Internal Violence Index: a composite and quantitative measure of internal violence and crime in developing countries

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Abstract

We have created a new index, the Internal Violence Index (IVI), which aims to compare the amount of violence at the country level for 130 developing countries. The IVI is a composite indicator composed of four clusters - internal armed conflict, criminality, terrorism, and political violence. It is based on quantitative variables only, in contrast to the existing subjective indicators of fragility.

Keywords: Internally displaced people, Terrorism, Criminality, Conflict, Fragility

JEL codes: F5, C82

Introduction

Violence has a dramatic impact on human development. It results in micro, meso, or macro-level costs, direct or indirect costs, material and intangible costs, ranging from injuries and higher mortality, to reductions in human and physical capital investment, lower productivity, and lower consumption (Soares, 2015; Balcells and Justino, 2014). As discussed in the World Development Report 2011 (WDR 2011), while poverty in the world is falling, countries affected by violence are lagging behind ("No low-income fragile or conflict-affected country has yet achieved a single MDG" see the WDR 2011 Preamble). Even if inter-state wars and civil wars have declined over recent decades, violence continues in the form of repeated and linked conflicts, and new forms of violence (organized crime), particularly in the South. However, the level of crime and violence may differ greatly between countries and may directly explain the disparities in development and poverty in the developing world.

According to WDR 2011 "One of the greatest challenges in researching lessons on violence prevention and recovery is the lack of available quantitative and qualitative data". This paper is a contribution to measuring the amount of violence comparatively at the country level using a composite indicator based on quantitative variables. This indicator takes into account civil and political violence (including internal conflicts), criminality, terrorism, political assassinations, and riots. It aims to complement the existing indices on conventional (inter-state) wars, as well as the subjective indicators of violence and fragility.

For a measure at the country level, the aggregation of different forms of violence should make sense. Recording and counting victims, and estimating violence in conflict or non-conflict settings is challenging (Seybolt et al., 2013; Salehyan, 2015). For instance, a civilian killed by homicide in a conflict context, if recorded, can be classified differently at the variables or clusters level (conflict vs criminality victim). However, she/he would be identically registered at the level of a composite indicator of violence.[1]

We have tried to build a measure that includes a broad range of interpersonal and inter-group conflicts as described in Burke et al (2015).[2] Inter-personal conflicts are conflicts between individuals, which include various acts commonly described as crime, such as assault, rape and robbery, as well other types of conflict that may not necessarily be criminal, such as violence at sporting events, road rage, and violent acts by police. Inter-group conflicts are conflicts between collections of individuals, such as organized political violence, civil conflicts, wars, riots, and land invasions.

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[1] As discussed by Jones and Rodgers (2011) in their critique of WDR 2011, lumping conflict with different forms of violence is problematic in the sense that they can have different origins and dynamics. Our aim is not to explore the causes of violence but to get a composite index of the incidence of internal violence. The origins of violence should preferably be explored at the cluster level.
[2] In addition, they discuss (3) institutional breakdown and population collapse and (4) intrapersonal conflict (suicide).

Our index is complementary to the usual measures of State fragility (e.g. the Fund for Peace's Fragile States Index), which rely, at least in part, on subjective assessments or such events as the presence of peace-keeping missions. In general, complementary but clearer information seems to emerge from more specific, outcome-based indicators, such as those related to conflict and crime. Here we focus on internal violence events which by their frequency or magnitude would demonstrate state fragility.

We aim to compute a composite index built from quantitative data on violence for a large number of developing countries. The variables pertaining to the violence have been selected and divided into four clusters: internal conflicts, criminality, terrorism, and political violence. As a benchmark, for the sake of transparency, equal weight (25 %) is assigned to each cluster of the index. Other weighting patterns are discussed. Scores are ranked from the least violent country (score of 0) to the most violent country (score of 100). The index has been computed for 130 developing countries.

The rest of the paper is organized as follows:- Section 1 discusses the conceptual framework and presents the variables which make up the index. Section 2 presents the methodology used to build the composite index. Section 3 presents the main results of the IVI and its sensibility to alternative aggregations, and of the correlations between the IVI and existing indicators of fragility.

1. Conceptual framework

We focus on internal violence, because internal conflict and criminality are, arguably, more due to structural reasons than open inter-state war, even if they may change over time. Moreover, the number of large-scale, inter-state wars has been declining in recent decades. On the contrary internal violence and crime has been increasing. However, internal violence and crime are multi-dimensional phenomena, which justify the need for a composite index.

Building an internal violence and crime index requires the collection of reliable data and indicators which capture the amount of violence in each country. We propose a composite index built directly from quantitative data, which is different from the existing indices which are based on the subjective assessments of various observers (e.g: the International Country Risk Guide, the Global Peace Index or the Economist Intelligence Unit). We use outcome-based variables from various sources. However, we do not measure the costs of violence (i.e. damages) that are directly linked to the level of income.

We try to build a "S.M.A.R.T." (simple, measurable, acceptable, relevant, timely) indicator, which should incorporate the different dimensions of violence but should use a reasonable number of sub-components to remain transparent. Data availability is an important issue as we aim for a large geographical coverage. We have explored numerous alternatives in doing so, and the resulting composite index is resumed in Figure 1. 9 quantitative variables related to violence have been selected and divided into four clusters: internal conflicts, criminality, terrorism and political

violence. As a benchmark, we use a simple arithmetic mean to aggregate the variables and the clusters assuming complete substitutability between components.

Figure 1.   The IVI and its components
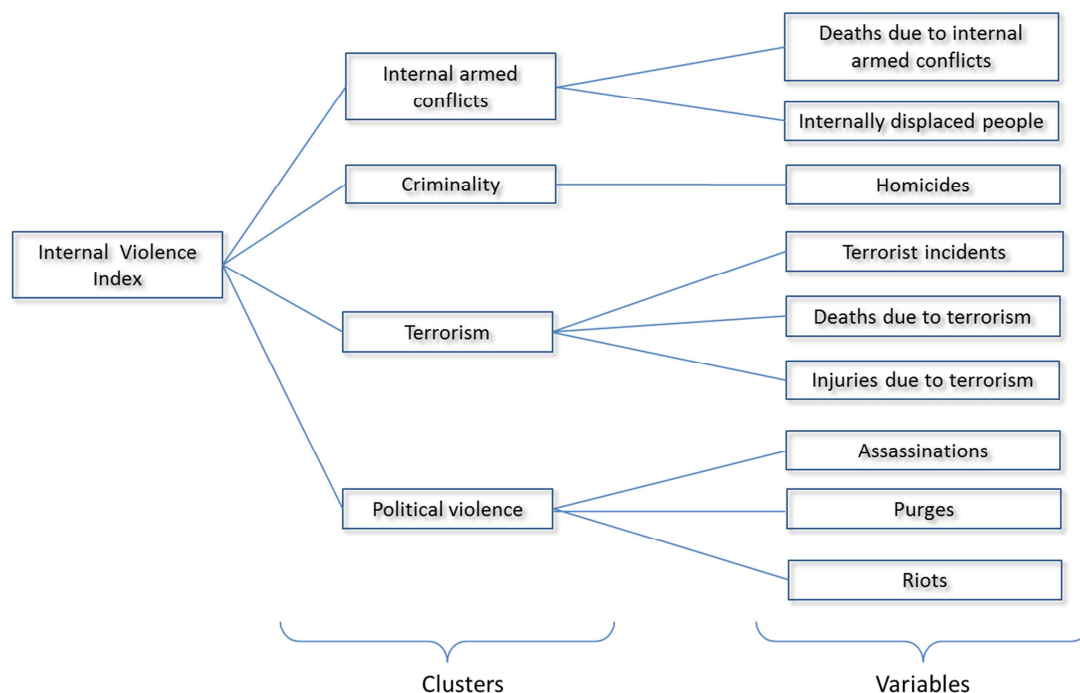
Source: Authors

1.1. Cluster 1: Internal armed conflict

In the first cluster, we aim to measure the level of internal violence generated by internal armed conflict which causes civilian deaths, injuries and population displacements. 2 variables are used: the number of deaths, and the number of internally displaced people (IDP) due to internal armed conflicts. The correlation between the 2 variables (0.37) is low, and suggests that they capture 2 different dimensions of internal conflict. We use the absolute value of the number of deaths, not as a ratio of total population, as we consider that the number of deaths is important per se when measuring the amount of violence, whatever share it represents of the total population. We instead measure the ratio of the number of IDP to total population which is more reflective of the social or economic weight of deaths by violence in fragile countries.

Number of deaths due to internal armed conflicts

We use data from version 5.0-2014 of the Uppsala Conflict Data Program (UCDP/PRIO) Battle-related Deaths Dataset (Pettersson and Wallensteen, 2015). The previous Version 4-2014 of the UCDP/PRIO Armed Conflict Dataset, while covering a very long time period, only recorded conflict

events at 2 intensity levels: Minor conflicts that exceed 25 battle-related deaths in a year and Major conflicts that exceed 1000 annual deaths.[3]

Version 5.0-2014 of the dataset is more detailed as it lists the estimated number of deaths due to armed conflicts. Its time coverage is shorter however, covering only the period from 1989 to 2012. We have also explored other armed conflict databases which are easier to manipulate. However they cover only some geographic areas and are less well-respected by academics and institutions.[4]

UCDP/PRIO defines 4 types of conflict: extra-systemic, inter-state, internationalized, and internal armed conflicts. In the Dataset codebook, internal armed conflicts are distinguished from international armed conflicts by the parties involved rather than by the territorial scope of the conflict. In internal conflicts, the primary party is always the government side. So, we only select the countries whose governments are engaged in a primary bilateral conflict (i.e. we do not account for other countries engaged in this internal conflict).

Internal conflicts mainly occur in Africa and Asia, where the majority of Least Developed Countries are located (Table 1). In 2012, 10 internal armed conflict countries were recorded in Africa. While the number of countries that experience internal armed conflicts is constant in Asia, conflict intensity has increased with a major contribution from the Syrian conflict. Unfortunately, contrary to the other variables used in the IVI, data are missing on internal armed conflicts in Central Asia. In 2012, the countries that recorded more than 800 deaths were Afghanistan, Pakistan, Syria, Yemen, Sudan, and Somalia (Figure 2).

Table 1. Recorded internal armed conflicts in 2012.

	2012	
Region/ Group	Conflict countries	Number of deaths
Africa		
Asia	12	31,109
South America	1	211
LDCs	11	15,446
Developing countries	23	37,379

Source: Authors' calculations from Uppsala Conflict Data Program (UCDP/PRIO) Armed Conflict Dataset

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[3]Gleditsch et al (2002), Themnér & Wallensteen (2014). See also Cunningham et al (2013).
[4] These data in general only focus on African countries - for instance the Social Conflict Analysis Database (SCAD), and the Armed Conflict Location and Event Data (ACLED). See also the Correlates of War (COW) dataset- see Eck (2012).

Figure 2.   Number of deaths due to internal armed conflicts in 2012

Number of deaths due to internal
armed conflicts in 2012

	No Death
	45 - 256
	257 - 812
	≥ 813
	Not observed

Internally Displaced People

According to the UNHCR, Internally displaced persons (IDPs) are among the most vulnerable people in the world. Unlike refugees, IDPs have not crossed an international border but have remained inside their home countries. Even if they have fled for similar reasons to refugees (armed conflict, generalized violence, human rights violations), IDPs legally remain under the protection of their own government – even though that government is the cause of their displacement.

We use data from the Internal Displacement Monitoring Centre (IDMC) backed by the Norwegian Refugee Council (NRC) and the United Nations.[5] As indicated on the IDMC website[6], the IDP figures record the causes of displacement in 4 categories: conflict, generalized violence, human rights violations, and natural disasters (while recognizing that displacement may have overlapping root causes). IDMC outlines that figures for conflict displacement are cumulative, taking into account both new and ongoing displacement situations, and IDP returns where possible (the estimates for disaster-related displacement represent the number of people newly displaced by disasters over the course of each year)[7]. For a given year, we use the measure of IDP "stock", rather than the alternative of new IDP "flow" because our aim is to measure the violence situation for a given year

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[5] Before 2006, this database on internally displaced people was provided by the U.S. Committee for Refugees and Immigrants (USCRI).

[6]http://www.internal-displacement.org/global-figures accessed on January 20, 2016. IDMC seeks and compiles information from national governments, the UN, and other international organisations, national and international non-governmental organisations (NGOs), human rights organisations, and the media, and it also carries out field missions to a number of countries every year.

[7]According to the definition of IDP's- "Situations of armed conflict include international armed conflict, and internal armed conflict. Generalised violence refers to disturbances within the country which are characterised by a serious disruption of order resulting from acts of violence such as riots, struggles between factions or against the authorities, or inter-communal violence. Human rights violations encompass failures by any state or, where applicable, relevant non-state actors, to respect their obligations under international human rights law."

within the entire population of IDPs (not just the new ones). We then assume that violence is a function of the total number of IDPs (stock). This goes further than the new IDP flow, which is a more direct and restricted measure of conflict in a given year. Furthermore, doing so limits the problem of IDP flows overlapping different years. Of course, the use of the IDP stock is correct under the condition that IDP returns are correctly recorded by IDMC.

According to the 2013 report, there were about 33.3 million IDPs at the end of 2013 due to conflict and violence, an increase of 4.5 million compared to 2012. The majority (63%) of IDPs come from five countries: Syria, Colombia, Nigeria[8], Democratic Republic of Congo, and Sudan. Syria, the Central African Republic, and the Democratic Republic of Congo hosted 67% of the 8.2 million people newly displaced in 2013. In the Americas, at least 6.3 million people were internally displaced. The vast majority was located in Colombia (5.5 million), followed by Mexico (160,000), Peru[9] (150,000) and Honduras (17,000). The highest IDP / Total population ratio is found in Syria, Central Africa Republic, Colombia, Somalia, and Sudan (Table 2).

Table 2. Countries with the largest number of IDPs in 2013

Country	Number of IDPs (Thousands)	Number of new IDPs (Thousands)	IDPs as % of total population (%)
Syria	6,500	3,500	32.0
Colombia	5,700	156	12.0
Nigeria	3,300	470	2.0
DR Congo	2,963	1,000	4.3
Sudan	2,426	470	6.9
Somalia	1,100	80	10.8
Pakistan	746	140	0.4
Myanmar	640	54	1.2
India	526	64	0.04
South Sudan	383	383	3.6
Mali	218	123	1.4

Source: Authors' calculation from IDMC. http://www.internal-displacement.org/

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[8]Nigeria dramatically appeared in the list with3.3 million displaced people in 2013. This large number is the result of the brutal attacks by the Islamic armed group Boko Haram in north-eastern Nigeria.
[9] In the case of Peru, most of the IDPs come from conflict in the 1980s and 90s with few returns.

Figure 3.   IDPs due to internal conflicts as % of the population in 2013

Percentage of IDPs due to
internal armed conflicts
  0
  0.9
  2.7
  12
  32

  Not observed
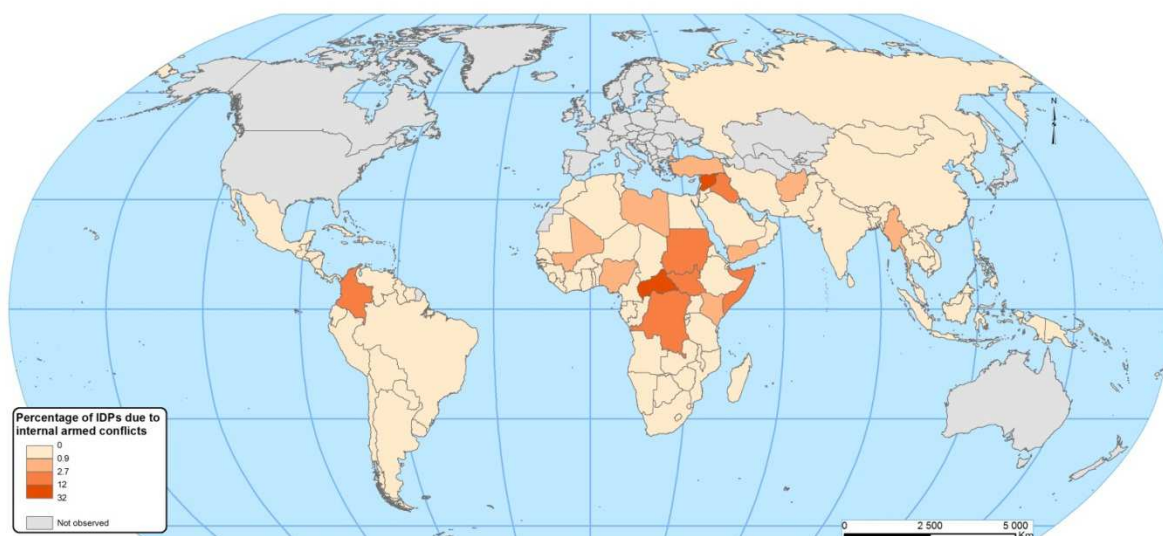
Source: Authors' calculation from IDMC.

1.2.   Cluster 2: Criminality

Criminality is a multi-faceted phenomenon (homicide, robbery, assaults, etc) and so it should be measured using several variables. Reliable data are available for the homicide rate only, which is however one of the most important elements of violent crime. We use the United Nations Office on Drugs and Crime (UNODC) Homicide Statistics dataset that compiles information from a variety of national and international sources relating to intentional homicide, from criminal justice and public health records. This database includes homicide data for 219 countries for the period 2000-2012, but only for 156 countries for the last year 2012[10]. The other variables from the UNODC statistics such as robbery, assaults, burglary, and sexual violence have been investigated, but the data are not available for a large number of countries (see also UNCTS). We also investigated the World Bank Enterprise Surveys database, but only the effect of crime on firms' turnover is recorded, and country / time coverage is incomplete. Drugs and piracy were investigated because they are critical factors of security in developing countries. Whilst their inclusion in the criminality cluster would be valuable, at the present the quality and geographic coverage of data prevented us from doing so.

 Figure 4 highlights the disparity in homicide rates around the world. Homicide rates are higher in Central and South America, the Caribbean and Southern and Central Africa, than the other regions. 49 countries (approximately 30% of countries for which data is available) record a homicide rate of less than 3 per 100,000 inhabitants for the year 2012, and a third of them (16 countries) have less than 1 homicide per 100,000 inhabitants. In contrast, 20 countries (approximately 13% of the total) show homicide rates higher than 20 homicides per 100,000 inhabitants, with most of them between 20 and 40 homicides. Only Honduras exceeds the rate of 60, with 90.4 homicides per 100,000 inhabitants in 2012.

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[10] In this first version of the IVI we deduce the data for 2011 ando 2012 for the other countries.

Figure 4. Intentional homicide rate in 2012 (per 100,000 inhabitants)
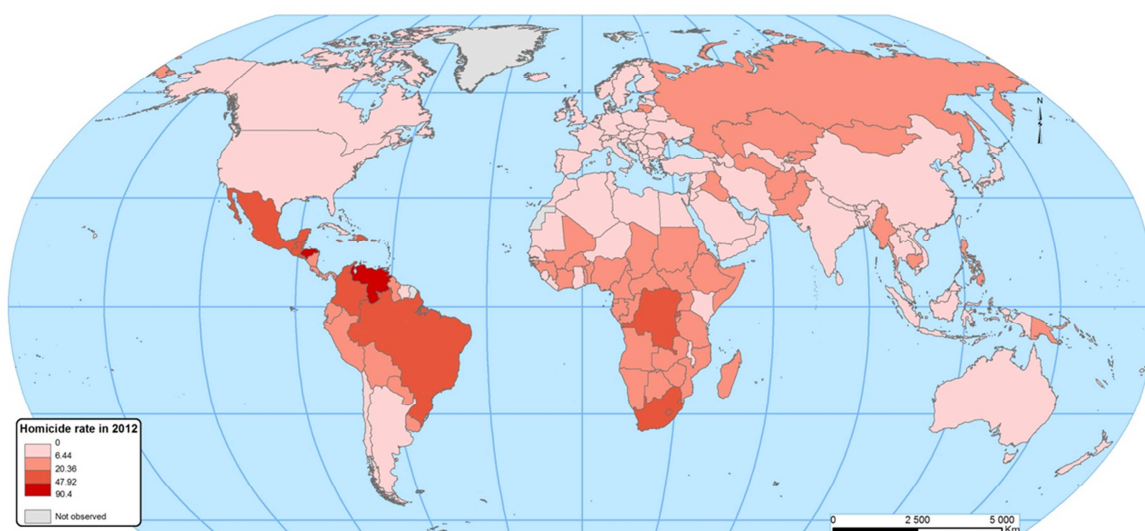
Source: UNODC Homicide Statistics dataset

1.3. Cluster 3: Terrorism

The data on terrorism comes from the Global Terrorism Database (GTD) collected by the National Consortium for the Study of Terrorism and Responses to Terrorism (START). The GTD is an open-source dataset that is considered as the most comprehensive information on terrorism. According to the START-GTD definition, a terrorist attack is "the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation"[11]. To be recorded in the GTD, the event must meet at least 2 of the 3 following criteria:

- aims at attaining a political, economic, religious, or social goal;
- includes evidence of an intention to coerce, intimidate, or convey some other message to a larger audience (or audiences) other than the immediate victims;
- is outside the precepts of International Humanitarian Law insofar as it targeted non-combatants.

We also make sure that terrorism events were not already accounted for in the internal conflict data used in the first cluster as could be the case (see Stanton, 2013). We use 3 variables that capture differently the relative intensity of terrorist activity at country level:

- Total number of terrorist incidents;
- Total number of fatalities caused by terrorism;
- Total number of injured caused by terrorism;

Data are available from 1970 to 2012. From 2008 to 2012, 14,536 attacks were recorded in the world, resulting in more than 28,000 deaths and more than 59,000 injured people (Table 3). The year 2012 was characterized by a surge in the number of events, and related deaths and injured, compared to previous years.

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[11] The full GTD and accompanying documentation are available at the following website: www.start.umd.edu/gtd.

Terrorism is strongly concentrated geographically (see Table 4). In 2012, Pakistan, Iraq, and Afghanistan had more than half of the attacks (54%), fatalities (63%), and injured (65%). In our sample of 130 developing countries for the year 2012, the number of terrorist incidents is significantly correlated with the number of deaths (coefficient of 0.70) and with the number of injured (0.76), and the correlation is also strong between the number of deaths and the number of injured due to terrorist incidents (0.81). However, Table 4 demonstrates the interest in taking different measures of terrorism intensity into account, particularly for those countries which are hurt hard by terrorism. In 2012, while the highest number of terrorist attacks occurred in Pakistan, the highest number of fatalities occurred in Afghanistan, and the highest number of injured in Iraq. The average mortality in terrorist attacks was higher in Nigeria (2.5 deaths per attack) than in Pakistan and Afghanistan. Additionally, the average number of people injured per terrorist attack was especially high in Syria (13.3 injured per attack).

Table 3. Terrorist incidents and casualties worldwide by year - 2008 to 2012

Year	2008	2009	2010	2011	2012
Number of countries	74	60	61	69	83
Number of terrorist events	1,951	1,739	1,885	2,158	6,803
Number of deaths	4,716	4,582	3,870	4,205	11,040
Number of injured	10,405	10,932	8,674	8,262	21,689

Source: Global Terrorism Database (GTD)

Table 4. 10 countries most hurt by terrorist attacks in 2012

Country	Total attacks	Total killed	Total injured	Average Number killed per attack	Average Number injured per attack
Pakistan	1,389	1,790	3,626	1.29	2.61
Iraq	1,268	2,406	6,662	1.90	5.25
Afghanistan	1,042	2,755	3,894	2.64	3.74
India	556	231	555	0.42	1.00
Nigeria	544	1,390	976	2.55	1.79
Thailand	214	171	887	0.80	4.14
Yemen	207	341	374	1.65	1.81
Somalia	179	307	408	1.72	2.28
Syria	134	629	1,783	4.69	13.31
Russia	128	138	240	1.08	1.88

Source: Global Terrorism Database (GTD)

Figure 5.   World totals - Terrorist attacks / Total killed / Total wounded - 2012
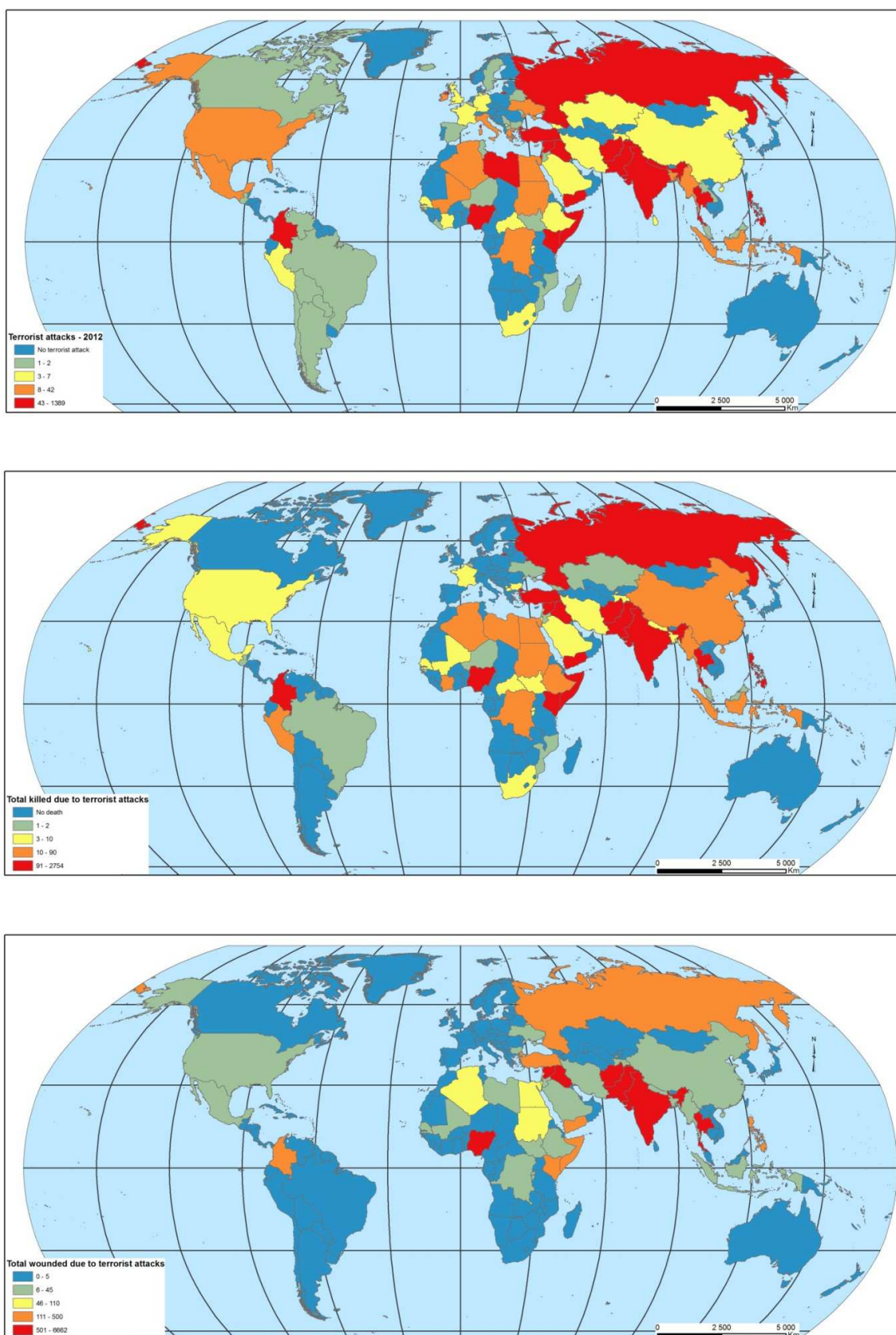
Source: Global Terrorism Database (GTD)

1.4. Cluster 4: Political violence (assassinations, purges, and riots)

In cluster 1 above we considered only those internal armed conflicts which result in causing at least 25 battle-related deaths. Moreover, while armed conflicts have tended to decline over recent decades, political violence may remain in other forms, originating from both government and opposition.

Following an investigation of different databases, we use the Cross-National Time-Series data archive CNTS (Banks and Wilson, 2015) which is large enough in scope and country coverage[12]. The CNTS contains almost 200 variables available for over 200 countries from 1815 to 2011 and is commonly used by researchers. The data are based on various sources, the main one being The Statesman's Yearbook for early data, while more recent data are gathered from a number of international sources. The internal conflict events data in the CNTS are mostly derived from The New York Times. The dataset records occurrences of events defined as General Strikes, Purges, Government Crises, Riots, Assassinations, Anti-Government Demonstrations, Guerilla Welfare, and Revolutions.

Some of these variables are likely to have been captured in our first three clusters (especially in the internal armed conflicts cluster) and we aim in this fourth cluster at measuring political violence only. We use only three variables, assassinations, purges, and riots. Assassinations are defined as "any politically motivated murder or attempted murder of a high government official or politician"; purges are defined as "any systematic elimination by jailing or execution of political opposition within the ranks of the regime or the opposition"; and riots are defined as "any violent demonstration or clash of more than 100 citizens involving the use of physical force". These 3 variables measure the number of reported events, and not the number of victims or the size of the event which are obviously difficult to record.

Data are available for 198 countries for which the CNTS has recorded a total of 84 events of assassinations, 35 events of purges, and 311events of riots over the period 2007-2011. Given a high occurrence of zeros in country / year data for each of the 3 variables, we simply add the number of events for the 3 variables over the 5 years to get one measure of political violence by country. Then, over this period, the countries which experienced the largest number of events of assassinations, purges, or riots are Egypt (33 events), Yemen (27), China (20), Iraq (17), and Pakistan (16). LDCs recorded 103 events in the reporting period compared with 134 in Africa, 41 in East Asia and Pacific, and 44 in South Asia. 96 countries experienced no violent events and 32 countries experienced only 1 violent event.

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[12] For instance, a database focusing on Africa was built by Salehyan et al. (2012).

Figure 6.   Total of assassinations, purges and riots over the period 2007 - 2011
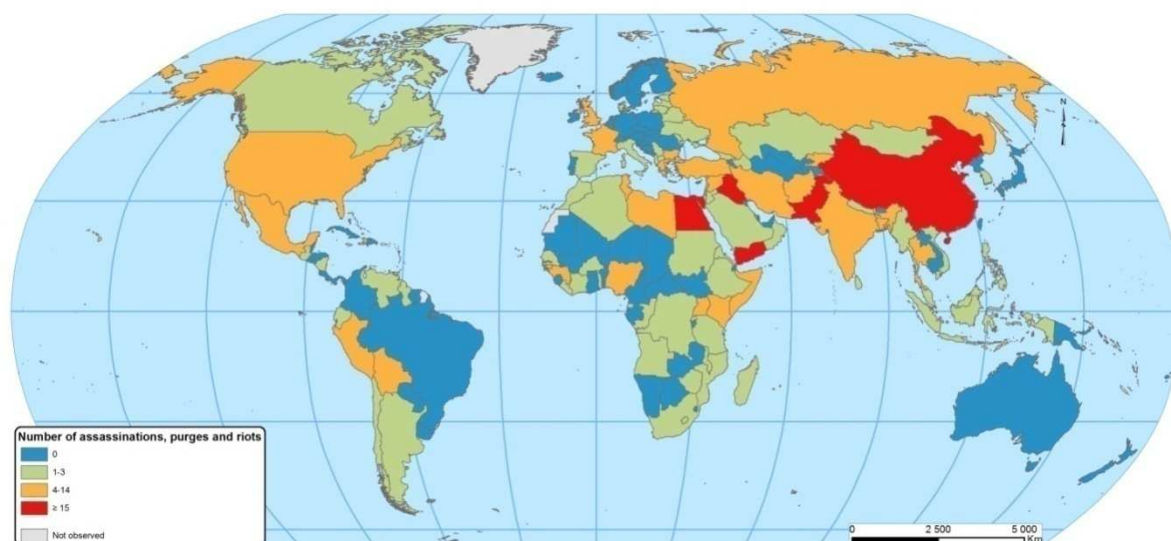
Source: Authors from Cross-National Time-Series database

2. Construction of the index

2.1.   Time dimension

The computation of the IVI for each year would lead to the generation of an historical annual series, but in this first version we restrict the computation to the latest year for which data are available. We consider that the current climate of violence is a function of the occurrence of violent events in a period overlapping the current and preceding years, assuming that an event in a year has a persistent but dwindling effect. Then, for a given year, events occurring in the preceding years have an impact that diminishes over time. For 2012, we apply a 5-year weighted average, for the period 2008-2012, using the weights from the Global Terrorism Index (GTI), reported in Table 5[13].

Table 5.   Effect of past events on the climate of violence in a given year.

Year	Weight (%)
Current year	52
Previous year	26
Two years previous	13
Three years previous	6
Four years previous	3

However, as discussed in the related sections above, this weighted average is not applied for IDPs, for which only the "stock" in 2012 is used, and it is not applied for cluster 4 (political violence) for

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[13] The GTI index is produced by the Institute for Economics and Peace. See Global Terrorism Index Report: http://economicsandpeace.org/wp-content/uploads/2011/09/2012-Global-Terrorism-Index-Report.pdf.

which the (rare) events are simply summed over the period 2007-2011. Finally, for every variable of the IVI we get one observation per country, considered as for the climate of violence in 2012.

2.2. Normalization of the variables

A number of extreme values are observed in the number of deaths due to internal armed conflicts (cluster 1), and in the number of terrorist incidents, and related deaths and injured (cluster 3). The distributions of these series were normalized through logarithmic transformations. We have checked that this transformation does not have a significant impact on IVI country ranking. For the IDP variable, only Syria appears as an outlier, and we set a cap at 25% of the total population for IDP.

The selected variables are initially expressed in different units and must be standardized to make them comparable. While different standardization or normalization methods can be used in this case, we rely on the usual "minimum / maximum" method following the formula:

$$Index = 100 \times \frac{(\text{variable value} - \min)}{(\max - \min)}$$

With min and max being the observed minimum and maximum values for each variable's distribution, except for IDPs and cluster 4 for which ad hoc maxima are set. Every indicator then lies between 0 and 100. The boundaries (minimum and maximum) of the variables are reported in Table 6.

Table 6. Min /max limits used for normalization of IVI components

Components	Reference years	Min	Max
Number of deaths due to internal conflicts (log)	2008-2012	0	6.6
Internally displaced people (% of total population)	2012	0.04	25
Homicide (rate - per 100,000 inhabitants)	2008-2012	0.9	46.5
Number of terrorism incident (log)	2008-2012	0	6.2
Number of Fatalities due to terrorism (log)	2008-2012	0	7.2
Number of Injured due to terrorism (log)	2008-2012	0	7.6
Number of Assassinations, purges, riots	2007-2011	0	18

Notes: Reference years are the periods for which data are gathered to compute the index of violence for 2012.

2.3. Weighting

Several techniques of aggregation can be used to build a composite indicator (see for example Freudenberg, 2003 or Booysen, 2002). Accepted techniques include arithmetic mean (or others like the quadratic mean) with equal weighting or different weightings set by experts or general agreement, Principal Component Analysis (PCA), factor analysis or linear model regression, or

Analytic Hierarchy Process (AHP). In this first version we are trying to build a simple and transparent index. The lack of transparency of PCA and factor analysis, and the difficulty in determining which variables are more (or less) important, leads the simple arithmetic mean with equal weighting to be preferred. Babbie (2015), among others, also argues that items should be "weighted equally unless there are compelling reasons for differential weighting". Equal weighting was also used by the well accepted Human Development Index, with an aggregation by an arithmetic mean until 2009, and then a quadratic mean since 2010. We will test the sensitivity of the index to different techniques of aggregation in the next section.

Next we use a simple arithmetic mean with the same weight of 25% assigned to the four clusters, and the same weight assigned to the components in each cluster, thus assuming substitutability between components (table 7). Table A.1 and Figure A.1 in the appendix show the descriptive statistics and distributions of the four clusters. They show different means and medians, with a large number of zero values in clusters 1 and 3, but similar standard deviations. Clusters 3 and 4 have similar distributions while cluster 2 has a flatter distribution.

Table 7. Components' weights in the IVI

Cluster	Variable
1. Internal conflict: 1/4	Number of deaths: 1/8
	IDPs rate: 1/8
2. Criminality: 1/4	Homicide rate: 1/4
3. Terrorism: 1/4	Number of events: 1/12
	Number of deaths: 1/12
	Number of injured: 1/12
4. Political violence: 1/4	Number of events of assassinations, purges and riots: 1/4

3. Results

The IVI has been calculated for a complete set of 130 developing countries. Country results are reported in the annex. Iraq was the most violent country in 2012, followed by Pakistan, Afghanistan, Yemen, Syria, and Nigeria. The least violent countries are Singapore, Qatar, Bhutan, and Brunei. The average value of the IVI is 15.4, with a minimum of 0 in Singapore, and a maximum of 67.8 in Iraq.

The Middle East region exhibits the highest average scores, with an average of 27.5, but with a high standard deviation signaling heterogeneity. A few countries are below the full sample average score (for example Qatar and Oman respectively at 0.1 and 1.4).

The high average score for the African region is due to the Arab spring events that increased the level of violence in Northern Africa. The average score of Least Developed Countries (LDCs) seems lower than that of non-LDCs, but the scores are more heterogeneous across the non-LDCs group.

Table 8.   Descriptive statistics of IVI by groups of countries

Group	Average	Median	Standard deviation	Min	Max
Developing (130)	15.4	9.5	15.2	0	67.8
LDCs (48)	13.7	8.6	14.6	0.5	57.6
Non LDCs (82)	16.3	10.5	15.5	0	67.8
Landlocked (22)	14.4	11.5	13.1	0.5	57.3
Africa (54)	14.2	9.3	12.7	1.0	55.3
SSA (49)	13.4	9.0	12.7	1.0	55.3
Middle East (12)	27.5	21.9	23.4	0.1	67.8
South - Southeast Asia (17)	16.4	8.9	18.9	0	63.6

Note: IVI is not computed for Central Asia countries due to missing data on internal armed conflicts

Figure 7.   IVI on the map
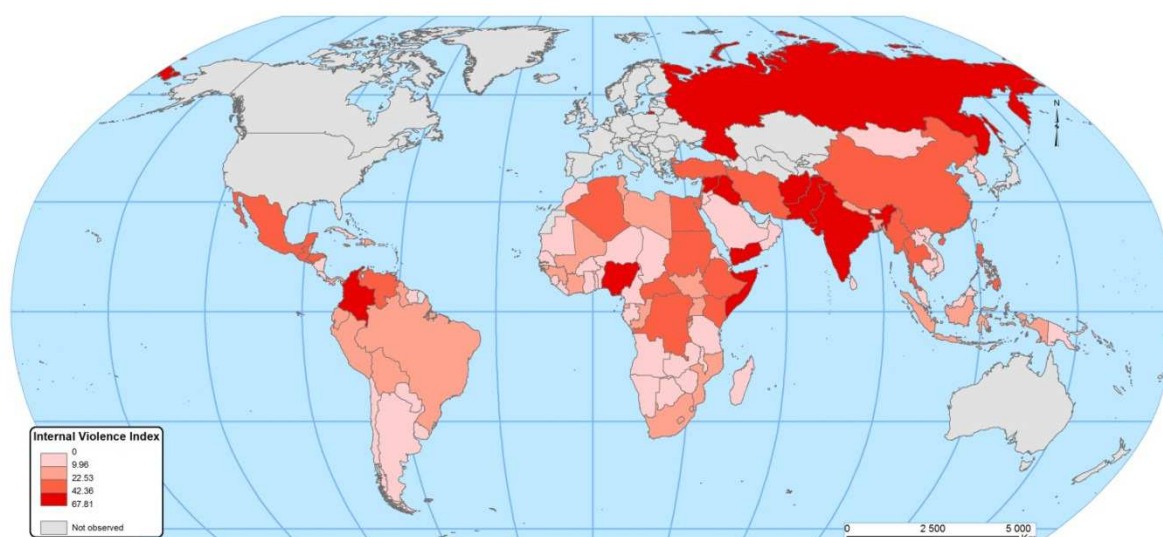
Source: Authors

3.1. Checking for Robustness

In terms of country ranking, we test the sensitivity of the results to three alternatives of normalization and aggregation of the components (full results are reported in the appendix).

IVI2 – changing the weights of variables within clusters 1, 3 and 4

In the methodology hitherto used, we assign equal weights at both variable and cluster levels. However it could be argued that some variables are more important, in the sense that they would be more objective or direct than others in determining the level of internal violence. Our first alternative called IVI2 is then based on unequal weights for the variables in clusters 1, 3, and 4 (maintaining equal weights at cluster level). Therefore, in cluster 1 (internal conflicts), more emphasis is given to the number of deaths rather than to the number of internally displaced people. We assume that the number of deaths is three times more important than the number of internally displaced people, giving a weight in the cluster of 75% and 25% respectively. Similarly, in cluster 3 (terrorism), we draw on the Global Terrorism Index (GTI)'s expert opinion that gives a weight of 25 % to terrorism events, 60 % to related fatalities, and 15 % to injured. Finally, for the cluster 4 (political violence), we use the weights from the CNTS's "weighted conflict measures" (which is a weighted average of eight variables of conflict events): 35 % to assassinations, 30 % to purges and 35 % to riots.

IVI and IVI2 are highly correlated, with a Spearman rank correlation of 0.99. Out of the 130 countries, 43 have the same rank on IVI and IVI2. However, Jordan, Central African Republic, Saudi Arabia, and Nepal are significantly less violent according to IVI2 compared to IVI, and lose 4 or 5 places in the ranking, and inversely for Mauritania (+11 places), Ethiopia (+9), Algeria (+6), and Niger (+4). Full results are reported in Appendix Table A.2.

Table 9. Descriptive statistics of IVI2 by groups of countries

Group	Average	Median	Standard deviation	Min	Max
Developing (130)	16.0	9.7	16.4	0	73.6
LDCs (48)	14.5	8.5	16.0	0.3	63.7
Non LDCs (82)	16.9	10.6	16.6	0	73.6
Landlocked (22)	14.9	10.5	14.4	0.3	63.7
Africa (54)	14.8	9.4	13.6	1.0	59.7
SSA (49)	14.0	8.8	13.6	1.0	59.7
Middle East (12)	28.3	21.9	25.4	0.1	73.6
South - Southeast Asia (17)	17.6	9.5	21.2	0	70.8

Figure 8.   IVI (horizontal axis) versus IVI2 (vertical axis)
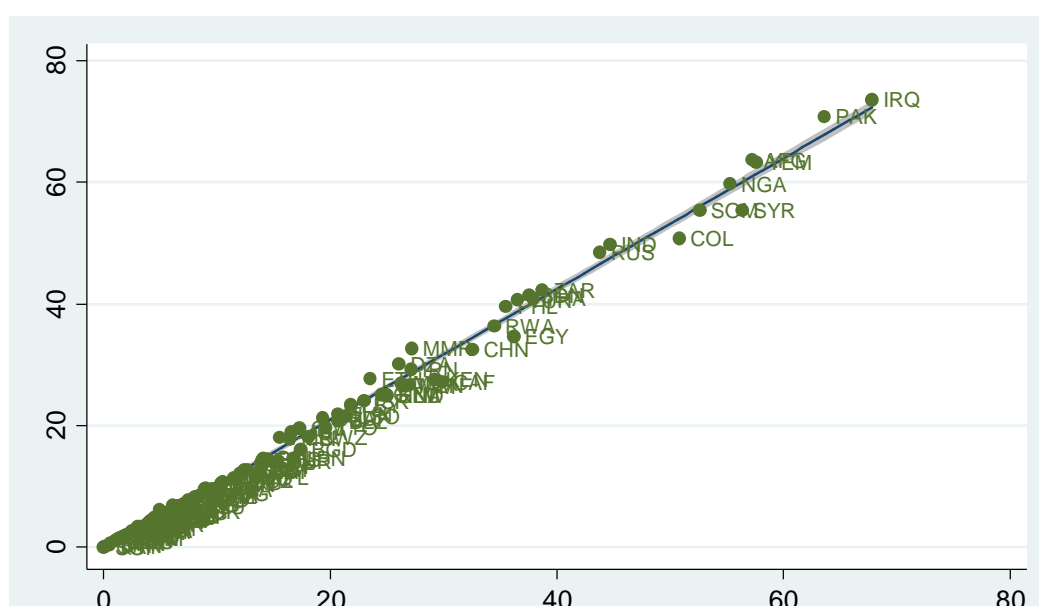
Source: Authors

IVI3

As an alternative to the arithmetic mean we use the quadratic mean to aggregate scores at the cluster level (maintaining equal weights as in IVI). As a bad score in one cluster then takes more weight, the quadratic mean limits the substitution or compensation effect between them. While as expected the averages, medians and standard deviations are higher for IVI3 than for IVI, the relative levels between the groups are similar, with Middle East at the top for violence.

The high Spearman rank correlation between IVI and IVI3 (0.95) suggests robustness in terms of ranking. Among the major changes, the countries that appear more violent with IVI3 than with IVI are Brazil (+16 places in the ranking), Dominican Republic (+15), Saint Lucia (+14), and Honduras (+13), while Sri Lanka (-20), Uganda (-19), and Cote d'Ivoire (-17) appear to be less violent.

Table 10.   Descriptive statistics of IVI3 by groups of countries

Group	Average	Median	Standard deviation	Min	Max
Developing (130)	21.7	16.0	18.3	0	75.7
LDCs (48)	18.0	11.7	16.5	0.8	66.5
Non LDCs (82)	23.9	18.9	19.1	0	75.7
Landlocked (22)	20.0	18.4	15.7	0.8	66.2
Africa (54)	19.5	14.6	14.9	2.1	59.0
SSA (49)	18.3	12.6	14.3	2.1	59.0
Middle East (12)	33.7	27.0	26.6	0.2	75.7
South - Southeast Asia (17)	20.5	9.0	21.5	0	71.9

Figure 9.   IVI (horizontal axis) versus IVI3 (vertical axis)
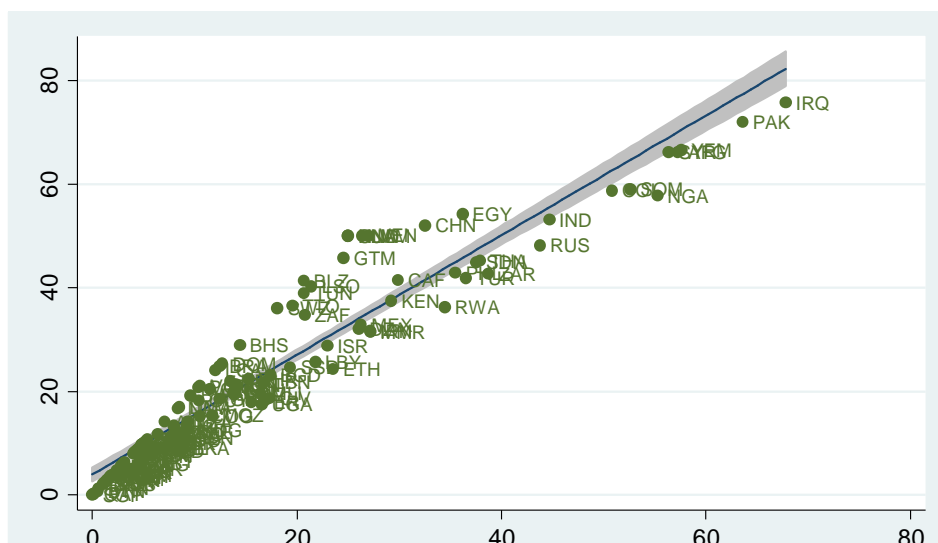
Source: Authors

3.2.   Comparing IVI with existing indicators of fragility

The interest in fragility has been increasing in donor and international institution circles, with variations in the terminology such as "fragile states", "failing states", "failed states", and "collapsed states", indicating increasingly problematic situations. There is no unique definition of the concept of fragility, but there is general agreement on some keys characteristics of fragile states: weak institutions and governance, lack of leadership, the inability to fulfill essential state functions (see for instance Rocha Menocal, 2011). Some organizations have published fragility indices (or non-fragility indices) covering institutional, economic, social, political, and global aspects of development conditions, which are mostly based on the judgments of international experts. Compared to the existing indices of fragility, the IVI covers a narrower aspect and is only based on quantitative information. Below we compare the IVI results to three well-known composite indices for fragile states; the Fund for Peace's Failed States Index, the World Bank's Country Policy and Institutional Assessment, and the World Bank's Worldwide Governance Indicator of Political Stability and Absence of Violence[14].

The Fund for Peace's Failed States Index (FSI), renamed the Fragile State Index in 2013, is based on 12 clusters, and includes a very large number of variables[15]. 4 clusters cover social aspects (demographic pressures, refugees and IDPs, group grievance, human flight and brain drain), 2 cover economic aspects (uneven economic development, poverty and economic decline), and 6 cover the political and military dimensions (state legitimacy, public services, human rights and rule of law, security apparatus, fractionalized elites, external intervention). The scoring methodology

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[14] Other indicators comprise the UK's DFID (2005) which defines fragile states as countries where 'the government cannot or will not deliver core functions to the majority of its people, including the poor', where core functions include service entitlements, justice and security; the OECD focuses on delivering services (OECD, 2012, 2014). Canada's Country Indicators for Foreign Project (CIFP) defines fragile states as countries with a lack of service entitlements, functional authority, institutional capacity and political legitimacy.

[15] More on this index on http://fsi.fundforpeace.org

relies on an analysis of the content of numerous documents, which is then compared with qualitative and quantitative data. FSI scores lie between 0 and 120, a higher score signaling a higher fragility: a score higher than 90 puts the country under a state of "alert". The FSI covered 178 developing and developed countries in 2015 (an increase from 76 developing and transition countries in 2005).

The World Bank's CPIA indicator evaluates the quality of countries' policies and institutions. It is based on a subjective assessment by World Bank staff of 16 criteria grouped in 4 clusters: economic management; structural policies; policies for social inclusion and equity; and public sector management and institutions[16]. 95 developing countries are rated from 1 to 6. To determine the level of fragility of IDA countries, the World Bank uses the CPIA as the main indicator (with a threshold at a CPIA level below 3.2), together with other factors like the presence of an UN peace-keeping mission.

One of the Worldwide Governance Indicators (WGI) of the World Bank called "Political stability and absence of violence" measures "perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including political violence and terrorism" (Kaufmann et al, 2010). This definition is close to that of the IVI. However, the computation of the WGI is based on the aggregation of numerous scores coming from a large number of sources, a mixture of both quantitative and qualitative information. The initial score lies between -2.5 and +2.5, a positive score signals a good level of political stability and / or a low level of violence. More than 200 countries and territories are scored since 1996.

We now examine the correlation between IVI rankings and the above mentioned indices of fragility which are rescaled and, for both World Bank indices, inversed to facilitate the comparison. The rescaled indices then lie between 0 and 100, with a high score signaling a high fragility, like IVI.

We find a strong correlation, 0.67, between IVI and PSAV, which is expected given the similar scopes and components. The correlation between IVI and FSI is moderately significant at 0.39. The FSI contains some indicators of violence and security which are highly correlated with the IVI. However, there is no significant correlation between IVI and CPIA (0.08).

Table 11. Pairwise correlations coefficients between IVI and indices of fragility

	IVI	FSI[1]	CPIA[2]
FSI[1]	0.39***		
CPIA[2]	0.08	0.62***	
PSAV[3]	0.67***	0.74***	0.32**

Notes: IVI= internal violence index; FSI[1]= Rescaled FSI with FSI= fragile state index; CPIA[2] =100 – Rescaled CPIA, CPIA= country policy and institutionnal assessement; PSAV[3]= 100 – Rescaled PSAV, PSAV= Political stability and absence of violence.

Correlations computed on the common sample for each pair of indices. *** significant at 1% level.

Figure 10.   Correlation between IVI (vertical axis) and other indicators of fragility (horizontal axis)
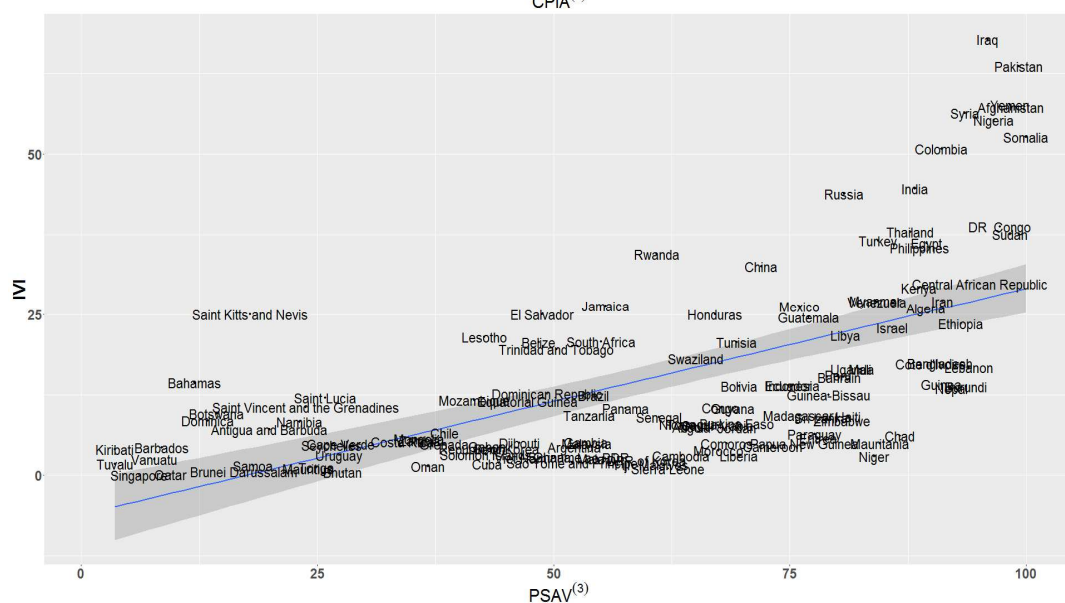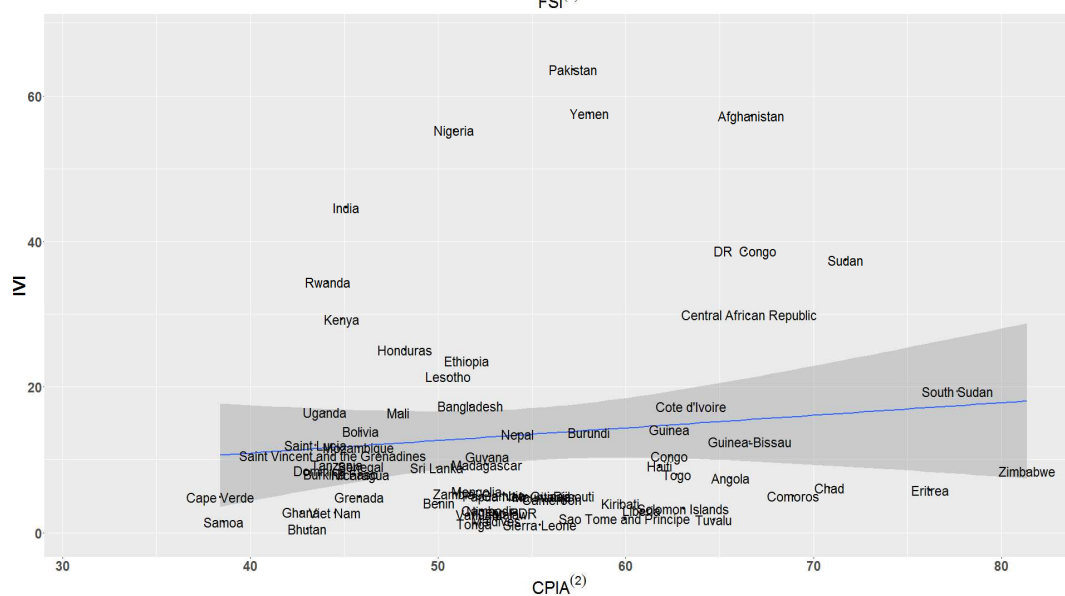
Conclusions

Fragile states face specific problems that hamper most development initiatives. Donors and several institutions have developed indices of fragility with the aim of targetting resources on the countries in need. These indices aggregate information on economic, social, and institutional conditions, but suffer from a lack of transparency and objectivity. We propose an Internal Violence Index (IVI) that measures a narrow concept of fragility for 130 developing countries through their level of violence in its many different forms and manifestations: internal armed conflicts, criminality, terrorism, and political violence. The IVI aims to be an objective index based on quantitative data with less room for subjective considerations.

This version of the IVI has some limitations. Some clusters should be developed further, in particular the cluster for criminality which contains only one variable (homicide). Criminality is a multi-faceted phenomenon, which includes as well as homicide other forms such as robbery, assaults, and maritime piracy. Also, more attention should be paid to the time dimension in future versions of the IVI with retrospective scores of the index.

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Annexe

Table A.1 Descriptive statistics of the normalized variables and clusters of IVI

Variable/ Cluster	Mean	Median	Standard deviation	Min	Max
Cluster 1 : Internal armed conflicts	9.9	0	20.8	0	100
Deaths due to internal armed conflicts	16.2	0	32.4	0	100
Internally displaced people	3.7	0	14.6	0	100
Cluster 2 : Homicide	22.8	15.7	24.5	0	100
Homicide	22.8	15.7	24.5	0	100
Cluster 3 : Terrorism	14.8	0	25.7	0	100
Deaths due to terrorism	13.1	0	24.0	0	100
Injured due to terrorism	14.9	0	25.7	0	100
Terrorist incidents	14.4	0	26.1	0	100
Cluster 4 : Political violence	14.0	5.6	22.7	0	100
Total assassinations, purges, & riots	14.0	5.6	22.7	0	100

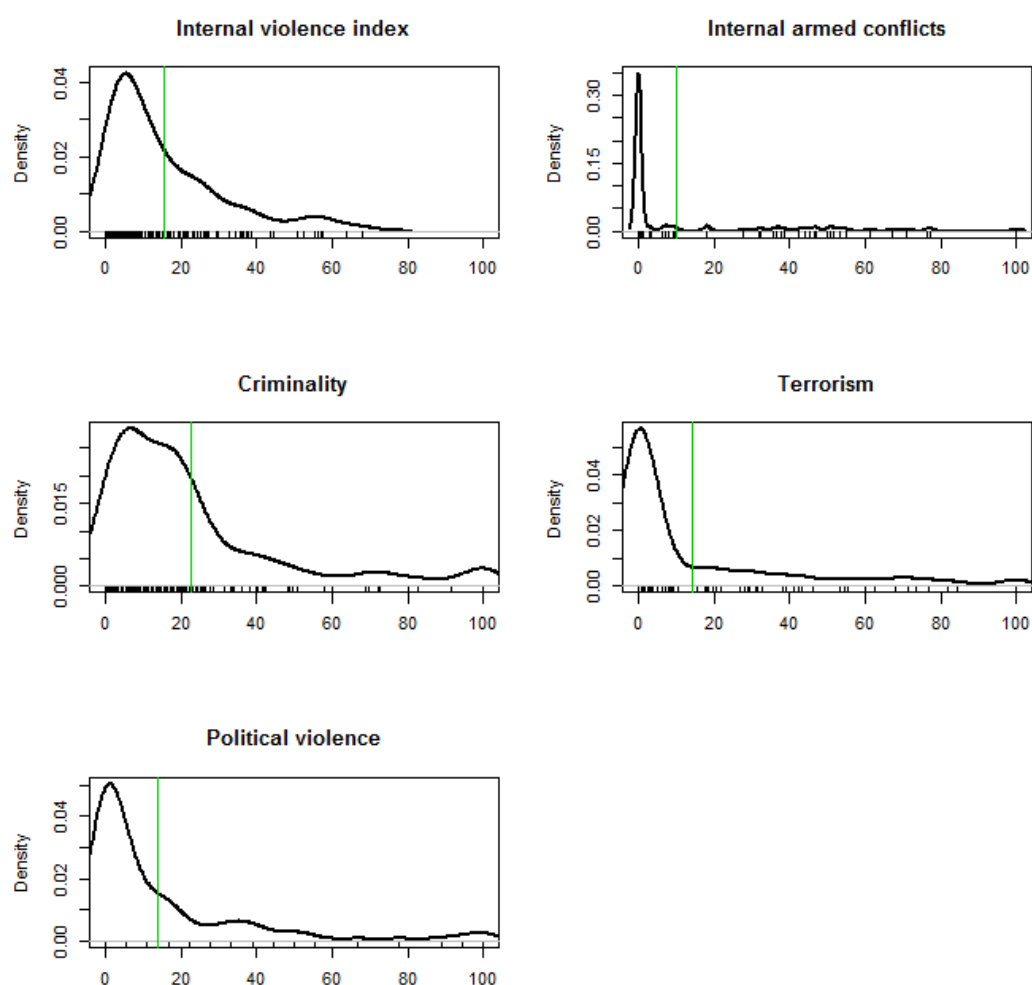**Figure A.1 Kernel density of the IVI and its four clusters**

Table A.2 Countries' scores and ranks on IVI, IVI2 and IVI3

Country	Code	IVI [A] Value	IVI [A] Rank	IVI 2 [B] Value	IVI 2 [B] Rank	IVI 3 [C] Value	IVI 3 [C] Rank	Difference in Ranking Rank [A]- Rank [B]	Difference in Ranking Rank [A]- Rank [C]
Afghanistan	AFG	57.25	4	63.65	3	66.16	5	+1	-1
Angola	AGO	7.47	78	7.67	77	10.48	81	+1	-3
Argentina	ARG	4.44	99	4.49	99	5.93	105	0	-6
Antigua and Barbuda	ATG	7.09	80	7.09	78	14.17	68	+2	+12
Burundi	BDI	13.74	53	12.37	56	19.71	55	-3	-2
Benin	BEN	4.11	102	4.11	102	8.22	98	0	+4
Burkina Faso	BFA	8.06	74	8.27	74	11.40	76	0	-2
Bangladesh	BGD	17.38	41	16.05	45	23.12	45	-4	-4
Bahrain	BHR	15.25	47	14.08	50	22.37	46	-3	+1
Bahamas	BHS	14.43	48	14.43	48	28.86	37	0	+11
Belize	BLZ	20.67	37	20.67	38	41.34	25	-1	+12
Bolivia	BOL	13.88	52	13.86	51	19.41	57	+1	-5
Brazil	BRA	12.41	57	12.41	55	24.82	41	+2	+16
Barbados	BRB	4.32	100	4.32	101	8.64	94	-1	+6
Brunei Darussalam	BRN	0.60	127	0.60	127	1.21	127	0	0
Bhutan	BTN	0.53	128	0.31	128	0.77	128	0	0
Botswana	BWA	9.59	65	9.59	66	19.19	58	-1	+7
Cent. Afr. Republic	CAF	29.88	19	27.19	24	41.42	24	-5	-5
Chile	CHL	6.56	81	6.72	80	9.01	91	+1	-10
China	CHN	32.54	18	32.51	19	52.06	11	-1	+7
Cote d'Ivoire	CIV	17.30	42	19.53	40	18.69	59	+2	-17
Cameroon	CMR	4.52	97	4.85	95	7.54	101	+2	-4
Congo	COG	10.53	62	10.73	61	15.21	67	+1	-5
Colombia	COL	50.82	8	50.77	8	58.77	7	0	+1
Comoros	COM	4.99	90	4.99	91	9.98	85	-1	+5
Cape Verde	CPV	4.85	95	4.85	96	9.69	88	-1	+7
Costa Rica	CRI	5.26	87	5.26	88	10.53	80	-1	+7
Cuba	CUB	1.81	118	1.81	118	3.62	117	0	+1
Djibouti	DJI	5.04	89	5.04	90	10.09	84	-1	+5
Dominica	DMA	8.52	71	8.52	71	17.03	64	0	+7
Dominican Republic	DOM	12.69	55	12.69	53	25.37	40	+2	+15
Algeria	DZA	26.06	26	30.07	20	32.08	34	+6	-8
Ecuador	ECU	13.97	50	14.24	49	20.16	54	+1	-4
Egypt	EGY	36.18	15	34.70	17	54.28	9	-2	+6
Eritrea	ERI	5.78	84	5.82	85	7.61	100	-1	-16
Ethiopia	ETH	23.53	31	27.69	22	24.24	43	+9	-12
Fiji	FJI	1.70	120	1.70	120	3.40	120	0	0
Gabon	GAB	4.50	98	4.50	98	8.99	93	0	+5
Ghana	GHA	2.85	110	2.85	110	5.70	106	0	+4
Guinea	GIN	14.11	49	14.59	46	21.33	49	+3	0
Gambia	GMB	5.10	88	5.10	89	10.20	82	-1	+6

Guinea-Bissau	GNB	12.45	56	12.65	54	18.59	60	+2	-4
Equatorial Guinea	GNQ	11.48	60	11.34	59	20.37	53	+1	+7
Grenada	GRD	4.86	94	4.86	94	9.71	87	0	+7
Guatemala	GTM	24.55	30	25.04	28	45.75	18	+2	+12
Guyana	GUY	10.39	63	10.46	63	18.22	61	0	+2
Honduras	HND	25.04	27	25.02	29	50.00	14	-2	+13
Haiti	HTI	9.16	68	9.44	68	13.25	71	0	-3
Indonesia	IDN	13.95	51	13.32	52	21.26	50	-1	+1
India	IND	44.67	9	49.78	9	53.17	10	0	-1
Iran	IRN	27.13	22	29.19	21	31.59	35	+1	-13
Iraq	IRQ	67.81	1	73.63	1	75.68	1	0	0
Israel	ISR	22.95	32	24.07	32	28.79	38	0	-6
Jamaica	JAM	26.39	24	26.46	27	50.08	13	-3	+11
Jordan	JOR	7.44	79	5.90	84	10.10	83	-5	-4
Kenya	KEN	29.21	20	27.63	23	37.50	28	-3	-8
Cambodia	KHM	3.07	108	3.07	109	6.14	104	-1	+4
Kiribati	KIR	4.00	103	4.00	103	8.00	99	0	+4
Saint Kitts and Nevis	KNA	25.00	28	25.00	30	50.00	15	-2	+13
Republic of Korea	KOR	4.17	101	4.38	100	8.33	97	+1	+4
Lao PDR	LAO	2.74	112	2.74	112	5.48	108	0	+4
Lebanon	LBN	16.73	43	14.52	47	21.69	48	-4	-5
Liberia	LBR	3.08	107	3.10	108	4.23	113	-1	-6
Libyan Arab Jamahiriya	LBY	21.78	33	23.40	33	25.74	39	0	-6
Saint Lucia	LCA	12.02	58	12.02	57	24.04	44	+1	+14
Sri Lanka	LKA	8.92	70	9.55	67	9.03	90	+3	-20
Lesotho	LSO	21.44	34	21.51	35	40.19	26	-1	+8
Morocco	MAR	3.82	104	3.76	104	5.03	109	0	-5
Madagascar	MDG	9.34	66	8.79	70	12.64	72	-4	-6
Maldives	MDV	1.64	121	1.64	121	3.29	121	0	0
Mexico	MEX	26.29	25	26.91	25	32.85	33	0	-8
Mali	MLI	16.46	45	17.75	44	19.61	56	+1	-11
Myanmar	MMR	27.19	21	32.65	18	31.57	36	+3	-15
Mongolia	MNG	5.67	85	5.73	86	8.99	92	-1	-7
Mozambique	MOZ	11.69	59	11.04	60	15.31	66	-1	-7
Mauritania	MRT	4.95	93	6.11	82	6.65	102	+11	-9
Mauritius	MUS	1.08	125	1.08	125	2.16	125	0	0
Malawi	MWI	2.56	114	2.63	113	3.64	116	+1	-2
Malaysia	MYS	4.96	92	4.96	93	8.48	95	-1	-3
Namibia	NAM	8.32	73	8.32	72	16.64	65	+1	+8
Niger	NER	2.96	109	3.34	105	4.39	112	+4	-3
Nigeria	NGA	55.27	6	59.71	5	57.75	8	+1	-2
Nicaragua	NIC	7.95	75	8.02	75	13.40	70	0	+5
Nepal	NPL	13.50	54	11.47	58	21.96	47	-4	+7
Oman	OMN	1.39	123	1.46	123	2.78	123	0	0
Pakistan	PAK	63.58	2	70.77	2	71.94	2	0	0

Panama	PAN	10.37	64	10.37	64	20.75	52	0	+12
Peru	PER	15.55	46	18.04	43	17.90	62	+3	-16
Philippines	PHL	35.50	16	39.58	15	42.86	21	+1	-5
Papua New Guinea	PNG	4.99	90	4.99	91	9.98	85	-1	+5
Democratic P. Rep. Korea	PRK	2.36	116	2.36	116	4.71	110	0	+6
Paraguay	PRY	6.42	82	5.99	83	11.68	75	-1	+7
Qatar	QAT	0.11	129	0.11	129	0.22	129	0	0
Russia	RUS	43.78	10	48.52	10	48.13	17	0	-7
Rwanda	RWA	34.46	17	36.35	16	36.32	30	+1	-13
Saudi Arabia	SAU	7.75	77	6.64	81	11.40	77	-4	0
Sudan	SDN	37.52	13	41.47	12	44.85	20	+1	-7
Senegal	SEN	9.05	69	9.71	65	10.91	78	+4	-9
Singapore	SGP	0.00	130	0.00	130	0.00	130	0	0
Solomon Islands	SLB	3.25	105	3.32	106	4.65	111	-1	-6
Sierra Leone	SLE	1.04	126	1.04	126	2.08	126	0	0
El Salvador	SLV	25.00	28	25.00	30	50.00	15	-2	+13
Somalia	SOM	52.60	7	55.38	6	58.98	6	+1	+1
South Sudan	SSD	19.35	39	21.23	36	24.57	42	+3	-3
Sao Tome and Principe	STP	1.96	117	1.96	117	3.92	114	0	+3
Suriname	SUR	2.85	110	2.85	110	5.70	106	0	+4
Swaziland	SWZ	18.07	40	18.07	42	36.07	31	-2	+9
Seychelles	SYC	4.71	96	4.71	97	9.43	89	-1	+7
Syria	SYR	56.34	5	55.34	7	66.16	4	-2	+1
Chad	TCD	6.14	83	6.83	79	8.45	96	+4	-13
Togo	TGO	7.93	76	7.86	76	11.71	74	0	+2
Thailand	THA	37.93	12	40.89	13	45.22	19	-1	-7
Tonga	TON	1.21	124	1.21	124	2.41	124	0	0
Trinidad and Tobago	TTO	19.56	38	19.63	39	36.44	29	-1	+9
Tunisia	TUN	20.70	36	21.87	34	38.93	27	+2	+9
Turkey	TUR	36.55	14	40.68	14	41.87	23	0	-9
Tuvalu	TUV	1.81	118	1.81	118	3.62	117	0	+1
Tanzania	TZA	9.28	67	9.19	69	14.08	69	-2	-2
Uganda	UGA	16.53	44	18.91	41	17.53	63	+3	-19
Uruguay	URY	3.15	106	3.15	107	6.29	103	-1	+3
St.Vincent and the Grenadines	VCT	10.55	61	10.55	62	21.10	51	-1	+10
Venezuela	VEN	27.00	23	26.64	26	50.09	12	-3	+11
Viet Nam	VNM	2.70	113	2.57	114	3.83	115	-1	-2
Vanuatu	VUT	2.49	115	2.55	115	3.54	119	0	-4
Samoa	WSM	1.48	122	1.48	122	2.96	122	0	0
Yemen	YEM	57.58	3	63.30	4	66.54	3	-1	0
South Africa	ZAF	20.80	35	21.00	37	34.76	32	-2	+3
DR of the Congo	ZAR	38.73	11	42.28	11	42.64	22	0	-11
Zambia	ZMB	5.37	86	5.37	87	10.75	79	-1	+7
Zimbabwe	ZWE	8.46	72	8.30	73	12.01	73	-1	-1

Figure A.2 Correlations between IVI, IVI2, and IVI3
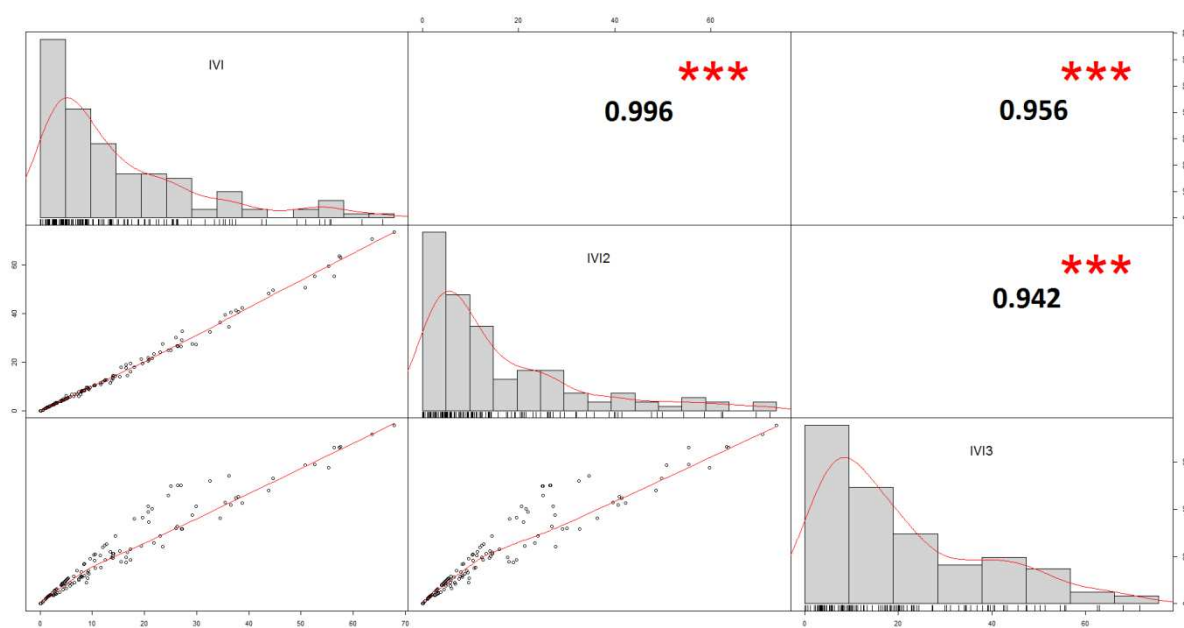
"Sur quoi la fondera-t-il l'économie du monde qu'il veut gouverner? Sera-ce sur le caprice de chaque particulier? Quelle confusion! Sera-ce sur la justice? Il l'ignore."

Pascal