 have a better average performance than the countries in Cluster 3 are Public Safety, Participation, Civil and Political Rights. The countries grouped in Cluster 3 face challenges in the majority of the sub-pillars of governance, and in particular Corruption and Participation. Interestingly, countries in all three clusters face challenges, on average, in Wealth Creation, but all three clusters do almost equally well on National Security and Financial Integrity.

Figure 2. Clusters of countries (alphabetical order) based on the 14 sub-pillars of African Governance

Cluster 1 (n=8)	Cluster 2 (n=29)		Cluster 3 (n=11)
Botswana	Benin	Malawi	Angola
Cape Verde	Burkina Faso	Mali	Chad
Gabon	Burundi	Mozambique	Congo, Dem. Rep.
Ghana	Cameroon	Niger	Cote d'Ivoire
Mauritius	Central Africa	Nigeria	Equatorial Guinea
Namibia	Comoros	Rwanda	Eritrea
Seychelles	Congo	Sao Tome and Principe	Guinea
South Africa	Djibouti	Senegal	Mauritania
	Ethiopia	Sierra Leone	Somalia
	Gambia	Tanzania	Sudan
	Guinea-Bissau	Togo	Swaziland
	Kenya	Uganda	
	Lesotho	Zambia	
	Liberia	Zimbabwe	
	Madagascar		

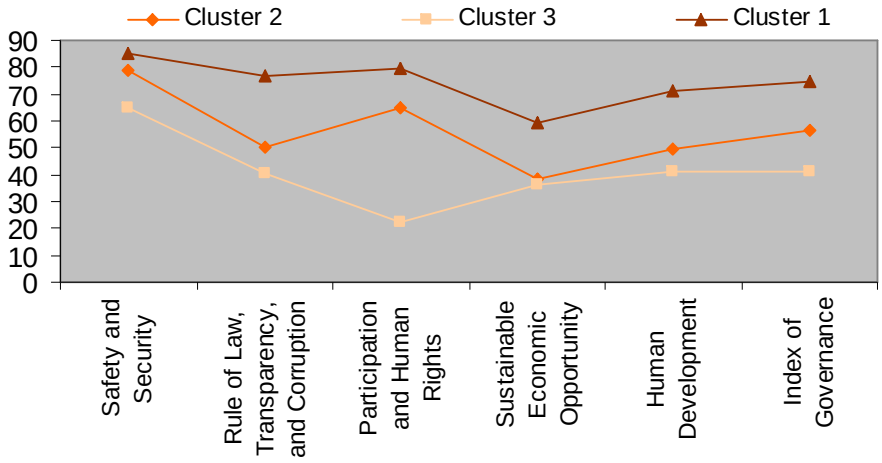
Table 8. Cluster means across the 14 sub-pillars of African Governance



We next calculated the average pillar score and the average Index score across the members of each cluster (Figure 3). Countries in Cluster 1 have, on average, the highest scores in the five pillars of Governance and in the overall Index. The countries in Cluster 2 follow, with average scores slightly lower than those of Cluster 1. Lower scores, on average, are achieved by the countries in Cluster 3. An interesting feature of Figure 3 is the clear splitting of the average scores per cluster group of the African countries under study across the five pillars of Governance and the overall Index, even though this type of (aggregated) information did not enter the cluster analysis. Recall that cluster analysis was carried out based on the 14 sub-pillars

of Governance, without any further assumption on the pillar structure, weighting or aggregation method. This outcome reveals that the 14 sub-pillars of Governance are able to distinguish between the performance of African countries on the five main aspects of governance (Safety and Security; Rule of Law, Transparency, and Corruption; Participation and Human Rights; Sustainable Economic Opportunity; Human Development) and that the overall Index reflects, without distortion, the information content in the dataset.

Figure 3. Average values per cluster group: pillars and overall Index



5.2 Cluster analysis: setting short-term targets

It can further be concluded that, given the diverse aspects of governance in African countries, it is unlikely that all countries could reach the targets for the sub-pillars of governance. With this in mind, the results of the cluster analysis could be used to set short-term targets for immediate pursuit (Table 9). To give an example, countries that belong to Cluster 3 should first attempt to reach a Public Safety score of around 75.0, which is the best score achieved among them (=short-term target) and gradually increase efforts to reach the long-term target of 100.0

Table 9. Short-term and long-term targets for the sub-pillars of Governance

		Short-term targets for each cluster group of countries (max value in the cluster)			Long-term targets (max value in the dataset)
		Cluster 1 (leaders) $n = 8$	Cluster 2 (middle) $n = 29$	Cluster 3 (laggards) $n = 11$	Entire dataset $n = 48$
Safety and Security	National Security	100.0	100.0	98.0	100.0
	Public Safety	100.0	100.0	75.0	100.0
Rule of Law, Transp. & Corruption	Legal Norms	100.0	88.9	83.3	100.0
	Judicial Independence	88.0	74.6	72.3	88.0
	Corruption	88.0	52.0	46.0	88.0
Participation and Human Rights	Participation	100.0	100.0	25.0	100.0
	Civil and Political Rights	84.3	79.4	61.7	84.3
Sustainable Economic Opportunity	Wealth Creation	51.2	32.3	57.2	57.2
	Financial Integrity	84.7	89.9	86.8	89.9
	Arteries of Commerce	99.8	21.9	16.9	99.8
	Environmental Sensitivity	100.0	78.5	67.0	100.0
Human Development	Poverty	91.0	72.7	64.4	91.0
	Health and Sanitation	96.5	69.7	61.4	96.5
	Education	97.3	81.7	75.1	97.3

6. Uncertainty and sensitivity analysis

The creativity evident in the work of composite indicator developers is not only a response to the multiple demands of the user/stakeholder community but also the result of disagreement within the research community on which indicators influence a particular phenomenon, and by how much (Cutter *et al.*, 2003). Notwithstanding recent attempts to establish best practice in composite indicator construction (OECD, 2008), "there is no recipe for building composite indicators that is at the same time universally applicable and sufficiently detailed" (Cherchye et al., 2008). This may be due in part to the ambivalent role of composite indicators in both analysis and advocacy (Saltelli, 2007). As the boundaries between the two functions are often blurred, controversy may be unavoidable when discussing these measures.

When building an index to capture governance in Africa, it is necessary to take stock of existing methodologies in order to avoid eventual skewness in the assessment and decision-making. By acknowledging the variety of methodological assumptions involved in the development of an index, one can determine whether the main results change substantially when the main assumptions are varied over a reasonable range of possibilities (Saisana *et al*., 2005; Saisana and Tarantola, 2002; Saltelli *et al.*, 2000; Saltelli et al., 2008). The advantages offered by considering different scenarios to build the Index could be: to gauge the robustness of the Index scores and ranks, to increase its transparency, to identify those countries whose performance improves or deteriorates under certain assumptions, and to help frame the debate on the use of the results for policy making.

The main question to be addressed here is:

- *What scenarios could have been used to build the Index of African Governance and how do the results of these scenarios compare to the 2006 results?*

We show below how uncertainty analysis (UA) can contribute to such a reflection. UA involves assessing the impact of alternative models on the country ranks. Each model is a different composite indicator in which the choice of weights and aggregation method have been varied within a plausible range. This approach helps to avert the criticism frequently dealt to composite measures or rankings, namely that they are presented as if they had been calculated under conditions of certainty (while this is rarely the case) and then taken at face value by end-users (Saisana et al., 2005; Saisana and Saltelli, 2008). The objective of UA is not to establish the truth or to verify whether the Index of African Governance is a legitimate model to measure governance in Africa, but rather to test whether the ranking itself and/or its associated inferences

are robust or volatile with respect to changes in the methodological assumptions within a plausible and legitimate range. Uncertainty (or robustness) analysis as described by the OECD (2008) has been already used for the assessment of several composite indicators, such as the Composite Learning Index (Saisana, 2008), the Environmental Performance Index (Saisana and Saltelli, 2008), the Alcohol Policy Index (Brand et al., 2007), the Knowledge Economy Index (Saisana and Munda, 2008) and the University Ranking Systems (Saisana and D'Hombres, 2008).

6.1 Multi-modelling approach

A multi-modelling approach was applied in the present work for the purpose of robustness analysis. It consists of exploring, via a saturated sampling, plausible combinations (150 simulations in total) of three main assumptions needed to build the index:

(a) the weights attached to the indicators;

(b) the aggregation rule;

(c) the number of sub-pillars included.

(a) ***Assumption on the weighting scheme***: In the Index of African Governance an equal weighting scheme was used within and across the five pillars. Although this is a legitimate choice, it is not unique and it is hard to find a theoretical justification for it. We tested three alternative and legitimate weighting schemes: factor analysis derived weights (upon factor rotation and squaring of the factor loadings, as described in Nicoletti et al., 2000) across all 14 sub-pillars; equal weighting across all 14 sub-pillars; and "country-specific weighting". The last alternative, also known as Data Envelopment Analysis, involves choosing the set of weights for each country that maximizes that country's performance in the overall Index relative to all other countries. We employed the cross-efficiency DEA, first developed by Sexton et al. (1986), who introduced the concept of ranking to DEA. The cross-efficiency method simply calculates the efficiency score of each country *n* times (= number of countries), using the optimal weights for all countries. The average efficiency score is usually then used to rank countries. Practitioners use this approach to discourage stakeholders from rejecting a ranking on the grounds that a given weighting scheme does not reflect their priorities (Cherchye et al., 2008).

(b) ***Assumption on the aggregation rule***: The Index rankings are built using a weighted arithmetic average (a linear aggregation rule) of the 14 sub-pillars (Eq. (4)). Decision theory practitioners have challenged aggregations based on additive models because of inherent

theoretical inconsistencies (Munda, 2008) and the fully compensatory nature of linear aggregation, in which an x% increase in one indicator can offset an x% decrease in another. We applied two alternative approaches for the aggregation function: a geometric weighted average (Eq. (5)) and a multi-criteria method. In the case of the geometric averaging, we linearly transformed the sub-pillar scores into a 1-100 scale to allow for the proper use of the geometric aggregation. The multi-criteria literature offers a plethora of methods (Kemeny, 1959; Munda, 2008; Young, 1978). We selected a method suggested by Brand et al. (2007) (Eq. (6)) for two main reasons: first, it can deal with a large number of countries, unlike the other currently available Condorcet–type methods (Condorcet, 1785); and second, it can deal with ties in indicator scores and also incorporate information on weights, unlike the Borda method (Borda, 1784).

Weighted Arithmetic Average score: $y_j = \sum_{i=1}^{n} w_i \cdot x_{ij}$ (4)

Weighted Geometric Average score: $y_j = \prod_{i=1}^{n} x_{ij}^{w_i}$ (5)

Borda adjusted score: $y_j = \sum_{i=1}^{n} (m_{ij} + \frac{k_{ij}}{2}) \cdot w_i$ (6)

y_j: composite indicator score for country j, w_i: weight attached to sub-pillar i, x_{ij}: sub-pillar score for country j on sub-pillar i, m_{ij}: number of countries that have weaker performance than country j relative to sub-pillar i; k_{ij}: number of countries with equivalent performance to country j relative to sub-pillar i.

(c) ***Assumption on the sub-pillars*****:** We have either kept all 14 sub-pillars or in some cases excluded one at a time. This statistical procedure is a tool to test the robustness of inference and should not be seen as a disturbance of the framework. In fact it makes it possible to assess the impact of assigning a zero weight to a sub-pillar, combined with the other assumptions on the weighting method and aggregation rule. Eliminating a sub-pillar from the framework can also be seen as "tuning" the ranking in favour of countries which have a comparative disadvantage on that sub-pillar (Grupp and Mogee, 2004). The assumption discussed so far should be seen as a minimal analysis of robustness, as suggested in econometrics by Kennedy (2007) and Leamer

(1990). We contend that an actual multi-stakeholder debate on the construction of this kind of measure would result in a plurality of alternative assumptions far exceeding those adopted here.

6.2 Uncertainty analysis results

The results shown in Table 10 are the frequencies of a country's Index rank calculated across all 150 scenarios. Such a frequency matrix synthesizes the ranking while making the uncertainty explicit. It is beyond doubt that Mauritius and Seychelles are the top two countries. In general the Index results are very stable up to Benin, after which the impact of the assumptions becomes more evident. For example, Rwanda could be ranked between the 11th and 28th position with almost equal probability. However, we acknowledge that we have considered quite diverse scenarios and a more prudent approach would be to assess whether on average the 2006 Index rank is similar to the median rank across all 150 simulated scenarios.

Table 10. Frequency matrix of a country's rank in the Index of African Governance

	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	31-32	33-34	35-36	37-38	39-40	41-42	43-44	45-46	47-48
Mauritius	100																							
Seychelles	97																							
Cape Verde		85	11																					
Botswana		92	8																					
South Africa		13	60	7	9	5																		
Namibia		5	66	29																				
Gabon		9	35	49	7																			
Ghana			15	75	10																			
Sao Tome and Principe				35	61																			
Senegal					63	34																		
Lesotho					34	40	13																	
Malawi					11	76	9																	
Benin						13	40	20	21	5														
Tanzania						13	56	28																
Comoros						11	30	24	13	8	9													
Kenya						7	19	28	29	9	7													
Madagascar							6	32	26	18	10	5												
Uganda								20	33	27	12													
Zambia							7	21	35	26	7													
Rwanda							9		14	17	15	19	10	10										
Burkina Faso								9	10	15	29	11	8	12										
Gambia									5	21	19	24	16	11										
Mozambique									5	19	25	17	14	7	12									
Cameroon										6	17	31	26	15										
Djibouti											10	25	39	18										
Mali												15	17	31	23	6								
Congo												6	24	30	21	5	6							
Togo											7	11	10	19	34	17								
Mauritania										7	5	9		7	7	9	11	17	13	5				
Swaziland								5	5	5	10	8	5			11	15	7	9	9				
Ethiopia														6	16	25	21	19	5					
Niger												11	7	6	13	13	15	9	13	9				
Zimbabwe													9	12	13	22	13	14	7					
Guinea-Bissau															17	16	19	7	17	13	5			
Nigeria															13	15	25	15	19	10				
Burundi															6	23	19	13	6		7	22		
Equatorial Guinea																19	25	32	11	7				
Eritrea																11	11	11	12	24	19	10		
Cote d'Ivoire																		10	25	20	37	5		
Guinea																		7	14	43	28			
Liberia																		13	17	18	33	16		
Sierra Leone																	6	14	17	12	35	12		
Central African Republic																				5	7	51	35	
Angola																			7	9	13	53	11	
Sudan																			6	7		23	56	
Chad																							81	18
Congo, Democratic Republic																							10	90
Somalia																							8	92

Note: Frequencies are calculated across 150 simulated scenarios combining: (a) alternative weighting schemes, (b) different aggregation rules, and (c) full set or excluding one indicator at a time from the 14 sub-pillar framework. For example, Botswana is ranked in the 3-4th position in 92% of scenarios and in only 8% of scenarios does it move down to the 5-6th position. Frequencies lower than 5% are not shown.

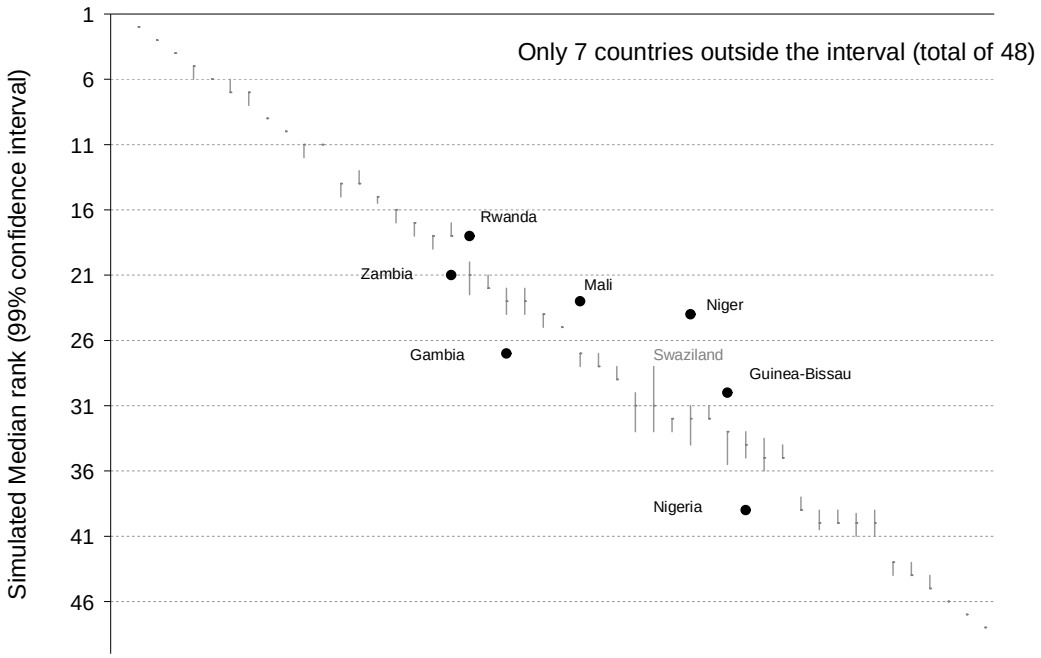
We next present the 'median' performance across all 150 models as a summary measure of the plurality of stakeholders' views on how to combine the information on the 14 sub-pillars in order to assess governance in Africa. Figure 4 shows the median rank and its 99% confidence interval for each African country and displays the name of countries whose original 2006 Index rank does not fall within this interval. Confidence intervals were estimated using bootstrap (1000 samples taken with replacement, see Efron, 1979). For 41 of the 48 countries, the 2006 Index rank lies within this interval, which suggests that these countries were ranked in the correct place, on average. Seven countries however appear to be slightly misplaced. Rwanda, Mali, Niger and Guinea-Bissau have been favoured by the choices made in the 2006 Index by

between three and eight places, while Zambia, Gambia and Nigeria were placed in a lower position (by three to five places) than our simulations would suggest. Any messages conveyed by the 2006 IAG for those seven countries should, therefore, be formulated with great caution and considered only as suggestive and contingent on the original methodological assumptions made in developing the Index. Furthermore, a precise rank, on average, could be assigned for twelve countries: Mauritius, Seychelles, Cape Verde, Botswana, Namibia, Sao Tome and Principe, Senegal, Malawi, Djibouti, Chad, Dem. Rep. Congo, Somalia. The widest confidence interval is estimated for Swaziland (=5 positions).

A positive result of this analysis is that the narrow confidence interval for almost all countries suggests that there is no particularly volatile section in the graph and that almost all African countries see little change in position, i.e. always less than three positions. The only exception is Swaziland, for which the confidence interval for the median rank is five positions wide, i.e. still not too wide to prevent further inference. These narrow confidence intervals suggest that robust conclusions (on average) on the relative performance of African countries can be drawn. Interestingly, a precise average rank can be assigned to twelve countries.

Overall, the 2006 Index ranking provides an unbiased summary picture of governance issues in Africa, since it is representative of a plurality of methodological scenarios.

Figure 4. Simulated median and its 99% confidence interval (across 150 models) for the Index ranks



Note: The dots relate a country's 2006 Index rank to the median rank calculated over the set of plausible scenarios (indicators, weighting scheme, aggregation rule) generated in our uncertainty analysis. Ranks that fall outside the interval are marked in black.

The results above are mostly presented as a suggestion to the developers. Plots such as these can either be used directly as measures (thus replacing a crisp rank with a median performance) or as part of a robustness analysis.

6.3 Sensitivity analysis results

Complementary to the uncertainty analysis, a sensitivity analysis makes it possible to assess the impact of each of the 150 scenarios on the Index ranking. To this end, we calculate for each country the absolute rank shift between the original Index rank and the rank provided by a given scenario and then summarise these shifts over all 48 countries by using the 50^{th} and the 90^{th} percentiles, the Spearman rank correlation coefficient and the Root Mean Square error.

Table 11 provides the results for the most and the least influential scenarios. Results for all 150 scenarios are provided in the Annex. Scenario 72, which employs a factor-analysis weighting scheme across the 14 sub-pillars and a geometric aggregation rule and does not include the sub-pillar on Participation in Elections, has the highest impact on the overall ranking: half the countries (i.e. 24 countries) shift more than four positions and five countries shift more than eleven positions (Burkina Faso, Cote d'Ivoire, Mali, Mauritania, Niger, Rwanda, Swaziland).

Follows the impact due to Scenario 114, which differs from the previous scenario in the use of equal weights. The Spearman rank correlation coefficients between the rankings provided by either of these two scenarios and the original ranking are close to 0.87-0.89. For all other scenarios the Spearman correlation coefficients are greater than 0.90. On the other hand, an almost negligible impact have the scenarios that are based on the original approach (weights and aggregation), but do not include either the National Security, or the Corruption, or the Wealth Creation, or the Financial Integrity, or the Arteries of Commerce, or the Health and Sanitation (listed at the last seven rows of Table 11). In these scenarios half the countries do not change position at all and the Spearman correlation is greater than 0.995.

Table 11. Sensitivity analysis: impact of the assumptions on the Index ranking (most and least influential scenarios, in a total of 150)

Scenario	Weighting	Aggregation	Excluded sub-pillar	50th percentile	90th percentile	Spearman rank coefficient	RMSE
72	FA	Geometric	Participation in Elections	4	11	0.872	7.00
114	EW	Geometric	Participation in Elections	3	11	0.892	6.45
73	FA	Geometric	Civil and Political Rights	3	10	0.921	5.50
44	Original	MCA	Participation in Elections	3	9	0.935	5.00
58	FA	Arithmetic	Participation in Elections	3	9	0.927	5.30
85	FA	MCA	Corruption	3	9	0.921	5.52
67	FA	Geometric	National Security	3	8	0.943	4.69
68	FA	Geometric	Public Safety	3	8	0.935	4.97
110	EW	Geometric	Public Safety	3	8	0.932	5.10
115	EW	Geometric	Civil and Political Rights	3	8	0.944	4.65
30	Original	Geometric	Participation in Elections	2.5	10	0.914	5.76
83	FA	MCA	Legal Norms	2.5	9	0.924	5.40
129	EW	MCA	Civil and Political Rights	2.5	8	0.923	5.44
26	Original	Geometric	Public Safety	2.5	6	0.958	4.04
71	FA	Geometric	Corruption	2	10	0.930	5.18
87	FA	MCA	Civil and Political Rights	2	10	0.903	6.12
142	DEA	Arithmetic	Participation in Elections	2	10	0.918	5.68
…	…	…	…	…	…	…	…
11	Original	Arithmetic	National Security	0	3	0.995	1.38
15	Original	Arithmetic	Corruption	0	2	0.997	1.15
18	Original	Arithmetic	Wealth Creation	0	1	0.998	0.87
19	Original	Arithmetic	Financial Integrity	0	1	0.999	0.74
20	Original	Arithmetic	Arteries of Commerce	0	1	0.999	0.65
23	Original	Arithmetic	Health and Sanitation	0	1	0.999	0.74
1	Original	Arithmetic	None	0	0	1.000	0.00

There is variable impact from the nine scenarios which are based on the full framework (all 14 sub-pillars), but which differ from the developers' approach in the weighting and/or aggregation method. The Spearman correlation coefficients are in all cases greater than 0.94. The highest impact on the ranking comes from Scenario 5 (Factor Analysis weighting and Geometric aggregation), and Scenario 9 (equal weights and MCA aggregation). In both of these scenarios, 24 countries shift more than two positions and five countries shift more than eight positions. Two scenarios produce rankings that are very similar to the original: Scenario 7, based on an

equal weighting of all 14 sub-pillars, and Scenario 10, based on cross-efficient Data Envelopment Analysis.

Although the different scenarios produce relatively different rankings compared to the original Index ranking, we would stress that on average these rankings are very similar to the 2006 Index ranking. The Spearman correlation between the 2006 Index ranking and the most extreme scenario (S72) is 0.872, and the correlation between the 2006 Index ranking and the most extreme scenario employing the full framework is 0.936.

Table 12. Sensitivity analysis: impact of the assumptions on the Index ranking (scenarios based on the full framework)

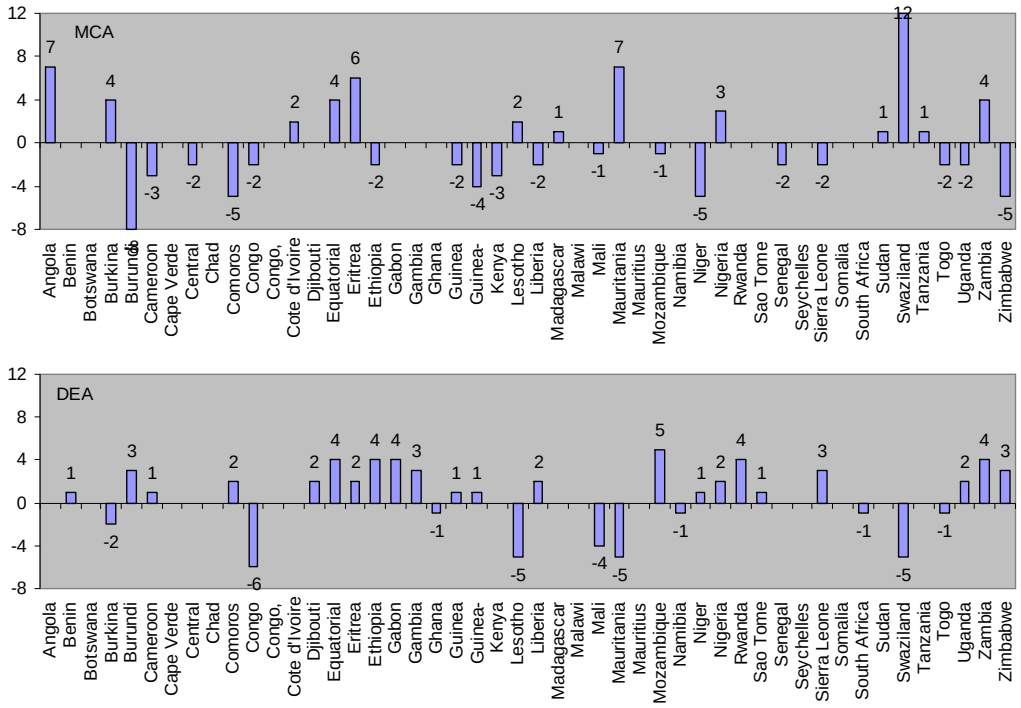
Scenario	Weighting	Aggregation	50th percentile	90th percentile	Spearman rank coefficient	RMSE
9	EW	MCA	2	8	0.946	4.53
5	FA	Geometric	2	8	0.949	4.41
8	EW	Geometric	2	6	0.959	3.98
3	Original	MCA	2	5	0.970	3.41
2	Original	Geometric	2	5	0.975	3.08
6	FA	MCA	1	9	0.936	4.97
4	FA	Arithmetic	1	6	0.970	3.36
7	EW	Arithmetic	1	4	0.989	2.06
10	DEA	Arithmetic	1	4	0.984	2.52

Before concluding this chapter on sensitivity analysis we will discuss in more detail two issues: compensability and fixed weighting schemes in the development of the Index of African Governance.

When using equal weighting and either linear or geometric aggregation, the compensability problem is likely to appear: high values in a few sub-pillars may offset very low values in many others. A solution to mitigate this is to use a non-compensatory multi-criteria analysis or at least a multi-criteria approach based on ordinal information on the indicators. The three scenarios in which multi-criteria analysis is employed on the full framework but which differ in the weighting scheme (Scenario 3, 6 and 9, see Table A.3 in the Annex) provide results that are relatively similar to the Index ($r_S \geq 0.94$). To give an example, had a multi-criteria aggregation rule been used with the original weighting scheme (Figure 5), the median impact on the Index ranking would have been two positions, and the most affected countries would have been Swaziland (with a twelve-position change), Mauritania and Angola (seven positions). This conclusion supports the methodological approach used by the developers, which, despite its linear form, provides a ranking that is not particularly affected by compensability issues.

Upon granting some flexibility to each country in the assignment of the weights, the cross-efficiency DEA ranking presents a strong association with the Index ($r_S = 0.984$). The median impact on the Index ranking would be just one position, and the most affected country would be Congo (with a six-position change), as shown in Figure 5. This result shows that even if the ensemble of the 48 "country-specific weighting schemes" had been employed to build the Index of African Governance, as opposed to a single and fixed set of weights for all countries, the picture of the state of governance in African countries would not have been substantially affected.

Figure 5. Impact of selected scenarios on the Index ranking



Notes: (Top graph) Country rank changes with respect to the original rank are due to the application of a multi-criteria analysis aggregation rule combined with the original weighting scheme. (Bottom graph) Country rank changes with respect to the original rank are due to the application of a cross-efficiency Data Envelopment Analysis.

Having carried out an uncertainty and sensitivity analysis of the 2006 Index of African Governance, which showed that the results are, in most cases, reliable estimates of governance issues in African countries, we show next how the Index can be used to extract data-driven narratives, in addition to those provided already by the developers in the relevant report (Rotberg and Gisselquist, 2008).

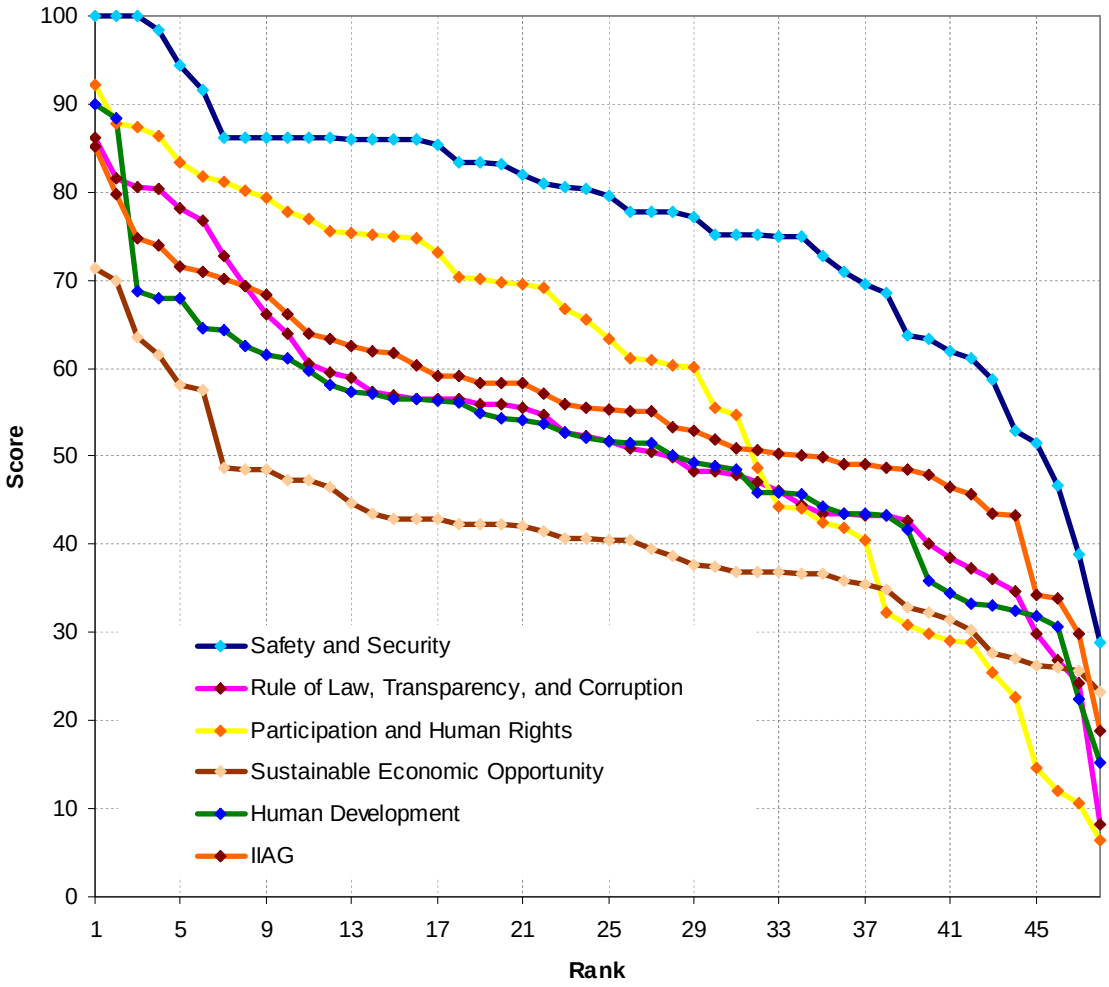
7. Policy implications

The Index and pillar scores capture different aspects of governance and provide good material for the analysis of governance in African countries south of Sahara. A high Index (or pillar) score means that a particular country has better governance conditions for economic and social prosperity. Although not the sole factor contributing to such success, good governance is increasingly important in competitive economies. While an African country will score higher than some and lower than others, the purpose of the Index of African Governance is not to identify winners and losers. Instead, the Index is intended to generate a discussion about what factors contribute to the best possible governance conditions.

The relation between the Index (or pillar) scores and the respective ranks for the 48 countries considered are shown in Figure 6. It is interesting to note the differences between two country scores ranked successively along the classification ladder and across the pillars and the Index. For example, in Sustainable Economic Opportunity, the distance between Namibia (6^{th}) and Congo (7^{th}) is 8.7 points, while the average distance between two consecutively ranked counties is merely 1.0 point.

This graph may also provide insight into the nature of policy challenges from the perspective of governance. The best overall performance is found in the Safety and Security pillar, in which three African countries score 100.0 points (Cape Verde, Gabon, Sao Tome and Principe) and all but three countries (Central African Republic, Somalia, Sudan) obtain scores greater than 50 points. The curve of Rule of Law, Transparency and Corruption pillar closely follows that of the overall Index. There is one pillar in which all countries' performance is particularly worrying: Sustainable Economic Opportunity. Only six countries manage to score more than 50 points (Botswana, Gabon, Mauritius, Namibia, Seychelles, South Africa). This suggests that the four components of this pillar, namely Wealth Creation, Macroeconomic Stability and Financial Integrity, Arteries of Commerce, and Environmental Sensitivity, represent distinct and difficult policy challenges for the African governments.

Figure 6. 2006 Index and pillar scores (and ranks)



7.1 Exceptional behaviour of some African countries

The 2006 Index shows that there is no ideal African state south of the Sahara excelling in all 14 sub-pillars of governance, but rather that there is space for improvement in all countries. One observation is that the top Index scores (Mauritius, Seychelles, Cape Verde, Botswana and South Africa) are all found in the south east of Africa, with the exception of Cape Verde in the north-western part of Africa. These countries share the "best practice cake" of governance in Africa.

Given that the aim of this analysis was not to name and shame, but rather to throw the spotlight on stronger and weaker points, we will discuss the results accordingly.

African countries which perform well in the overall Index generally perform well in all five pillars of governance. The only exception is South Africa, which is ranked 42nd (bottom quartile)

in the Safety and Security pillar, but 4th in the overall Index (top quartile). To see this more clearly, we grouped the countries into four quartiles according to their rank in the overall Index and in each pillar. We will now discuss those countries that belong to the top quartile in the overall Index (or pillar) but simultaneously to the bottom quartile of a given pillar (or Index), and vice versa. Table 13 shows the results. As we suspect, the map of African governance reveals several surprises.

In the Safety and Security pillar, only South Africa stands out, with a very strong performance in the overall Index (2nd) but a very poor performance in this pillar (42nd). The challenges in South Africa lie in decreasing the "Ease of Access to Small Arms and Light Weapons" and the level of "Violent Crime (Homicides)". The opposite is not observed, i.e. no country performs in the top quartile in the Safety and Security pillar but in the bottom quartile in the overall Index. In the Rule of Law, Transparency and Corruption pillar, there are no peculiarities to report and the levels of performance follow that of the overall Index. In the Participation and Human Rights pillar only Liberia stands out. Liberia performs in the top quartile in Participation and Human Rights (2nd), but is at 38th position in the overall Index classification. This country is particularly weak in the majority of the indicators underlying three pillars: Rule of Law, Transparency, and Corruption; Sustainable Economic Opportunity; Human Development. In the Sustainable and Economic Opportunity pillar only Equatorial Guinea stands out, with top performance in this pillar (9th) but taking only 36th position in the overall Index classification. This country is particularly weak in several indicators underlying three pillars: Rule of Law, Transparency, and Corruption; Participation and Human Rights; and Human Development. Finally, in the Human Development pillar only Sudan stands out, with a relatively good performance in this pillar (12th position), while taking 45th position in the overall Index classification. This country is particularly weak in many of the indicators that belong to three pillars: Safety and Security; Rule of Law, Transparency, Corruption; Participation and Human Rights.

Table 13. Comparison of the Index ranks versus the five pillar ranks (top/bottom quartiles)

	Index of African Governance	
	Top 25%	Bottom 25%
Safety and Security		
Top 25%		-
Bottom 25%	South Africa (42nd, 5th)	
Rule of Law, Transparency, and Corruption		-
Top 25%		
Bottom 25%	-	
Participation and Human Rights		
Top 25%		Liberia (2nd, 38th)
Bottom 25%	-	
Sustainable Economic Opportunity		
Top 25%		Equatorial Guinea (9th, 36th)
Bottom 25%	-	
Human Development		
Top 25%		Sudan (12th, 45th)
Bottom 25%	-	

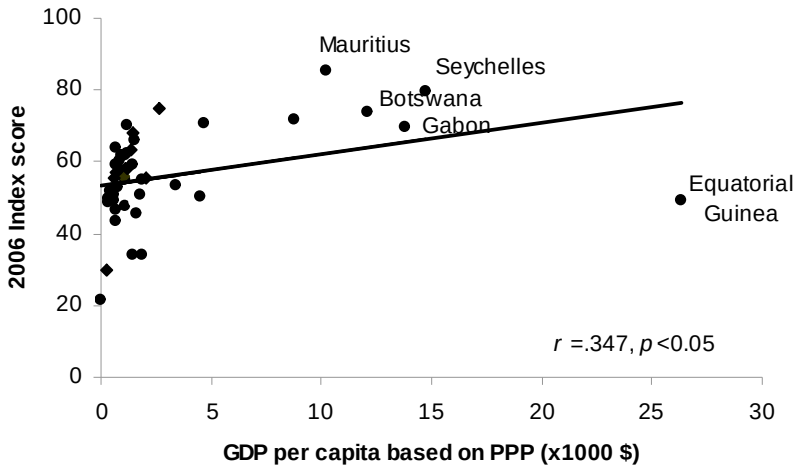
7.2. African Governance – what it is and is not about

This section analyses the Index of African Governance scores in relation to possible determinants of governance success. In particular, we explore the correlation between the Index and (1) GDP per capita; (2) Judicial independence using Freedom House's Rule of Law; (3) Public Sector Corruption; (4) Respect for Civil Rights; (5) Child Mortality, (6) Access to Drinking Water; (7) Primary School Completion Rate. We also explore what the Index of African Governance does not capture, contrary to what common expectations or the conceptual framework would suggest.

GDP per capita

Though statistically significant, the correlation between GDP per capita and the Index of African Governance is very low ($r = .347$). In fact, Figure 7 confirms the high variation in the Index scores at every income level, in particular for 42 African countries at levels lower than $5000. Equatorial Guinea, which has the highest GDP per capita among the countries studied ($26,300), scores only 49.2 points in the overall Index (36th position). Beneath the aggregation level of the Index, the only pillar that demonstrates a good relationship to income is the Sustainable Economic Opportunity, as expected. All other pillars of Governance have a very low or insignificant association with GDP per capita. Intuitively, this result is desirable, as it confirms that good governance goes much beyond income benefits and captures more diverse aspects, such as safety and security, transparency and corruption.

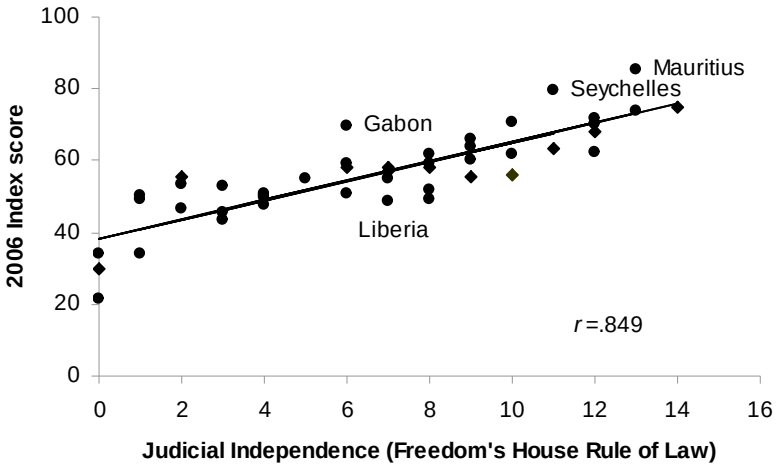
Figure 7. Index of African Governance vs. GDP per capita



Judicial Independence- Freedom House's Rule of Law

Figure 8 shows a strong relationship ($r = .849$) between governance and judicial independence as measured by the Freedom House's Rule of Law. The "Rule of Law" index is intended to assess the independence of the judiciary, civilian control of the police, protection from political terror, and equal treatment across various groups. It thus comes as no surprise that "Rule of Law" explains a significant part of the variance in the overall Governance scores.

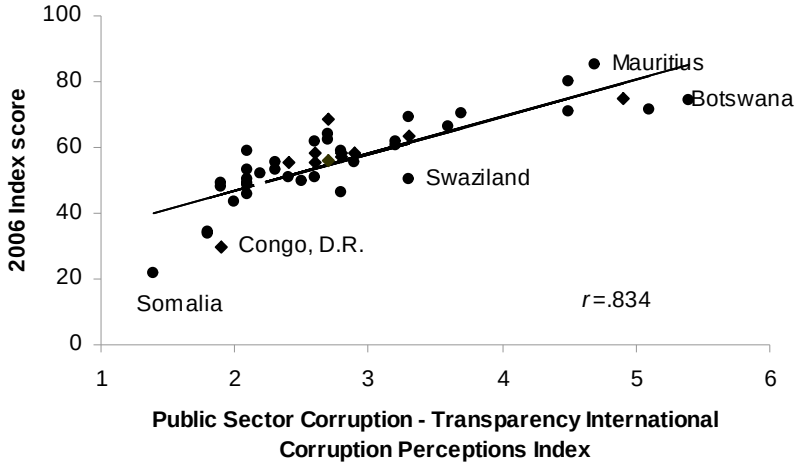
Figure 8. Index of African Governance vs. Judicial Independence



Public Sector Corruption- Transparency International's Corruption Perceptions Index

The relationship between the Index of African Governance scores and Public Sector Corruption is very similar to that between the Index and Freedom House's Rule of Law ($r = .834$, Figure 9). Given the lack of official statistics on corruption, the developers relied on the industry standard, Transparency International's Corruption Perception Index (CPI), which draws on multiple expert opinion surveys of perceptions of public sector corruption. Low CPI values indicate high levels of perceived corruption. The African countries with the highest CPI scores have the lowest variance in governance and show up at the top of the Index of African Governance distribution. Countries with lower CPI scores (higher perceived corruption) show consistently lower Governance scores.

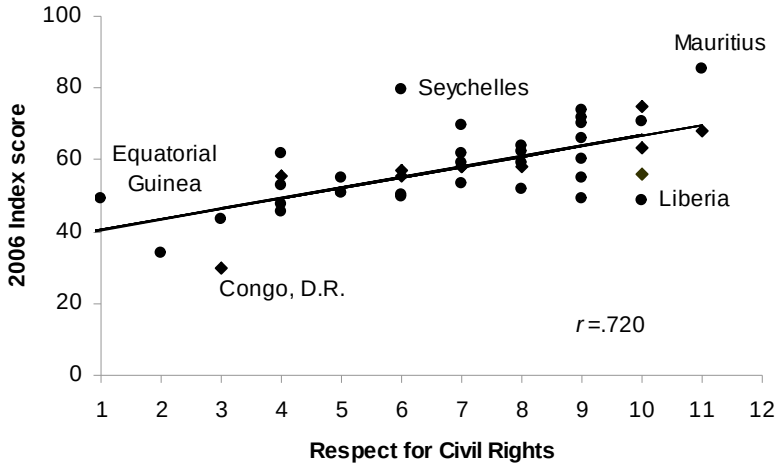
Figure 9. Index of African Governance vs. Public Sector Corruption



Respect for Civil Rights

To measure respect for civil rights, the Index of African Governance uses the "Empowerment Rights Index" (encompassing freedom of movement, freedom of speech, worker's rights, political participation and freedom of religion) and the indicator on "Freedom of Assembly and Association" from the Cingranelli-Richards (CIRI) Human Rights Dataset. Thus, the positive relationship ($r = .720$) between the Index of African Governance and respect for civil rights suggests that the latter is a prerequisite for achieving good governance results in African countries (see Figure 10).

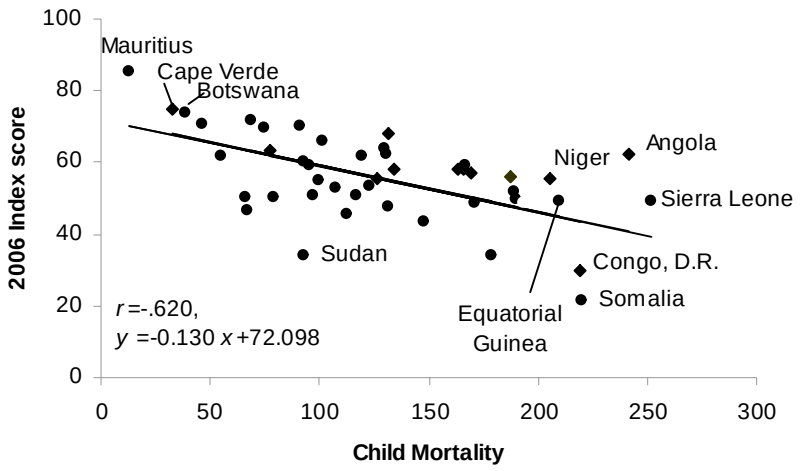
Figure 10. Index of African Governance vs. Respect for Civil Rights



Child Mortality

Child mortality under the age of five is considered a key indicator of health outcomes and a result of good governance. The importance of reducing child mortality is also stressed in the Millennium Development Goals (Goal 4). The strong negative association between the Index of Governance scores and child mortality rates ($r = -.620$) suggests that, in general, good governance leads to lower mortality rates and vice versa, and that a five-point increase in the Index of African Governance score is associated with a 38.5 decrease in the mortality rate (Figure 11). However, Figure 11 shows that African countries with the lowest mortality rates have the lowest variance in governance and show up in the top of the Index of African Governance distribution. In fact, the three lowest mortality rates in African countries (<40.0 per 1000 live births in 2006) are obtained by Mauritius, Cape Verde and Botswana, which are ranked in the top four of the overall Index. The opposite is not equally evident. In fact, African countries with high mortality rates have higher variance in governance. For example, mortality rates greater than 200 per 1000 live births are found in six countries – Angola, Congo Dem. Rep., Equatorial Guinea, Niger, Sierra Leone, and Somalia – but these countries score between 21.7 and 55.5 points in the overall Index of African Governance.

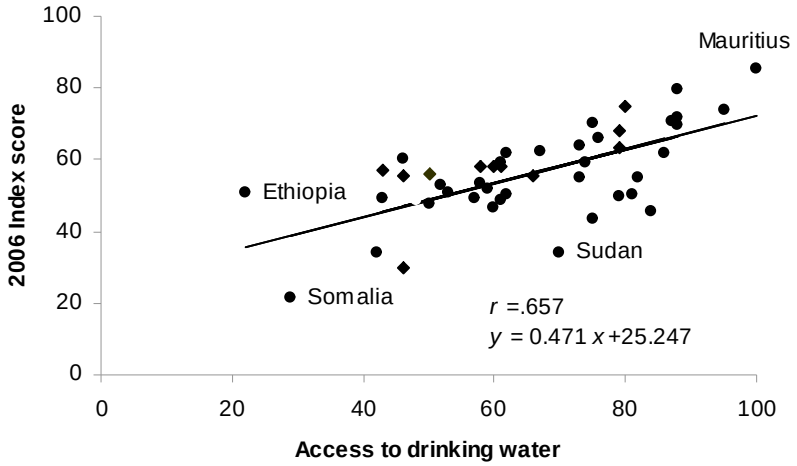
Figure 11. Index of African Governance vs. Child Mortality



Access to Drinking Water

Access to potable water measures the percentage of the population with access to drinking water and ranges between roughly 22% of the population in Ethiopia to 100% in Mauritius. The good positive association between the Index of Governance scores and access to drinking water ($r = .657$) suggests that, in general, good governance leads to high access to potable water and vice versa. This is confirmed in Figure 12 along the entire distribution range. Furthermore, a five-point increase in the Index of African Governance score is associated with a 10.6 increase in the percentage of population with access to potable water.

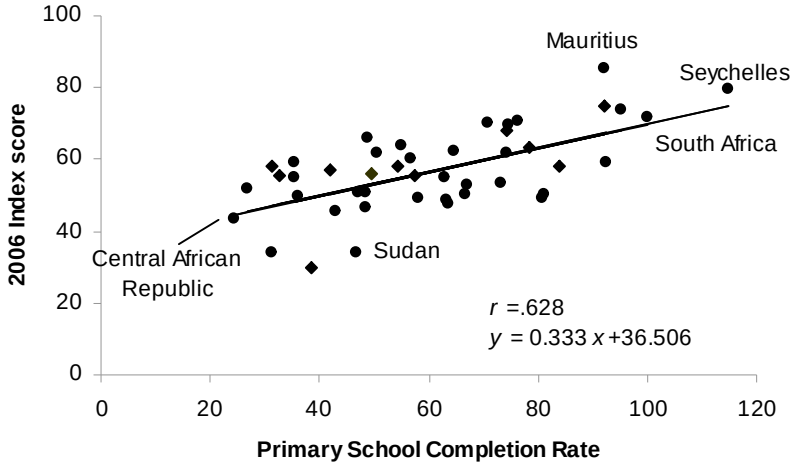
Figure 12. Index of African Governance vs. Access to drinking water



Primary School Completion Rate

Primary school completion rates range between 24.3% in Central African Rep. to over 100% in Seychelles and South Africa. The good positive association between the Index of Governance scores and primary school completion rate ($r = .628$) suggests that, in general, good governance leads to high primary school completion rates and vice versa (Figure 13). Overall, a five-point increase in the Index of African Governance score is associated with a 15.0 increase in the primary school completion rate.

Figure 13. Index of African Governance vs. Primary School Completion Rate



Less influential aspects in African Governance

What about other important indicators of governance, such as GDP growth and inequality of income (Gini index), which were included in the conceptual framework for the Index? Figure 14 to Figure 17 show that the Index scores are randomly associated with GDP growth, inflation, income inequality and HIV prevalence. In fact, the correlation coefficient is in all cases lower than 0.28 (absolute value) and the 95% confidence interval for the slope includes zero in all regressions. These results do not imply that keeping inflation, income inequality and HIV prevalence at low levels, and GDP growth at high levels, should not be among the policy objectives of governments in African countries. They simply point to the fact that, even if governments made an effort to improve these aspects, the effort would not be captured by the Index of African Governance. The complete list of indicators which were included in the conceptual framework of African Governance but which are randomly associated with the overall Index scores were presented in Table 5. These conclusions need to be taken into consideration when interpreting the results of the Index.

Figure 14. Index of African Governance vs. GDP Growth

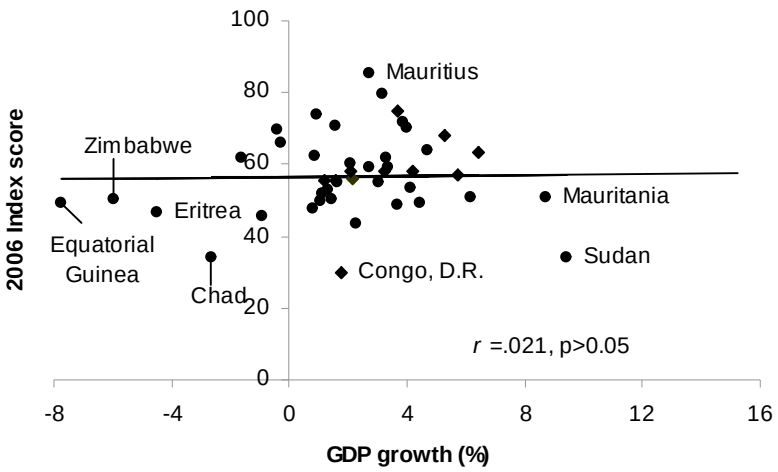


Figure 15. Index of African Governance vs. Inflation

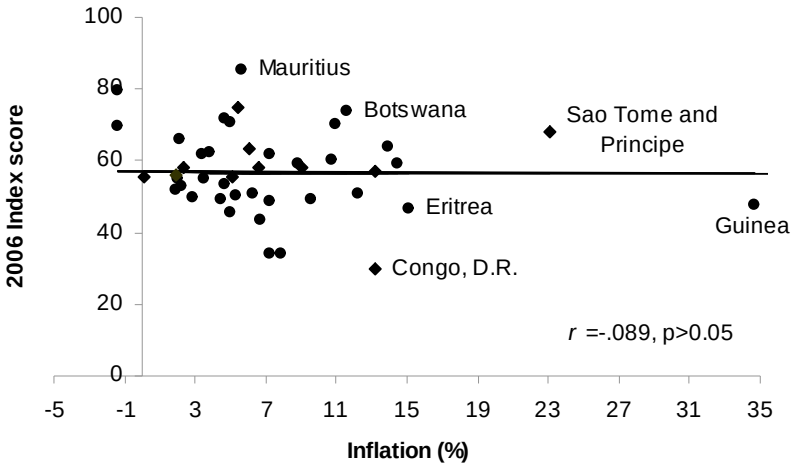


Figure 16. Index of African Governance vs. Gini Index

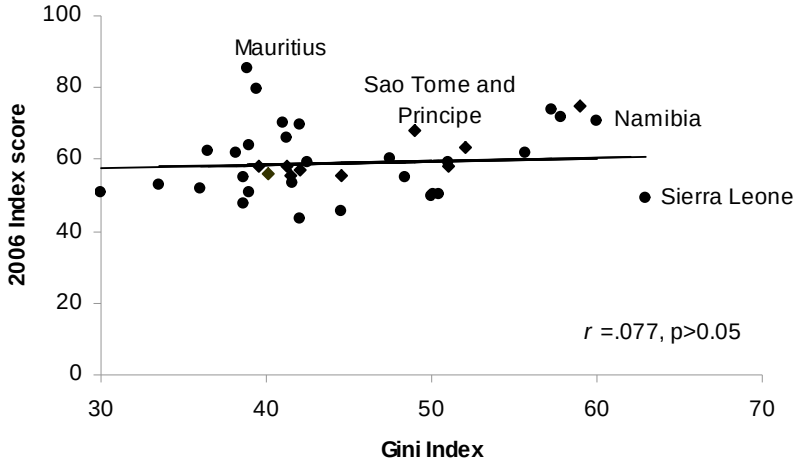
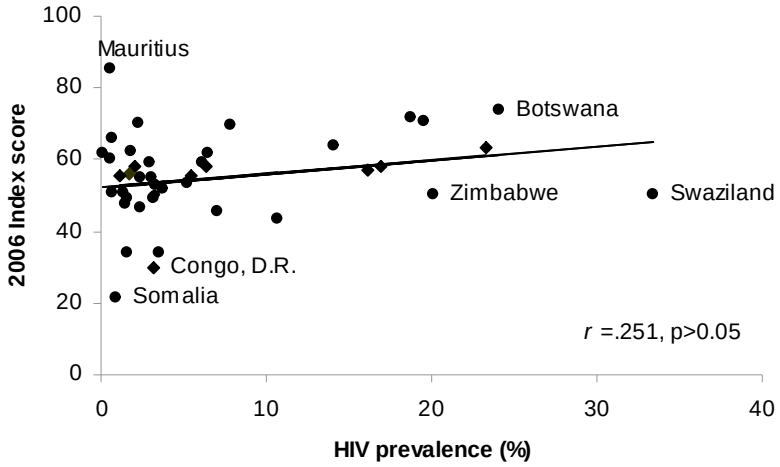


Figure 17. Index of African Governance vs. HIV Prevalence

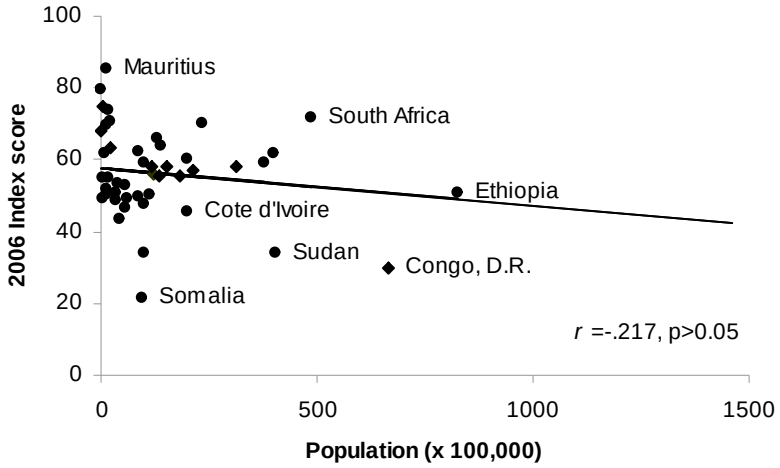


7.3 Index of African Governance and population size

A question on whether population size can favour governance can be raised. In African countries south of the Sahara, the 2006 Index results show that there is no clear pattern as to whether population size has a positive or negative impact on governance (Figure 18). The association

between the Index scores and population is not statistically significant ($r = –0.217, p > 0.05$). This result shows that population size is not a determinant in good governance.

Figure 18. Index of African Governance vs. Population Size



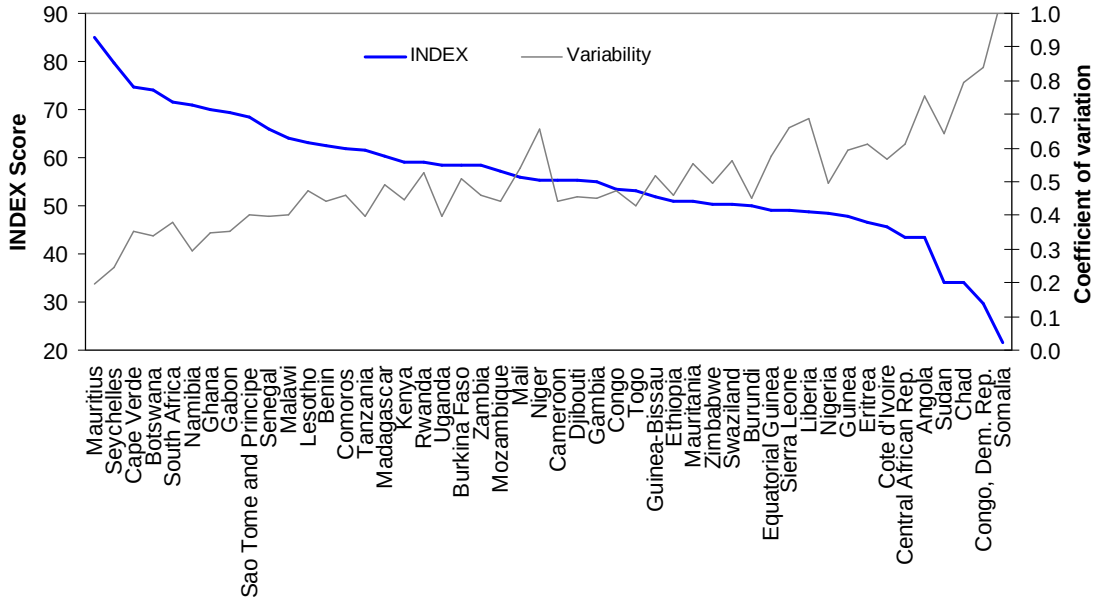
7.4. Index of African Governance & variability

To conclude the discussion on policy implications, we consider the relationship between the Index scores and the variability (=coefficient of variation) in the set of 14 sub-pillars comprising the governance framework. The countries situated high or mid-range in the Index tend to score uniformly high in the majority of the sub-pillars. In other words, these countries display a relatively low variability. Figure 19 shows that variability increases moving down the list in decreasing order of the Index scores. This scissors pattern is evident and pronounced. The correlation between the Index and the coefficient of variation series is equal to $r = –0.908$, indicating *a high degree of reverse association between the Index scores and variability in the underlying sub-pillars*. For comparison purposes, in the case of the Trade and Development Index (UNCTD, 2005), which is based on eleven components and 110 countries, the correlation coefficient between the index scores and the coefficient of variation was slightly ($r = –0.93$). By contrast, in the case of the Composite Learning Index (CCL, 2007), which is based on seventeen indicators and 4567 communities in Canada, the correlation coefficient between the index scores and the coefficients of variation series was much lower ($r = –0.61$).

An implication of this finding is that while changes in the Index scores over time could be regarded as a quantitative indication of trends in governance in Africa, those in respect of the variability could be seen as qualitative changes. Reducing even further the variability in the sub-pillars should be among the objectives of governance policies and strategies in Africa. To be

successful, an African country should put simultaneous efforts into achieving multiple goals within a coherent governance strategy, while also focussing on the reduction of existing gaps in performance. As the exceptional behaviour of a few countries (e.g. Liberia, Equatorial Guinea and Sudan) indicates – i.e. countries which have very low overall Index performance but very high performance in just one of the five pillars of governance (see results in Table 13) – a disproportionate emphasis on a limited number of objectives without concomitant focus on the many other determinants of governance can yield only marginal results. By demonstrating significant inter-country differences in the values of the coefficient of variation, the scissors diagram (Figure 19) points to the importance of country-specific approaches to governance strategies. At the same time, however, there is no way that these variations in the different governance-related issues will be reduced without coherence between policy- and law-making, on the one hand, and strategies, partnership and solidarity, on the other.

Figure 19. The scissor diagram of the Index of African Governance and Variability



8. Conclusions

The Index of African Governance, developed by the Harvard Kennedy School (Rotberg and Gisselquiest, 2008) distils key aspects of governance in five main dimensions:

a. *Safety and Security*,
b. *Rule of Law, Transparency, and Corruption*,
c. *Participation and Human Rights*,
d. *Sustainable Economic Opportunity*, and
e. *Human Development*.

These dimensions of governance range from National Security and Participation in Elections to Environmental Sensitivity, Poverty and Education. A total of 57 indicators is included in the conceptual framework for the Index. As always when combining statistical indicators to capture a complex dimension, the Index of African Governance is a mixture of analysis and advocacy related to the political priorities of 48 African countries south of the Sahara.

Important findings suggest that:

- The performance of African countries is in general satisfactory in four of the five pillars. However, the Sustainable Economic Opportunity pillar, which captures issues of Wealth Creation, Macroeconomic Stability and Financial Integrity, Arteries of Commerce, and Environmental Sensitivity, represents the main challenge for the majority of the countries: only six countries manage to score more than 50 points (Botswana, Gabon, Mauritius, Namibia, Seychelles, South Africa).
- There is only one country, South Africa, which scores at the top of the Index (2^{nd}) but has a very poor performance in one of the pillars, coming 42^{nd} in Safety and Security. The challenges in South Africa lie in decreasing the "Ease of Access to Small Arms and Light Weapons" and the number of "Violent Crime (Homicides)". No other country makes it to the top of the Index without scoring moderately to highly in all five pillars of governance. The opposite, however, is observed for three countries whose overall Index score is in the bottom quartile, while scoring in the top quartile in one of the pillars: Liberia has top performance in Participation and Human Rights (2nd), Equatorial Guinea in Sustainable and Economic Opportunity (9th), and Sudan in Human Development (12^{th}).
- Possible determinants of governance success in African countries are, among others, (1) Judicial Independence using Freedom House's Rule of Law; (2) Public Sector Corruption;

(3) Respect for Civil rights; (4) Child Mortality, (5) Access to Drinking Water; and (6) Primary School Completion Rate.

- Other important aspects of governance, such as GDP growth, inflation, income inequality and HIV prevalence, although they were included in the conceptual framework, do not bear any statistically significant association to the Index scores. These results do not imply that keeping inflation, income inequality and HIV prevalence at low levels, and GDP growth at high levels, should not be among the policy objectives of governments in African countries. They simply point to the fact that even if governments made an effort to improve these aspects, the effort would not be captured by the Index of African Governance. The same comment holds for other indicators, such as Number of Days to Settle a Contract Dispute, Deficits/Surplus as a % of GDP, Business Environment, Incidence of Tuberculosis, and Progression to Secondary School.
- Regarding an eventual question of whether population size can favour governance , in African countries south of the Sahara, the 2006 Index results show that there is no clear pattern as to whether population size can have a positive or negative impact on governance (regression coefficients either very low or not statistically significant).
- There is a high degree of reverse association ($r = -0.908$) between the Index scores and the variability in the 14 sub-pillars. An implication of this finding is that while changes in the Index scores over time could be regarded as a quantitative indication of trends in governance in Africa, those in respect of the variability could be seen as indicating qualitative changes. To be successful, an African country must put simultaneous efforts into achieving multiple goals within a coherent governance strategy, while working towards the reduction of existing gaps performance. As the exceptional behaviour of a few countries indicates (i.e. countries which have very low overall Index performance but very high performance in just one of the five pillars of governance, e.g. Liberia, Equatorial Guinea and Sudan), a disproportionate emphasis on a limited number of objectives without concomitant focus on the many other the determinants of governance can yield only marginal results.

We subjected the Index to thorough validity testing. First, we conducted an internal consistency check to assess whether the conceptual framework was confirmed by the statistical analysis and whether there were any potential pitfalls. Within this context, we suggested merging some categorical values in four qualitative indicators: Ratification of Core International Human Rights Conventions, Property Rights Index, Respect for Physical Integrity Rights and Respect for Civil Rights. We also confirmed the conceptual framework and its splitting into pillars and sub-pillars

by means of (linear or non-linear) Principal Component Analysis. The impact of choosing an equal weighting within each pillar, as preferred by the developers, versus a PCA-based weighting to estimate the pillar ranking, was also estimated and was found to be non-important in the case of four of the five pillars. Only the pillar on Sustainable Economic Opportunity needs to be treated with caution due to missing data, in particular on the Environmental Sensitivity index. The original approach to estimating missing data by mean substitution is not particularly apt, as discussed in Sect. 3; hot-deck imputation is recommended instead. Despite these pitfalls, the Index of African Governance is supported by more sophisticated statistical analysis, and has the advantage of computational simplicity.

Among the good features of the Index, we would also stress three points:

- All correlations between the overall Index scores and each of the five pillar scores are positive and relatively high ($r = 0.69 - 0.89$). This shows that the pillars and the Index point in the same direction and that there are no trade-offs between the main pillars of the composite indicator.
- Overall, there is no strong dominance issue, neither at the sub-pillar nor at the pillar level. However, given that the variance of the pillar on Participation and Human Rights is twice or even almost five times greater than the variance of the other pillar scores, it seems that this pillar has a higher discriminating power among the Index scores compared to the other pillars, despite the equal weighting of the five pillars. This phenomenon could be avoided by standardising the five pillar scores prior to finally aggregating them into an overall Index score. The same remark, at the sub-pillar level, holds for Participation in Elections.
- The overall Index reflects, without distortion, the information content in the dataset, given the compatibility of the cluster analysis results at the sub-pillar level and the pillar level.

Second, we conducted an uncertainty analysis to assess the impact on the Index ranking of simultaneous variations in the methodological assumptions related to the weighting scheme, the aggregation method and the number of sub-pillars included in the framework. The effect proved to be acceptable for the vast majority of the countries, but important for seven countries: Rwanda, Mali, Niger, Guinea-Bissau, Zambia, Gambia and Nigeria. Any Index-driven narrative on those countries should be considered only as suggestive and contingent on the original methodological assumptions made in developing the Index. Overall, the Index of African Governance gives a fair representation of the ensemble of models considered and, consequently,

it is a construct that African governments could relate to and utilise. The sensitivity analysis results indicated that although the different scenarios produce relatively different rankings compared to the original Index ranking, on average these rankings are very similar to the 2006 Index ranking. The Spearman correlation between the 2006 Index ranking and the most extreme scenario is 0.872, and the correlation between the 2006 Index ranking and the most extreme scenario employing the full framework of 14 sub-pillars is 0.936. Additionally, the scenarios which employ a multi-criteria analysis aggregation rule produce results that are relatively similar to the Index ranking ($r_S \geq 0.94$). This conclusion supports the methodological approach used by the developers, which, despite its linear form, provides a ranking that is not particularly affected by compensability issues. Finally, the strong correlation between the Index ranking and the cross-efficiency DEA ranking ($r_S = 0.984$) suggests that even if the ensemble of the 48 "country-specific weighting schemes" had been employed to build the Index of African Governance, as opposed to a single and fixed set of weights for all countries, the picture of the state of governance in African countries would not have been substantially affected.

The Index of African Governance, having passed the "statistical" filters of index quality, can reliably be used to measure governance in countries south of the Sahara, to identify weaknesses and propose remedial actions. From the point of view of implications, the assessment carried out on the Index does not represent merely a methodological or technical appendage. Composite measures are often attached to regulatory mechanisms whereby governments or organizations are rewarded or penalised according to the results of such measurements. The use and publication of composite measures can generate both positive and negative behavioural responses and if significant policy and practice decisions rest on the results, it is important to have a clear understanding of the potential risks involved in constructing a composite and arriving at a ranking or benchmarking.

The analysis undertaken in this work provides no guarantee of the true ability of the Index to describe governance in African countries. Yet, it provides enough evidence that the Index of African Governance, tailored to the specific policy objectives and priorities in countries south of Sahara, cannot easily be falsified.

ANNEX: Methodological boxes and additional information

Box 1. PCA and Non-linear PCA, FA, Reliability Item Analysis and their role in the study of the Index of African Governance

Principal component analysis (PCA) is a multivariate statistical approach that essentially identifies patterns inherent in a multivariate model with a view to reducing the dimensionality in a set of variables, and/or to transforming interdependent variables into significant and independent ones (Manly, 1994; Dunteman, 1989). Classical PCA is used for quantitative indicators, while non-linear PCA is used for categorical indicators or mixed ones (Gifi, 1990, Michailidis and de Leeuw, 1998).
PCA summarizes a *p*-dimensional dataset into a smaller number, *q*, of dimensions while preserving the variation in the data to the maximum extent possible. The *q* new dimensions are constructed such that:

1. They are linear combinations of the original variables;
2. They are independent of each other;
3. Each dimension captures a successively smaller amount of the total variation in the data.

These features of PCA justify its use as a tool to investigate the relationships between the selected indicators of lifelong learning. The objective was to capture those features in the data that help better understand lifelong learning or to discover interesting new patterns among the relationships between the indicators of learning. The p original indicators, per pillar of learning, were combined into q linear combinations, which form the new principal components of the system. A linear combination $Z_i, i = 1,..., p$ of a standardized data vector, $X = (x_1, x_2, ..., x_p)$ is defined as:

$$Z_1 = a_{11}x_1 + a_{12}x_2 + ... + a_{1p}x_p$$
$$Z_2 = a_{21}x_1 + a_{22}x_2 + ... + a_{2p}x_p$$
...
$$Z_p = a_{p1}x_1 + a_{p2}x_2 + ... + a_{pp}x_p$$

where $a_{11}^2 + a_{12}^2 + ... + a_{1p}^2 = 1$, $a_{21}^2 + a_{22}^2 + ... + a_{2p}^2 = 1$, etc. The coefficients α_{ij} are chosen so that the explained variance of the original data is maximized (i.e. the squared difference of the new variable values and their respective means is maximized in relation to the total variance of the untransformed data). The results for $a_{11}, a_{12}, ..a_{1p}$ determine the first principal component. The second principal component with coefficients $a_{21}, a_{22}, ..a_{2p}$ is then obtained analogously by maximizing the variance orthogonal to the direction of the first component, and so forth. Orthogonality of the principal components means that they are statistically independent so that any changes in one component do not impact the others. This is sometimes a desirable feature of composite indicators.

The consecutive process of maximizing residual variance implies that at every step less variance is remaining. Once it falls below a specified threshold, the procedure is stopped and no additional principal components are calculated. Several criteria exist to determine the threshold value. Several methods consider the eigenvalues of the data matrix. The eigenvalue, λ, is the value that solves the detrimental equation: $|R - \lambda I| = 0$, where R is the $(p \times p)$ correlation matrix calculated from standardised data for the $n = 48$ African countries and p indicators (or sub-pillars) and I is the identity matrix. This provides a *p*-th degree polynomial equation in λ and hence K roots. These roots are called eigenvalues of the correlation matrix R. Next λ is arranged in descending order of magnitude, as $\lambda_1 > \lambda_2 > ... > \lambda_p$. Corresponding to each value

of λ , the matrix equation $(R-\lambda I)a=0$ is solved for the $p\times 1$ eigenvectors a, subject to the condition that $a'a=1$ (normalization condition).

Standard practice is to choose relevant dimensions (principal components) if they: (a) have associated eigenvalues greaten than 1.0 (Kaiser's rule); 2. individually account to total variance by more than 10%; 3. cumulatively contribute to total variance by more than 60% (OECD, 2008). A more conservative Joliffe criterion suggests choosing relevant dimensions whose eigenvalue is greater than 0.7. These criteria were used in the analysis of the dataset (at the indicators' and at the sub-pillars' level) for the Index of African Governance.

Non-linear PCA, also called Categorical PCA has been specifically developed to handle categorical indicators or indicators of both qualitative and quantitative type (Gifi, 1990, Michailidis and de Leeuw, 1998). Non-linear PCA is a particular exploratory analysis technique which allows for synthesizing variables in one or more dimensions simultaneously preserving measurement levels of categorical data. It is then capable of handling at the same time qualitative (with either ordered or non ordered categories) and quantitative indicators. In the case of qualitative indicators with ordered categories the method provides a quantification of categories for each indicator while preserving their relative order. In other terms, if the measurement level of an indicator is 'low'; 'medium', 'high' the corresponding quantified indicator will assume three not-decreasing numerical values associated respectively to the 'low', 'medium' and 'high' category. Equal quantifications are allowed, in this case two different original categories are associated to the same value. This often implies category redundancy helping the optimization of the related survey.
The method is based on an algorithm which simultaneously computes optimal quantification of ordinal variables and scores of dimensions of the reduced space.
Major outputs of the methods are optimal category quantifications of qualitative indicators, loadings of indicators and standardized unit scores. The interpretation of major outputs are similar to that offered by standard PCA. Still it is worth noting that, unlike standard PCA, in non-linear PCA the solutions in subspaces of different dimensions are not nested. This means that, once the relevant dimensions are identified, the model has to be re-run again with that exact number of dimensions..

Factor analysis (FA) is similar to PCA. It also aims at describing the set of p indicators $X=(x_1,x_2,...,x_p)$ in terms of a smaller number of q factors, and highlight the relationship between these variables. However, whereas PCA simply is based on linear data combinations, FA is based on a rather special model that assumes that the data are composed of common and unique factors, and consequently, that the data variance can be decomposed into that accounted for by the common and the unique factors. The model is given by:

$$x_1 = a_{11}F_1 + a_{12}F_2 + ... + a_{1q}F_q + \varepsilon_1$$
$$x_2 = a_{21}F_1 + a_{22}F_2 + ... + a_{2q}F_q + \varepsilon_2$$
$$...$$
$$x_p = a_{p1}F_1 + a_{p2}F_2 + ... + a_{pq}F_q + \varepsilon_p$$

As previously $x_i (i=1,...,p)$ represents the original variables (but standardized with zero mean and unit variance); $a_{i1}, a_{i2}, ..a_{1p}$ are called factor loadings related to the variable x_i; $F_1, F_2, ..., F_q$ are the uncorrelated common factors, each with zero mean and unit variance; and $\varepsilon_1, \varepsilon_2, ..., \varepsilon_p$ are the specific factors assumed to be independently and identically distributed with zero mean. There are several approaches to deal with this FA model, e.g. communalities,

maximum likelihood factors, centroid method, principal axis method, etc. The most common is the use of PCA to extract the first q principal components and consider them as factors and neglect the remaining. Principal components factor analysis is most preferred in the development of composite indicators, e.g., Product Market Regulation Index (Nicoletti et al., 2000), as it has the virtue of simplicity and ensures that the resulting factors account for a large part of the cross-community variance of the underlying indicators. In fact, in factor analysis the focus is set only on those indicators of lifelong learning that are potentially useful for explaining the cross-community variation in learning environments (indicators values that are similar across communities are of little interest and cannot possibly explain differences in overall performance). Thus, the factors are constructed without pre-empting the conclusions of the analysis, since analyst's beliefs are not considered.

Factor analysis was used in some of the alternative scenarios to build the Index of African Governance (e.g., Scenario 4, 5, etc.). After choosing the number of factors to keep, we applied rotation, a standard step that aims at performed to enhance the interpretability of the results (Darton, 1980). The sum of eigenvalues is not affected by rotation, but changing the axes, will alter the eigenvalues of particular factors and will change the factor loadings. There are various rotational strategies that have been proposed in the literature. The goal of all of these strategies is to obtain a clear pattern of loadings. However, different rotations imply different loadings, and thus different meanings of principal components - a problem some cite as a drawback to the method. We used the most common rotation method, the "varimax rotation".

Cronbach's alpha allows to study the internal consistency of groups of indicators by indicating the extend to which a set of indicators can be treated as measuring a single latent phenomenon (Cronbach, 1951). Cronbach's can take values between negative infinity and 1, although only positive values make sense. If a scale has an alpha above 0.60, it is usually considered to be internally consistent, even if some authors suggest higher thresholds: for instance 0.7 by Nunnally (1978) or 0.80 by De Vellis (1991). This approach was used to confirm the single latent phenomenon captured by the indicators underlying single sub-pillars (e.g., in the case of six indicators under the National Security sub-pillar, or three indicators under the Ratification of Norms sub-pillar).

Box 2. Cluster Analysis and its role in the analysis of the Index of African Governance

Cluster analysis refers to a rich suite of statistical classification methods used to determine similarities or dissimilarities of objects in large datasets (see Kaufman and Rousseeuw, 1990 for a broad introduction to this field). We used this technique to identify groups of the 48 countries south of Sahara according to the 14 sub-pillars of governance. Within each cluster, countries have a better basis for benchmarking their governance policies and priorities and identifying best practices (thus setting short-term targets) because the members of the cluster are similar with respect to the data used to classify them and the differences across the groups are maximized.

In this context, the question of interest in carrying out a cluster analysis of the 14 sub-pillars of Governance (without assuming a five pillar structure, for the moment) is whether there are similarities among African countries in their governance related issues.

There is no best method for cluster analysis and the results of cluster analyses are subject to interpretation. Therefore, we applied two different algorithms. Specifically, we explored the data structure using a non-parametric, distance-based agglomerative clustering algorithm known as Ward's method. A feature of agglomerative clustering is that it starts with as many individual clusters as there are countries. It then successively combines countries that are most similar to each other with respect to a quantitative similarity measure until all countries are joined in a single cluster. The similarity measure decreases during this process, while the within-cluster dissimilarity increases as more and more countries are added.

The trade-off lies therefore in choosing a similarity measure, or "pruning value," that yields both a relatively small number of clusters and a high level of similarity. We determine that three clusters yield a reasonable division between the 48 African countries. After determining the number of clusters, we use the *k*-means clustering method developed by Hartigan and Wong (1979) to determine cluster membership. *k*-means is a non-hierarchical method that requires that the number of clusters, *k*, be specified upfront (hence the preliminary use of Ward's method) and then iteratively finds the disjoint partition of the objects into *k* homogeneous groups such that the sum of squares within the clusters is minimized. The algorithm converges in fewer than 10 iterations for the 14 sub-pillars and the 48 countries.

Box 3. Multi-criteria Analysis and its role in the robustness analysis of the Index of African Governance

The Index of African Governance is an additive (and linear) model. Some policy analysts challenge aggregations based on additive models, inter alia, because of the undesired, at times, property of compensability, which entails offsetting a disadvantage on many indicators by a sufficiently large advantage on just few indicators, whereas smaller advantages would not do the same. Thus, a preference relation is non-compensatory if no trade-off occurs and is compensatory otherwise. The use of weights, to be attached to the indicators, with intensity of preference originates compensatory multi-criteria methods and gives the meaning of trade-offs to the weights. On the contrary, the use of weights with ordinal criterion scores originates non-compensatory aggregation procedures and gives the weights the meaning of importance coefficients (Keeney and Raiffa, 1976; Podinovskii, 1994). Vansnick (1990) showed that the two main approaches in multi-criteria decision theory i.e., the compensatory and non-compensatory ones can be directly derived from the seminal work of Borda (1784) and Condorcet (1785). Indeed, looking at social choice literature, one can realize that various ranking procedures used in multi-criterion methods have their origins in social choice.

To deal with the issue of eventual compensability among the sub-pillars scores, we build 45 scenarios (out of 150) that employ a multicriteria method. We selected the approach suggested by Brand et al. (2007) for two main reasons: it can deal with a large number of countries, unlike the other currently available Condorcet–type methods (Condorcet, 1785), and it can deal with ties in the indicators scores and also incorporate information on weights, unlike the Borda method (Borda, 1784). Specifically, the algorithm computes scores for a country i as follows:

$$Y_i = \sum_{j=1}^{14} (n_{ij} + \frac{k_{ij}}{2}) \cdot w_j \,,\ 1 \le i \le 48\,,\ \ 1 \le j \le 14$$

where

$n_{ij} \equiv$ number of countries that have weaker performance than country i relative to sub-pillar j, $0 \le n_{ij} \le 47$

$k_{ij} \equiv$ number of countries with equivalent performance to country i relative to sub-pillar j, $0 \le k_{ij} \le 47$

$w_j \equiv$ weight assigned to sub-pillar j

In brief, when country *A* performs better than country *B* for a given sub-pillar, then country *A* gets all the credit (= sub-pillar's weight), whilst country *B* gets zero credit. In case two countries have equal scores in a given sub-pillar, the credit (weight) for that sub-pillar is split equally between the two countries. This way, a country cannot "compensate" for a preponderance of weak performance in few sub-pillars with a small number of exceptionally high scores in few sub-pillars. In other words, to attain a reasonably good score under this approach, a country must devote a reasonable amount of attention to the majority of the sub-pillars of governance. This is not true under additive models that are fully compensatory.

Box 4. Data Envelopment Analysis and its role in the robustness analysis of the Index of African Governance

In absence of reliable information about the true weights to be attached to the 14 sub-pillars of Governance, we endogenously selected those country-specific weights that maximize a country's score with respect to the $n = 48$ countries in the dataset using Data Envelopment Analysis (DEA) (Melyn & Moesen, 1991; Cherchye et al., 2004). This gives the following linear programming problem for each country i:

$$Y_i = \max_{wij} \frac{\sum_{j=1}^{14} y_{ij} w_{ij}}{\max_{y_c \in \{dataset\}} \sum_{j=1}^{14} y_{cj} w_{ij}} \qquad (\textit{bounding constraint})$$

Subject to

$w_{ij} \geq 0$, where $j = 1,...,14$, $i = 1,...,48$ (*non-negativity constraint*)

In this basic programming problem, the weights are non-negative and a country's score is between 0 (worst) and 1 (best).

However, this traditional DEA model, though suitable for classifying countries into efficient and inefficient ones, it is not very appropriate for ranking countries, since the weights are country-specific. Cross efficiency evaluation method, proposed by Sexton, Silkman, and Hogan (1986), is a DEA extension tool that could be utilized to identify good overall performers and rank countries. The main idea is to use DEA in a peer evaluation instead of a self-evaluation. There are at least three advantages for cross-evaluation method. Firstly, it provides a unique ordering of the countries. Secondly, it eliminates unrealistic weight schemes without requiring the elicitation of weight restrictions from application area experts (Anderson, Hollingsworth, & Inman, 2002). Finally, the cross efficiency means can act effectively to differentiate between good and poor performers (Boussofiane, Dyson, & Thanassoulis, 1991). Therefore the cross-evaluation method is widely used for ranking performance of decision making units (Sexton et al., 1986; Shang & Sueyoshi, 1995).

In brief, the linear programming problem is solved for each country and the n sets of weights are used to calculate n DEA scores for each country. The average of those n scores for each country is used for the overall assessment of countries performance and final ranking.

Table A. 1. Checklist for building a composite indicator

Step	Why it is needed
1. Theoretical framework Provides the basis for the selection and combination of variables into a meaningful composite indicator under a fitness-for-purpose principle (involvement of experts and stakeholders is envisaged at this step).	• To get a clear understanding and definition of the multidimensional phenomenon to be measured. • To structure the various sub-groups of the phenomenon (if needed). • To compile a list of selection criteria for the underlying variables, e.g., input, output, process.
2. Data selection Should be based on the analytical soundness, measurability, country coverage, and relevance of the indicators to the phenomenon being measured and relationship to each other. The use of proxy variables should be considered when data are scarce (involvement of experts and stakeholders is envisaged at this step).	• To check the quality of the available indicators. • To discuss the strengths and weaknesses of each selected indicator. • To create a summary table on data characteristics, e.g., availability (across country, time), source, type (hard, soft or input, output, process).
3. Imputation of missing data is needed in order to provide a complete dataset (e.g. by means of single or multiple imputation).	• To estimate missing values. • To provide a measure of the reliability of each imputed value, so as to assess the impact of the imputation on the composite indicator results. • To discuss the presence of outliers in the dataset.
4. Multivariate analysis should be used to study the overall structure of the dataset, assess its suitability, and guide subsequent methodological choices (e.g., weighting, aggregation).	• To check the underlying structure of the data along the two main dimensions, namely individual indicators and countries (by means of suitable multivariate methods, e.g., principal components analysis, cluster analysis). • To identify groups of indicators or groups of countries that are statistically "similar" and provide an interpretation of the results. • To compare the statistically-determined structure of the data set to the theoretical framework and discuss possible differences.
5. Normalisation should be carried out to render the variables comparable.	• To select suitable normalisation procedure(s) that respect both the theoretical framework and the data properties. • To discuss the presence of outliers in the dataset as they may become unintended benchmarks. • To make scale adjustments, if necessary. • To transform highly skewed indicators, if necessary.
6. Weighting and aggregation should be done along the lines of the underlying theoretical framework.	• To select appropriate weighting and aggregation procedure(s) that respect both the theoretical framework and the data properties. • To discuss whether correlation issues among indicators should be accounted for. • To discuss whether compensability among indicators should be allowed.
7. Uncertainty and sensitivity analysis should be undertaken to assess the robustness of the composite indicator in terms of e.g., the mechanism for including or excluding an indicator, the normalisation scheme, the imputation of missing data, the choice of weights, the aggregation method.	• To consider a multi-modelling approach to build the composite indicator, and if available, alternative conceptual scenarios for the selection of the underlying indicators. • To identify all possible sources of uncertainty in the development of the composite indicator and accompany the composite scores and ranks with uncertainty bounds. • To conduct sensitivity analysis of the inference (assumptions) and determine what sources of uncertainty are more influential in the scores and/or ranks.
8. Back to the data is needed to reveal the main drivers for an overall good or bad performance. Transparency is primordial to good analysis and policymaking.	• To profile country performance at the indicator level so as to reveal what is driving the composite indicator results. • To check for correlation and causality (if possible). • to identify if the composite indicator results are overly dominated by few indicators and to explain the relative importance of the sub-components of the composite indicator.
9. Links to other indicators should be made to correlate the composite indicator (or its dimensions) with existing (simple or composite) indicators as well as to identify linkages through regressions.	• To correlate the composite indicator with other relevant measures, taking into consideration the results of sensitivity analysis. • To develop data-driven narratives based on the results.
10. **Visualisation of the results** should receive proper attention, given that the visualisation can influence (or help to enhance) interpretability.	• To identify a coherent set of presentational tools for the targeted audience. • To select the visualisation technique which communicates the most information. • To present the composite indicator results in a clear and accurate manner.

Note: Source OECD (2008) Handbook on composite indicators

Table A. 2. Summary statistics for the Pillars and Sub-pillars of Governance

		Mean	Min	Max	Variance	Skewness
	Pillar					
	Safety and Security	76.6	29.0	100.0	232.6	-1.1
	Rule of Law, Transpar., Corruption	52.6	8.2	86.1	251.4	0.0
	Participation and Human Rights	57.6	6.4	92.2	556.2	-0.6
	Sustainable Economic Opportunity	41.4	23.3	71.4	117.0	0.9
	Human Development	51.1	15.2	89.9	204.8	0.2
	Index of African Governance	55.8	18.9	85.1	158.8	-0.3
	Sub-pillar					
Safety and Security	National Security	87.9	43.4	100.0	130.0	-1.8
	Public Safety	54.2	0.0	100.0	886.5	-0.4
Rule of Law, Transparency, and Corruption	Legal Norms	69.0	16.7	100.0	381.0	-1.0
	Judicial Independence	52.6	0.0	88.0	330.9	-0.4
	Corruption	36.1	8.0	88.0	345.1	1.3
Participation & Human Rights	Participation in elections	57.8	0.0	100.0	1121.2	-0.7
	Civil and Political Rights	57.4	12.9	84.3	303.9	-0.6
Sustainable Economic Opportunity	Wealth Creation	29.5	14.0	57.2	76.6	1.3
	Financial Integrity	75.6	37.5	89.9	92.3	-2.2
	Arteries of Commerce	13.4	1.3	99.8	327.3	3.1
	Environmental Sensitivity	48.1	0.0	100.0	558.7	0.0
Human Development	Poverty	44.2	0.0	91.0	429.6	-0.4
	Health and Sanitation	53.2	30.3	96.5	172.8	1.0
	Education	56.3	0.0	97.2	445.6	-0.2

Table A. 3. Sensitivity analysis results: impact of the assumptions on the Index ranking

Scenario	Weighting	Aggregation	Excluded indicator	50th percentile (shift in rank)	90th percentile (shift in rank)	Spearman rank coefficient (with respect to original ranking)	RMSE (with respect to original ranking)
1	Original	Arithmetic	None	0	0	1.000	0.00
2	Original	Geometric	None	2	5	0.975	3.08
3	Original	MCA	None	2	5	0.970	3.41
4	FA	Arithmetic	None	1	6	0.970	3.36
5	FA	Geometric	None	2	8	0.949	4.41
6	FA	MCA	None	1	9	0.936	4.97
7	EW	Arithmetic	None	1	4	0.989	2.06
8	EW	Geometric	None	2	6	0.959	3.98
9	EW	MCA	None	2	8	0.946	4.53
10	DEA	Arithmetic	None	1	4	0.984	2.52
11	Original	Arithmetic	National Security	0	3	0.995	1.38
12	Original	Arithmetic	Public Safety	1	4	0.988	2.10
13	Original	Arithmetic	Legal Norms	1	2	0.993	1.58
14	Original	Arithmetic	Judicial Independence	1	2	0.993	1.61
15	Original	Arithmetic	Corruption	0	2	0.997	1.15
16	Original	Arithmetic	Participation	1	8	0.951	4.33
17	Original	Arithmetic	Civil and Political Rights	1	3	0.987	2.25
18	Original	Arithmetic	Wealth Creation	0	1	0.998	0.87
19	Original	Arithmetic	Financial Integrity	0	1	0.999	0.74
20	Original	Arithmetic	Arteries of Commerce	0	1	0.999	0.65
21	Original	Arithmetic	Environmental Sensitivity	1	3	0.992	1.77
22	Original	Arithmetic	Poverty	1	4	0.985	2.41
23	Original	Arithmetic	Health and Sanitation	0	1	0.999	0.74
24	Original	Arithmetic	Education	1	3	0.991	1.81
25	Original	Geometric	National Security	1	5	0.976	3.04
26	Original	Geometric	Public Safety	2.5	6	0.958	4.04
27	Original	Geometric	Legal Norms	2	5	0.976	3.06
28	Original	Geometric	Judicial Independence	1	6	0.972	3.30
29	Original	Geometric	Corruption	1.5	6	0.963	3.79
30	Original	Geometric	Participation	2.5	10	0.914	5.76
31	Original	Geometric	Civil and Political Rights	1	6	0.963	3.78
32	Original	Geometric	Wealth Creation	2	5	0.970	3.39
33	Original	Geometric	Financial Integrity	2	6	0.975	3.11
34	Original	Geometric	Arteries of Commerce	1	5	0.970	3.38
35	Original	Geometric	Environmental Sensitivity	1	4	0.980	2.75
36	Original	Geometric	Poverty	2	7	0.963	3.76
37	Original	Geometric	Health and Sanitation	1.5	5	0.974	3.19
38	Original	Geometric	Education	2	5	0.973	3.20
39	Original	MCA	National Security	1	6	0.970	3.39
40	Original	MCA	Public Safety	2	8	0.953	4.26
41	Original	MCA	Legal Norms	2	4	0.970	3.39
42	Original	MCA	Judicial Independence	2	5	0.964	3.72
43	Original	MCA	Corruption	2	6	0.973	3.22
44	Original	MCA	Participation	3	9	0.935	5.00
45	Original	MCA	Civil and Political Rights	2	6	0.957	4.06
46	Original	MCA	Wealth Creation	1.5	4	0.976	3.06
47	Original	MCA	Financial Integrity	2	5	0.970	3.37
48	Original	MCA	Arteries of Commerce	1	6	0.973	3.24
49	Original	MCA	Environmental Sensitivity	2	5	0.967	3.57
50	Original	MCA	Poverty	2	6	0.954	4.19
51	Original	MCA	Health and Sanitation	2	5	0.963	3.75
52	Original	MCA	Education	2	6	0.968	3.51

Scenario	Weighting	Aggregation	Excluded indicator	50th percentile (shift in rank)	90th percentile (shift in rank)	Spearman rank coefficient (with respect to original ranking)	RMSE (with respect to original ranking)
53	FA	Arithmetic	National Security	1	6	0.968	3.49
54	FA	Arithmetic	Public Safety	1	7	0.958	4.02
55	FA	Arithmetic	Legal Norms	1	6	0.977	2.99
56	FA	Arithmetic	Judicial Independence	1	5	0.972	3.28
57	FA	Arithmetic	Corruption	2	5	0.969	3.43
58	FA	Arithmetic	Participation	3	9	0.927	5.30
59	FA	Arithmetic	Civil and Political Rights	2	8	0.942	4.73
60	FA	Arithmetic	Wealth Creation	1	5	0.976	3.01
61	FA	Arithmetic	Financial Integrity	1	5	0.975	3.12
62	FA	Arithmetic	Arteries of Commerce	1	4	0.983	2.56
63	FA	Arithmetic	Environmental Sensitivity	1	4	0.981	2.72
64	FA	Arithmetic	Poverty	2	6	0.963	3.76
65	FA	Arithmetic	Health and Sanitation	1	5	0.976	3.01
66	FA	Arithmetic	Education	1	4	0.989	2.04
67	FA	Geometric	National Security	3	8	0.943	4.69
68	FA	Geometric	Public Safety	3	8	0.935	4.97
69	FA	Geometric	Legal Norms	2	7	0.949	4.43
70	FA	Geometric	Judicial Independence	2	7	0.942	4.71
71	FA	Geometric	Corruption	2	10	0.930	5.18
72	FA	Geometric	Participation	4	11	0.872	7.00
73	FA	Geometric	Civil and Political Rights	3	10	0.921	5.50
74	FA	Geometric	Wealth Creation	2	8	0.947	4.52
75	FA	Geometric	Financial Integrity	2	8	0.947	4.53
76	FA	Geometric	Arteries of Commerce	1	4	0.979	2.85
77	FA	Geometric	Environmental Sensitivity	1	5	0.966	3.59
78	FA	Geometric	Poverty	2	9	0.937	4.93
79	FA	Geometric	Health and Sanitation	2	8	0.953	4.25
80	FA	Geometric	Education	1.5	5	0.966	3.61
81	FA	MCA	National Security	2	9	0.919	5.58
82	FA	MCA	Public Safety	2	9	0.921	5.51
83	FA	MCA	Legal Norms	2.5	9	0.924	5.40
84	FA	MCA	Judicial Independence	2	8	0.927	5.29
85	FA	MCA	Corruption	3	9	0.921	5.52
86	FA	MCA	Participation	2	9	0.902	6.14
87	FA	MCA	Civil and Political Rights	2	10	0.903	6.12
88	FA	MCA	Wealth Creation	1	7	0.952	4.30
89	FA	MCA	Financial Integrity	2	8	0.935	4.98
90	FA	MCA	Arteries of Commerce	2	8	0.959	3.97
91	FA	MCA	Environmental Sensitivity	2	8	0.936	4.94
92	FA	MCA	Poverty	2	8	0.930	5.18
93	FA	MCA	Health and Sanitation	1	8	0.938	4.88
94	FA	MCA	Education	2	7	0.950	4.39
95	EW	Arithmetic	National Security	1	4	0.987	2.23
96	EW	Arithmetic	Public Safety	2	6	0.967	3.56
97	EW	Arithmetic	Legal Norms	1	3	0.990	1.99
98	EW	Arithmetic	Judicial Independence	1	5	0.985	2.39
99	EW	Arithmetic	Corruption	1	4	0.984	2.44
100	EW	Arithmetic	Participation	2	9	0.934	5.05
101	EW	Arithmetic	Civil and Political Rights	2	6	0.976	3.04
102	EW	Arithmetic	Wealth Creation	1	4	0.988	2.11
103	EW	Arithmetic	Financial Integrity	1	4	0.989	2.06
104	EW	Arithmetic	Arteries of Commerce	1	4	0.988	2.14
105	EW	Arithmetic	Environmental Sensitivity	1	3	0.991	1.90
106	EW	Arithmetic	Poverty	1	5	0.976	3.03

Scenario	Weighting	Aggregation	Excluded indicator	50th percentile (shift in rank)	90th percentile (shift in rank)	Spearman rank coefficient (with respect to original ranking)	RMSE (with respect to original ranking)
107	EW	Arithmetic	Health and Sanitation	1	3	0.991	1.87
108	EW	Arithmetic	Education	1	3	0.989	2.01
109	EW	Geometric	National Security	2	7	0.957	4.05
110	EW	Geometric	Public Safety	3	8	0.932	5.10
111	EW	Geometric	Legal Norms	2	6	0.958	4.03
112	EW	Geometric	Judicial Independence	2	6	0.958	4.02
113	EW	Geometric	Corruption	2	8	0.944	4.64
114	EW	Geometric	Participation	3	11	0.892	6.45
115	EW	Geometric	Civil and Political Rights	3	8	0.944	4.65
116	EW	Geometric	Wealth Creation	2	8	0.954	4.22
117	EW	Geometric	Financial Integrity	2	8	0.953	4.26
118	EW	Geometric	Arteries of Commerce	1	4	0.970	3.42
119	EW	Geometric	Environmental Sensitivity	1	5	0.975	3.11
120	EW	Geometric	Poverty	2	9	0.940	4.81
121	EW	Geometric	Health and Sanitation	2	6	0.959	3.98
122	EW	Geometric	Education	2	6	0.962	3.80
123	EW	MCA	National Security	2	8	0.931	5.16
124	EW	MCA	Public Safety	2	8	0.923	5.42
125	EW	MCA	Legal Norms	2	8	0.949	4.41
126	EW	MCA	Judicial Independence	2	8	0.940	4.81
127	EW	MCA	Corruption	2	7	0.938	4.89
128	EW	MCA	Participation	2	8	0.911	5.84
129	EW	MCA	Civil and Political Rights	2.5	8	0.923	5.44
130	EW	MCA	Wealth Creation	1	7	0.964	3.73
131	EW	MCA	Financial Integrity	2	8	0.948	4.45
132	EW	MCA	Arteries of Commerce	1.5	7	0.958	3.99
133	EW	MCA	Environmental Sensitivity	2	8	0.943	4.66
134	EW	MCA	Poverty	2	7	0.937	4.91
135	EW	MCA	Health and Sanitation	2	8	0.941	4.77
136	EW	MCA	Education	2	7	0.958	4.03
137	DEA	Arithmetic	National Security	1	4	0.984	2.50
138	DEA	Arithmetic	Public Safety	2	6	0.968	3.53
139	DEA	Arithmetic	Legal Norms	2	5	0.982	2.69
140	DEA	Arithmetic	Judicial Independence	1	5	0.977	2.99
141	DEA	Arithmetic	Corruption	2	4	0.981	2.74
142	DEA	Arithmetic	Participation	2	10	0.918	5.68
143	DEA	Arithmetic	Civil and Political Rights	1	5	0.979	2.88
144	DEA	Arithmetic	Wealth Creation	1	4	0.987	2.34
145	DEA	Arithmetic	Financial Integrity	1.5	4	0.982	2.66
146	DEA	Arithmetic	Arteries of Commerce	2	5	0.979	2.89
147	DEA	Arithmetic	Environmental Sensitivity	2	7	0.969	3.48
148	DEA	Arithmetic	Poverty	2	6	0.968	3.51
149	DEA	Arithmetic	Health and Sanitation	1	5	0.982	2.65
150	DEA	Arithmetic	Education	1	5	0.977	3.02

ANNEX: Statistical dimensionality of the framework

The statistical dimensionality of the framework developed in the Index of African Governance (Rotberg and Gisselquist, 2008) has been analysed as follows.

For each pillar, an overall PCA or non-linear PCA analysis is carried out to assess/confirm the number of relevant dimensions of that pillar. The theoretical structure of each pillar (i.e. the number of sub-pillars) is expected to be described by the same number of relevant statistical dimensions (factors). If this is the case, then the theoretical framework for the pillar will be confirmed by the statistical analysis and we could conclude that data endorse the chosen framework. The same approach is adopted at a higher level using all 55 indicators in order to check whether significant dimensions can be retrieved from the whole dataset.

Another way to check the correspondence between the theoretical structure and the "statistical" structure suggested by the data is the comparison between composite indicator ranks (scores) obtained by applying statistical methods and the ranks (scores) presented in Rotberg and Gisselquist, 2008, which represent the baseline. If the two are similar then again the theoretical framework and the methodological approach would be endorsed by the observed data.

The matching between the statistical and the baseline rankings is calculated following a two steps procedure.

1. Within each sub-pillar the relevant statistical dimensions (factors) are obtained using non-linear PCA/PCA. With these methods it is possible to transform the original data matrix "countries versus indicators" into a new matrix "countries versus factors". Country scores are NOT the original indicators of the dataset but a "statistical" transformation of the latter, calculated so as to maximize the independent information gathered within each factor, Notice that (a) factors are linear transformations of the original indicators; (b) each factor has an autonomous information power. We could use the factors (instead of the original indicators) to construct the sub-pillar composite. The ideal situation would be to have a unique factor describing the sub-pillar, meaning that all the indicators included in that sub-pillar are actually describing the same (latent) phenomenon. This is rarely the case and more than one relevant factor could be associated to each sub-pillar. In this case the composite indicator for that sub-pillar is calculated using weighted scores: for each country, a weighted score is computed with weights equal to the proportion of the explained variance of each factor (see OECD, 2008; pag. 90). Notice that if, within a sub-pillar, there is more than one relevant factor, further analysis is recommended. Redundancy could come from the choice of the indicators populating the sub-pillar or their actual observed values.
2. The country score for each pillar is computed as linear average of sub-pillar intermediate composite scores; at this stage the weights used in the baseline have been used. The "statistical" scores/ranks obtained are compared to the scores/ranks of the baseline Index of African Governance 2008.

Pillar Safety and Security

The pillar Safety and Security is divided into two sub-pillars, National Security and Public Safety. The variables populating the pillar are all quantitative but two (access to small arms and light weapons, level of violent crime) that are qualitative. Non-linear PCA is employed Table A4 displays the results when considering simultaneously all 7 indicators and confirms the existence of 2 relevant dimensions. Those two factors account for more than 60% of the variance and display a high Cronbach's Alpha (at least the first factor) indicating a high ability to capture the latent phenomenon.

Table A4. Summary for the pillar Safety and Security, 7 indicators

Safety and Security

Dimension	Cronbach's Alpha	Variance Accounted For	
		Total (Eigenvalue)	% of Variance
1	.789	3.090	44.149
2	.152	1.150	16.432
3	-.193	.858	12.257
4	-.603	.659	9.418
5	-.738	.613	8.752
6	-1.586	.424	6.055
7	-4.510	.206	2.936
Total	1.000[a]	7.000	100.000

a. Total Cronbach's Alpha is based on the total Eigenvalue.

Table A5 displays the results of the non-linear PCA for the sub-pillar National Security (the sub-pillar Public safety only has 1 indicator and thus PCA cannot be run). Two relevant dimensions are found. This requires the re-run of the non linear PCA imposing 2 factors (Table A6). From the corresponding eigenvalues the weights are calculated as: $w_1 = 2.814/3.962$ and $w_2 = 1.148/3.962$ and used for computing the "statistical ranking" of the sub-pillar National security. Pillar's ranking (or statistical rank) is then obtained by linearly aggregating the statistical scores for National security and the indicator of Public safety with the baseline weights (2/3, 1/3 respectively). Figure A1 shows the difference between the statistical analysis (stat rank) and the baseline pillar ranking.

Table A5. Summary for the pillar Safety and Security, sub-pillar National Security

National Security				Component Loadings		
		Variance Accounted For			Dimension	
Dimension	Cronbach's Alpha	Total (Eigenvalue)	% of Variance		1	2
1	0.768	2.775	46.258	Number of Battle-Deaths	0.82	-0.342
2	0.116	1.107	18.45	Refugees and Asylum Seekers Originating From the Country	0.581	0.616
3	-0.253	0.826	13.767	Ease of Access to Small Arms and Light Weapons	0.515	0.716
4	-0.66	0.645	10.754	Government Involvement in Armed Conflicts	0.764	-0.299
5	-1.602	0.428	7.139	Number of Civilian Deaths Due to One-Sided Violence	0.675	-0.171
6	-4.306	0.218	3.633	Internally-Displaced People	0.706	-0.146
Total	1.000[a]	6	100			

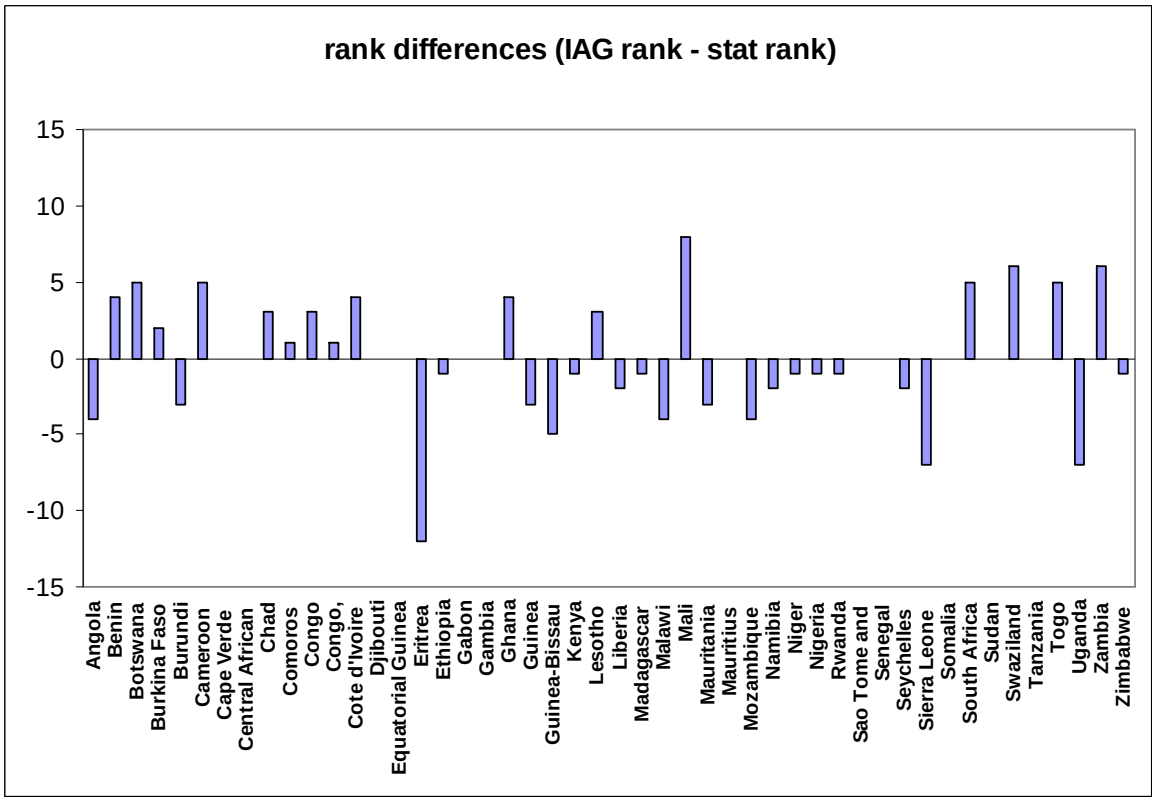
Table A6. Sub-pillar Public Safety, non-linear PCA on 2 factors.

Public Safety			
		Variance Accounted For	
Dimension	Cronbach's Alpha	Total (Eigenvalue)	% of Variance
1	.773	2.814	46.892
2	.155	1.148	19.138
Total	.897[a]	3.962	66.031

a. Total Cronbach's Alpha is based on the total Eigenvalue.

The two rankings are very similar. Spearman rank correlation coefficient is quite high at 0.93. The median impact is a two-position change and only one country shifts ten positions or more (Eritrea: max shift = 12).

Figure A1. Pillar Safety and Security, differences between the Index of African Governance (IAG) for the pillar and the index based on statistical analysis (stat-rank)



Pillar Rule of Law, Transparency and Corruption

The pillar Rule of Law, Transparency and Corruption is divided in three sub-pillars: Ratification of Critical Legal Norms, Judicial Independence and Efficiency, Corruption. Overall it has 4 quantitative, 2 qualitative and 1 dichotomous variables, therefore non-linear PCE has to be employed. Table A7 displays the results when considering simultaneously all 7 indicators and confirms the existence of 3 relevant dimensions. Those two factors account for more than 70% of the variance and display a high Cronbach's Alpha indicating a high ability to capture the latent phenomenon.

Table A7. Summary for the pillar Rule of Law, Transparency and Corruption, 7 indicators.

Rule of Law, Transparency and Corruption

Dimension	Cronbach's Alpha	Variance Accounted For: Total (Eigenvalue)
1	.731	2.675
2	.302	1.349
3	.221	1.234
4	-.295	.798
5	-.525	.690
6	-2.217	.345
7	-5.360	.179
Total	1.006[a]	7.270

a. Total Cronbach's Alpha is based on the total Eigenvalue.

Non-linear PCA can be conducted at the sub-pillar level only for the sub-pillars Ratification of critical legal norms and Judicial independence and efficiency, since the third pillar has only 1 indicator. Results are summarised in Tables A8 and A9.

Table A8. Summary for the pillar Rule of Law, Transparency and Corruption, sub-pillar Ratification of Critical Legal Norms.

Ratification of critical legal norms			Component Loadings		
				Dimension	
Dimension	Cronbach's Alpha	Variance Accounted For: Total (Eigenvalue)		1	2
1	0.519	1.529	Ratification of International Human Rights Conventions	1.033	0.645
2	0.396	1.359	presence of International Sanctions	-0.567	0.684
3	-0.729	0.673	Laws on Contracts and Property Rights	-0.381	0.73
Total	1.079[a]	3.562			

a. Total Cronbach's Alpha is based on the total Eigenvalue.

Table A9. Sub-pillar Ratification of critical legal norms, non-linear PCA on 2 factors

Ratification of Critical Legal Norms

Dimension	Cronbach's Alpha	Variance Accounted For: Total (Eigenvalue)
1	.522	1.534
2	.442	1.417
Total	.992[a]	2.951

a. Total Cronbach's Alpha is based on the total Eigenvalue.

In order to calculate the "statistical ranking" for the sub-pillar Ratification of critical legal norms, non-linear PCA is run again constraining it to consider only 2 factors. The eigenvalues so found (and the associated countries' scores) constitute the relative weights for the statistical ranking, with $w_1 = {1.534}/{2.951}$ and $w_2 = {1.417}/{2.951}$.

Table A10 presents the results for the PCA on the quantitative indicators of the sub-pillar Judicial Independence and efficiency. The sub-pillar is described by two dimensions and the relative weights to consider are $w_1 = {1.288}/{(1.288+0.963)}$ and $w_2 = {0.963}/{(1.288+0.963)}$. Notice that since PCA is a nested procedure is not necessary to run it again when more than one relevant factor is found, as with non-linear PCA.

Table A10. Summary for the pillar Rule of Law, Transparency and Corruption, sub-pillar Judicial Independence and Efficiency

Judicial Independence and Efficiency

Component	Extraction Sums of Squared Loadings: Total	% of Variance	Cumulative %
1	1.288	42.948	42.948
2	.963	32.100	75.048
3	.749	24.952	100.000

Extraction Method: Principal Component Analysis.

Pillar's ranking (or statistical rank) is obtained by linearly aggregating the statistical scores for the three sub-pillars with the baseline weights (1/3 each). Figure A2 shows the difference between the statistical analysis (stat rank) and the baseline pillar ranking. The ranking based on weights and scores retrieved from non-linear PCA appears to be similar to the original Rule of Law, Transparency and Corruption ranking but with a caveat. The Spearman rank correlation coefficient between the two is 0.77. The median impact is a five-position change and ten countries shift ten positions or more (Central Africa, Equatorial Guinea, Ethiopia, Gabon, Madagascar, Mali, Rwanda, San Tome and Principe, Sierra Leone, Swaziland and Somalia: max

shift 31 positions). These results suggest that a PCA-based ranking has a more significant impact on the results of this pillar, as compared to the previous pillar.

Figure A2. Pillar Rule of Law, Transparency and Corruption, differences between the Index of African Governance (IAG) for the pillar and the index based on statistical analysis (stat-rank)

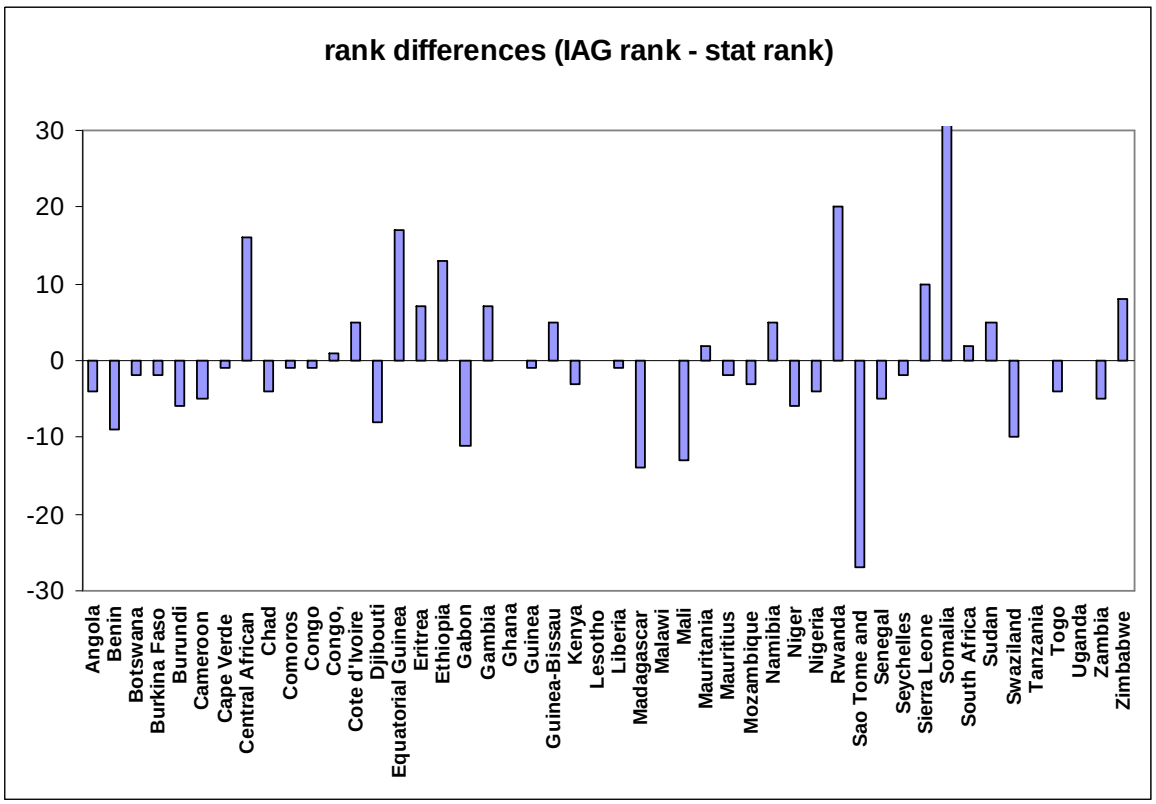


Table A11. Quantification of categorical indicators

Ratification of Int. Human Rights Conventions			Laws on Contracts and Property Rights		
Category	Frequency	Quantification	Category	Frequency	Quantification
2	1	-6.861	1	6	-2.422
3	2	-0.376	2	24	0.134
4	3	0.112	3	10	0.976
5	10	0.112	4	3	0.976
6	23	0.123			
7	9	0.123			

An interesting point in the use of non-linear PCA is that it provides quantification for categorical indicators, i.e. it optimally identifies the number and identity of categories of a qualitative variable. Table A11 shows that the qualitative variable Ratification of international human rights conventions, originally divided into 7 categories can be, without loss of information, divided in 4 categories (categories 4 and 5 and categories 6 and 7 can be merged). The same happens for the variable Laws on contracts and property rights: categories 3 and 4 can be merged with no

loss of information. Notice that if this result were to be found analyzing several years it would suggest the need to revise the questionnaire accordingly and eliminating the redundant categories.

Pillar Participation in Human Rights

The pillar Participation in Human Rights is divided into two sub-pillars: Participation in election and Political rights. The variable populating the sub-pillars are mixed: qualitative (free and fair executive/legislative elections, respect for physical integrity rights, respect for civil rights, absence of gender discrimination), dichotomous (participation of oppositions in executive/legislative elections) and quantitative (press freedom index). Therefore a non-linear PCA needs to be employed. Table A12 displays the results when considering simultaneously all 8 indicators and confirms the existence of 2 relevant dimensions. Those two factors account for 63% of the variance and display a high Cronbach's Alpha (at least the first factor) indicating a high ability to capture the latent phenomenon.

When performing non-linear PCA separately on the two sub-pillars, the first one is explained by only one factor, as in the ideal case, while the second by two factors (Tables A13 and A14)

In order to derive a composite score for the pillar one has to re-run twice non-linear PCA imposing for the first sub-pillar one factor and for the second pillar two factors. The calculating the composite scores for the latter will be done by weighting the fist factor 2.516/3.752 and the second factor 1.237/3.752. The scores of the two sub-pillars are then equally weighted and aggregated as in the baseline.

Table A12. Summary for the pillar Participation and Human Rights, 8 indicators

Participation and human rights

Dimension	Cronbach's Alpha	Variance Accounted For: Total (Eigenvalue)
1	.837	3.733
2	.286	1.336
3	.001	1.002
4	-.777	.597
5	-1.107	.508
6	-1.615	.416
7	-2.401	.323
8	-4.785	.194
Total	1.002[a]	8.108

a. Total Cronbach's Alpha is based on the total Eigenvalue.

Table A13. Summary for the pillar Participation and Human Rights, sub-pillar Participation in Elections

Participation in elections

Dimension	Cronbach's Alpha	Variance Accounted For	
		Total (Eigenvalue)	% of Variance
1	0.882	2.956	73.889
2	-1.069	0.555	13.873
3	-2.66	0.334	8.348
4	-7.236	0.156	3.89
Total	1.000[a]	4	100

a. Total Cronbach's Alpha is based on the total Eigenvalue.

non-linear PCA with 1 dimension

Dimension	Cronbach's Alpha	Variance Accounted For	
		Total (Eigenvalue)	% of Variance
1	0.9	3.077	76.915
Total	0.9	3.077	76.915

Table A14. Summary for the pillar Participation and Human Rights, sub-pillar Respect for Civil and Political Rights

Respect for civil and political rights

Dimension	Cronbach's Alpha	Variance Accounted For
		Total (Eigenvalue)
1	0.616	1.857
2	0.198	1.173
3	-0.577	0.7
4	-1.379	0.492
Total	1.018[a]	4.222

a. Total Cronbach's Alpha is based on the total Eigenvalue.

non-linear PCA with 2 dimensions

Dimension	Cronbach's Alpha	Variance Accounted For
		Total (Eigenvalue)
1	0.803	2.516
2	0.254	1.237
Total	.978[a]	3.752

Figure A3 shows the rank comparison (reported as absolute difference between the ranking obtained using non-linear PCA, i.e. by statistically eliminating redundancy and the baseline).

The highest difference between ranking is displayed by Seychelles and Mali (13 positions), while the median difference is of 2 positions. Overall, given the modest shift of the median, the statistical analysis supports both the theoretical framework and the methodological approach used by IAG developers.

Figure A3. Pillar Participation and Human Rights, differences between the Index of African Governance (IAG) for the pillar and the index based on statistical analysis (stat-rank)

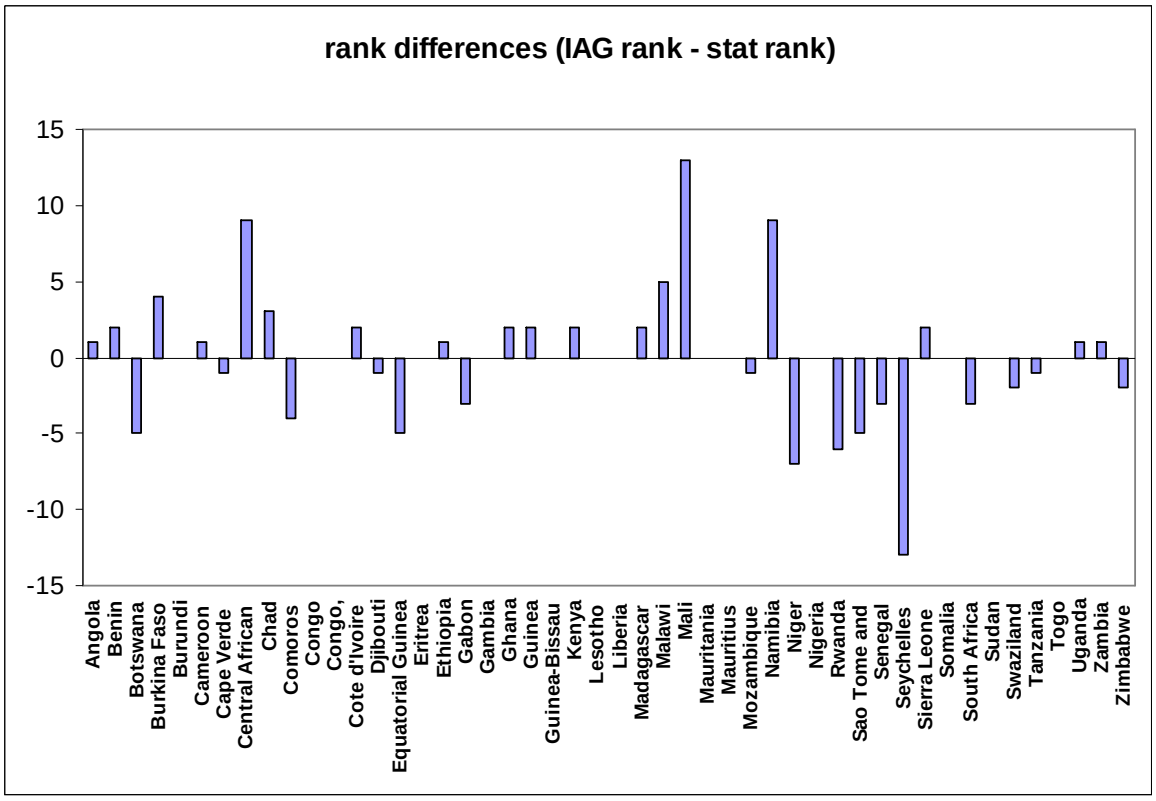


Table A15. Quantification of categorical indicators.

Absence of gender discrimination			Respect for ph. Integrity			Respect for civil rights		
Category	Frequency	Quantification	Category	Frequency	Quantification	Category	Frequency	Quantification
0	1	-6.851	0	1	-6.853	0	4	-2.898
1	1	0.136	1	5	0.139	1	1	-1.487
2	8	0.136	2	5	0.139	2	1	-0.316
3	15	0.136	3	5	0.139	3	2	-0.315
4	16	0.136	4	8	0.139	4	5	-0.038
5	4	0.212	5	12	0.139	5	5	-0.038
6	3	0.212	6	8	0.172	6	5	-0.038
			7	3	0.172	7	6	0.081
			8	1	0.172	8	5	0.57
						9	7	0.57
						10	5	1.065
						11	2	1.065

Table A15 shows the quantification of three qualitative variables belonging to the sub-pillar *Respect for civil and political rights*.[3] The measurement scale of indicator *absence of gender*

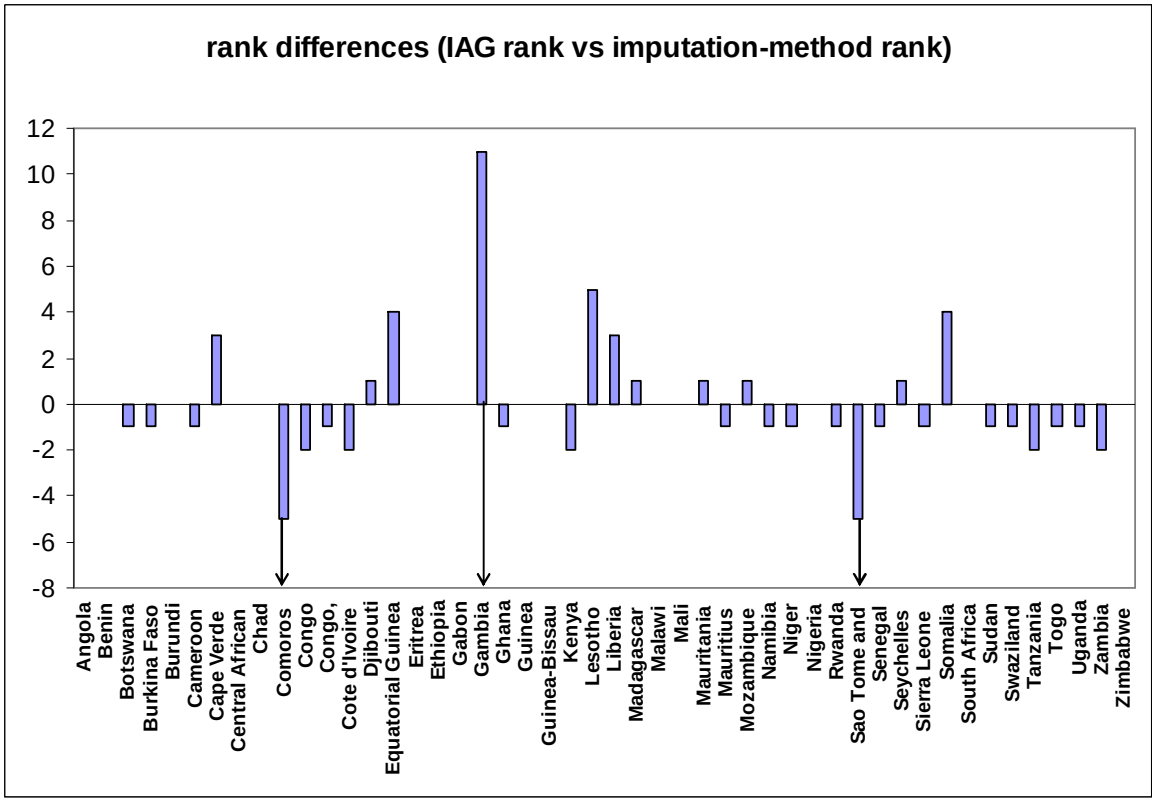
[3] For the remaining qualitative indicators the CATPCA confirms the original measurement scale.

discrimination could be squeezed into 3 categories (0, 1, 2) instead of the original 6, given that categories 1 to 4 and 5,6 are statistically undistinguishable. A similar argument holds for the indicators *respect for physical integrity* and *respect for civil rights* where the original 8 and 11 categories can be transformed without loss of information into 4 and 5 respectively. Notice that if this result were to be found analyzing several years it would suggest the need to revise the questionnaire accordingly and eliminating the redundant categories.

Pillar Sustainable Economic Opportunity

The pillar Sustainable Economic Opportunity is described by four sub-pillars: Wealth creation; Macroeconomic stability and financial integrity; Arteries of commerce; Environmental sensitivity. Overall this pillar hosts 12 quantitative variables thus PCA can be employed. This pillar has many missing values, especially the Environmental Performance Index where 9 out of 48 data are missing. Moreover Somalia lacks data for 7 out of 12 indicators while Liberia lacks the data for 2 indicators. The imputation method has strong influence as suggested in section 3, therefore the methodological approach followed for the other pillars is meaningless: the results of the PCA and thus the statistical ranking proposed will be highly dependent on the imputation and we will be unable to confirm or reject the theoretical framework proposed.

Figure A4. Pillar Sustainable Economic Opportunities, differences between the Index of African Governance (IAG) for the pillar and the index based on statistical analysis (stat-rank – with imputed data)



Nevertheless, once imputed missing values with the Hot-deck procedure, the overall score was computed following IAG 2008 approach (equal weights within and across the four sub-pillars). As expected, major differences regard countries with imputed observations. In Figure A4 rank differences are shown. "Statistical ranks" are highly different from baseline IAG ranks. This is probably due to the influence that missing data have on the IAG rank, from the one hand, and the influence that the imputation method has on the statistical rank, from the other hand.

Pillar Human Development

The pillar Human Development is described by three sub-pillars: Poverty; Health and Sanitation; Educational Opportunity. The 21 variables populating the pillar are all quantitative, therefore PCA is used.

The pillar is affected by a certain amount of missing values. In particular the variables Percentage of people who live on less that 1$ a day, Gini index, and percentage of students who progress from primary to secondary school show a percentage of missing observations above 10%, as shown in Table A16. The consequence is that in PCA the standard missing data options 'pair-wise deletion' and 'list-wise deletion' lead to discard too many records in the data-set.

Table A16. Some descriptive statistics and % of missing values for the pillar Human Development

Descriptive Statistics

	N	percentage of missing values	Minimum	Maximum	Mean	Std. Deviation
% of people who live on less than 1 $ a day	31	**35%**	0.00	100.00	48.79	27.43
% of people below their national poverty line	46	4%	0.00	100.00	37.83	21.93
Gini Index of income distribution	41	**15%**	0.00	100.00	52.82	24.74
Life expectancy at birth	48	0%	4.77	100.00	40.35	23.82
child mortality	46	4%	4.91	100.00	53.91	23.26
maternal mortality	46	4%	0.00	100.00	61.16	19.88
prevalence of denutrition	45	6%	0.00	100.00	61.41	24.83
% of children immunized against diptheria	48	0%	0.00	100.00	66.04	23.49
% of children immunized against diptheria	48	0%	0.00	100.00	69.99	25.44
% of people affected by HIV	44	8%	0.00	100.00	79.90	23.60
estimated new TB cases	48	0%	0.00	100.00	70.79	19.78
physicians density	48	0%	0.00	100.00	12.29	18.89
nurses to patients ratio	48	0%	0.00	100.00	14.55	21.42
% of population with potable water	48	0%	0.00	100.00	55.32	22.25
adult literacy	48	0%	0.00	100.00	60.32	27.93
adult women literacy	44	8%	4.10	100.00	56.60	28.75
% of children who complete primary school	46	4%	9.74	100.00	53.43	24.84
% of girls who complete the primary school	46	4%	6.28	100.00	51.59	26.92
pupil to teacher ratio	44	8%	22.32	100.00	60.35	17.09
% of students who progress to secondary school	34	**29%**	19.08	96.22	57.30	21.94
female to male ratio at school	47	2%	0.00	93.68	61.69	24.71
Valid N (listwise)	20					

Our suggestion is to investigate further the reason behind the 'missingness', especially for the above mentioned indicators, to explore the possibility of alternative data sources or the use of more sophisticated imputation methods, as shown for the pillar Sustainable Economic Opportunity. In the following we adopted the option 'replace with mean' in the PCA analysis of

sub-pillars. It should be kept in mind that sub-pillar Poverty is mostly affected by missing data, with two out of three indicators presenting a high percentage of missing values (Table A16).

Table A17. Summary for the pillar Human Development

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	7.928	37.753	37.753
2	3.104	14.781	52.534
3	1.925	9.167	61.701
4	1.553	7.397	69.098
5	1.097	5.222	74.320
6	1.016	4.839	79.159
7	.783	3.728	82.887
8	.778	3.703	86.590
9	.623	2.968	89.558
10	.472	2.246	91.804
11	.369	1.757	93.561
12	.321	1.529	95.090
13	.264	1.259	96.349
14	.220	1.048	97.396
15	.179	.851	98.247
16	.123	.586	98.832
17	.097	.461	99.293
18	.065	.309	99.603
19	.045	.212	99.815
20	.036	.171	99.986
21	.003	.014	100.000

The statistical analysis of the Pillar Human Development shows that strictly according to Kaiser's rule for dimension extraction, the first six dimensions are relevant. However dimensions 4, 5 and 6 accounts each for less than 7.4% of total variance, whilst the first three dimensions cumulatively account for more than 60% of total variance. The statistical structure of the pillar may be then downgraded to a three sub-pillar structure, confirming the IAG framework.

Table A18. Summary for the pillar Human Development, sub-pillar Poverty

Component	Initial Eigenvalues			**loadings**	Component
	Total	% of Variance	Cumulative %		1
1	1.668	55.598	55.598	% of people who live on less than 1 $ a day	0.87
2	0.909	30.315	85.913	% of people below their national poverty line	0.831
3	0.423	14.087	100	Gini Index of income distribution	0.468

Table A19. Summary for the pillar Human Development, sub-pillar Health and Sanitation

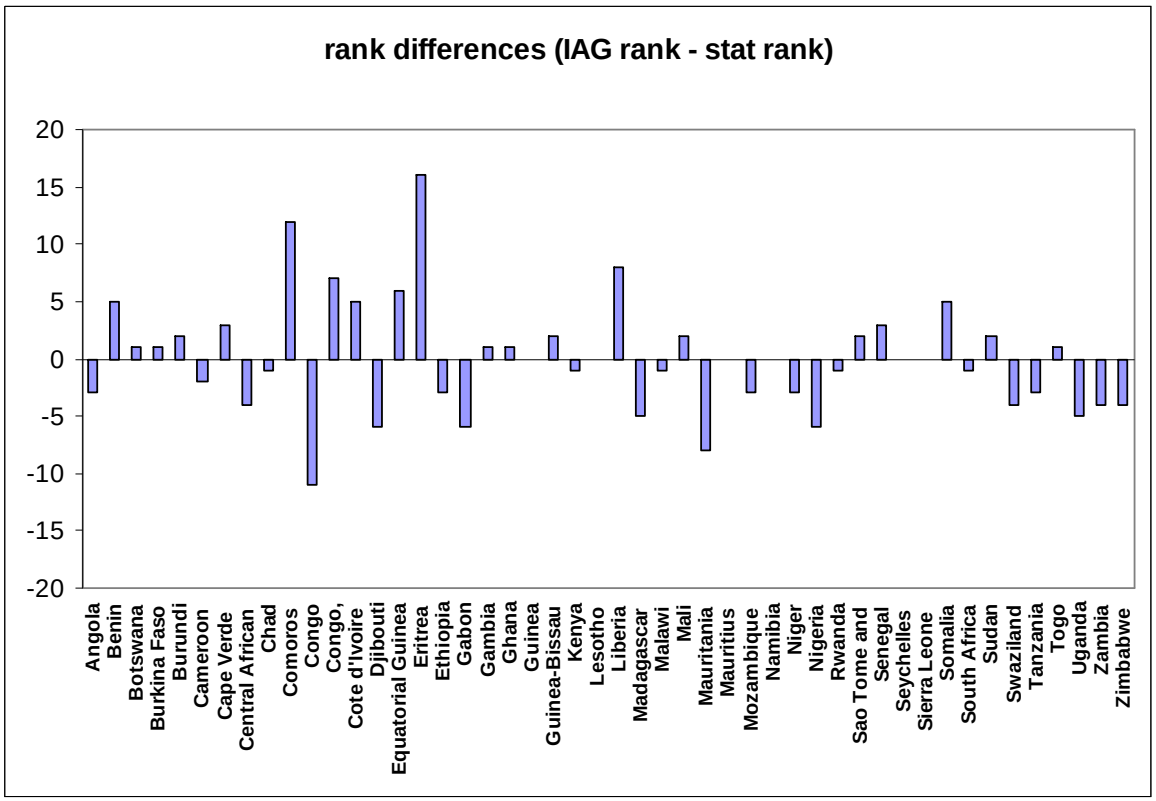
Component	Initial Eigenvalues			loadings	Component		
	Total	% of Variance	Cumulative %		1	2	3
1	4.232	38.474	38.474	Life expectancy at birth	0.561	0.738	-0.179
2	2.279	20.722	59.196	child mortality	0.811	-0.058	0.046
3	1.651	15.007	74.203	maternal mortality	0.745	-0.033	-0.009
4	0.985	8.953	83.156	prevalence of undernourishment	0.495	0.057	-0.461
5	0.668	6.068	89.224	% of children immunized against diphtheria	0.599	0.074	0.706
6	0.494	4.493	93.717	% of children immunized against diphtheria	0.631	0.018	0.705
7	0.231	2.101	95.818	% of people affected by HIV	-0.339	0.883	0.032
8	0.182	1.658	97.476	estimated new TB cases	-0.072	0.913	0.054
9	0.154	1.4	98.876	physicians density	0.726	0.219	-0.399
10	0.067	0.607	99.484	nurses to patients ratio	0.669	-0.23	-0.489
11	0.057	0.516	100	% of population with potable water	0.78	-0.087	0.079

Table A20. Summary for the pillar Human Development, sub-pillar Educational Opportunities

Component	Initial Eigenvalues			loadings	Component	
	Total	% of Variance	Cumulative %		1	2
1	4.342	62.028	62.028	adult literacy	0.847	-0.26
2	1.07	15.279	77.307	adult women literacy	0.895	-0.193
3	0.659	9.414	86.721	% of children who complete primary school	0.866	0.069
4	0.509	7.275	93.996	% of girls who complete the primary school	0.921	0.008
5	0.341	4.869	98.864	pupil to teacher ratio	0.659	0.48
6	0.074	1.06	99.925	% of students who progress to secondary school	0.51	0.706
7	0.005	0.075	100	female to male ratio at school	0.729	-0.481

The PCA of the 3 sub-pillars is presented in Table A18, A19 and A20. The corresponding eigenvalues are used to compute the statistical racking of each sub-pillar that is further aggregated into a pillar ranking equally weighting each sub-pillar. Figure A4 shows the difference between the "statistical ranking" and the baseline IAG ranking. The Spearman rank correlation coefficient between the ranking obtained using PCA and the original Human Development ranking is 0.94. The median impact is a three-position change and only three countries shift ten positions or more (Comoros, Congo, Eritrea: max shift = 13).

Figure A5. Pillar Human Development, differences between the Index of African Governance (IAG) for the pillar and the index based on statistical analysis (stat-rank)



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Abstract

Levels of performance of any government do matter in determining the quality of the civil society. The Ibrahim Index of African Governance developed by the Harvard Kennedy School shows how governance can be measured. The Index assesses governance issues over time (2000, 2002, 2005, 2006) and for 48 African countries south of the Sahara, according to a five-pillar conceptual structure: (a) Safety and Security, (b) Rule of Law, Transparency, and Corruption, (c) Participation and Human Rights, (d) Sustainable Economic Opportunity, and (e) Human Development. This report aims at validating and critically assessing the methodological approach undertaken to build the 2006 Index of African Governance, by raising two key questions:

- Is the Index of African Governance internally sound and consistent from a statistical and conceptual point of view?
- What scenarios could have been used to build the Index and how do the results from these scenarios compare to the original results?

The overall assessment of the 2006 Index by means of multivariate analyses, uncertainty and sensitivity analyses reveals no particular shortcomings in the conceptual structure. Data-driven narratives on governance issues in Africa are also offered in this report with a view to show directions of discussions and messages that stem from an index-based analysis of governance. Overall, the Index of African Governance can be reliably used to identify weaknesses, propose remedial actions, allow for easy spatial and temporal comparisons (benchmarking), to prioritize countries in Africa of relatively low governance content, and ultimately to monitor and evaluate policies effectiveness.

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

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