Defining and measuring state fragility: a new proposal[1]

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Abstract: Despite having recently entered the wider realm of development policy, 'fragile states' has established itself as a ubiquitous concept in the international discourse. The term is usually associated with a lack of will or capacity of the state to perform its core functions. However, there is no consensus on the definition among the several actors applying it. Alongside the profusion of definitions, there is also a significant number of attempts to measure state fragility, which frequently result in indices used to build rankings of countries. Still, several caveats have been identified to these analyses. This paper aims at contributing to the literature on state fragility by proposing an alternative operationalisation. It is based on a definition derived from the theoretical framework proposed in Besley and Persson (2011), who identify two symptoms of state fragility: state ineffectiveness and political violence. Multivariate statistical analysis is then used to understand the existence of patterns among countries and to reduce the multidimensionality of the concept. The results from cluster analysis show that the two symptoms of state fragility are manifested differently among different groups of countries, thus lending support to the need for considering a disaggregated approach. Additionally, the first two principal components obtained with principal component analysis also reflect these two symptoms. In light of these results, it is argued that constructing a disaggregated index would contribute to an improved operationalisation of the concept of state fragility.

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1. Introduction

The term 'fragile states' assumed a prominent position in the development discourse in the 1990s. Concepts such as 'state failure' and 'state collapse' had been applied before within the field of international relations. However, it was only after a change in the views regarding human and global security, and the link between conflict and development, that international organisations and academics started to employ the term 'fragile states' with development concerns.[2] Among the features associated with fragile states are: i) the economic and human costs for these and neighbouring countries (Chauvet and Collier, 2004); ii) the threats they impose to regional and global security and stability (European Report on Development, 2009); and iii) the fact that they are plagued by high levels of poverty, and have had a slower progress towards the Millennium Development Goals (MDGs) when compared to other developing countries (OECD, 2012; OECD, 2014). These elements have led to an increasing concern with fragile states and have justified the need for external intervention in these countries. Still, plagued by a lack of will or capacity of the state to perform its core functions, and frequently also by political violence, fragile states impose great challenges for the effectiveness of development assistance.

Despite having established itself as a ubiquitous concept in the international discourse, the definition of fragile states remains disconcertingly far from precise. Furthermore, the existing lists of fragile states, alongside the indices of failure and fragility, fail to provide a concerted view on the issue. This paper aims at contributing to the existing literature by proposing an alternative operationalisation of the concept, based on a clear definition derived from the theoretical model of state fragility proposed in Besley and Persson (2011), which allows one to differentiate between the causes, symptoms and consequences of state fragility.

Fragility indices have been used by a distinct number of institutions, from development organisations (e.g. World Bank), to independent institutes (e.g. Fund for Peace), or universities (e.g. George Mason University). The methodologies diverge, as do the obtained lists and rankings of fragile states, leading to different, and sometimes conflicting, views and claims about state fragility. The criticisms pointed to the existing measures, especially those based on indices, are often related to the way the concept is operationalised, the steps involved in the construction of the measurement instrument, and to the interpretation and application of the obtained results.

Bearing this in mind, the alternative measurement procedure proposed in this paper is an attempt to overcome some of the current limitations. The goal is to respond to the call expressed by Woolcock (2014: 12), who states that "[i]t is increasingly recognized that prevailing theories, measures and strategies guiding international agencies' responses to fragile and conflict states are inadequate, and that fresh thinking and doing is thus required". Additionally, the usefulness of obtaining a measure of state fragility can be justified on the basis that it serves as a valuable instrument for empirical analysis, and it promises not only more objectivity and transparency in

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[2] More specifically, three main reasons have contributed to the prominent position of the term in the development discourse. Firstly, a series of events in the 1990s, namely the Cold War and the failure of the Soviet Union, resulted in an increasing concern with the dissolution of state institutions and the implications of internal conflict to international security. Second, the attacks of the 9/11 contributed to a new understanding of the relation between underdevelopment and conflict. Finally, the view that good policies and institutions are crucial for development that emerged at the end of the 1990s, and which served as the basis for aid selectivity during this period, created a "Samaritan's Dilemma" for development assistance: poor performers in policy and institutional indicators received less aid, but at the same time they were those that needed it the most.

the claims made, but also comparability across countries (Bhuta, 2012a: 13). From the point of view of policy-makers it also serves two different purposes: i) to define the eligibility of countries for special kinds of development assistance, or to draw attention to countries that should constitute exceptions to performance-based allocation systems; and ii) as a tool for risk assessment, to identify potential threats to global security (Bhuta, 2012a: 2).

In light of these issues, the present analysis seeks to contribute to an improved operationalisation of the concept of state fragility by: i) using a working definition of state fragility which is built on a clear conceptual framework that establishes the role of the state and how its performance is measured; and ii) applying statistical methods to understand the existence of patterns among countries and to reduce the multidimensionality of the concept. More specifically, cluster analysis is applied to a group of variables used to proxy for state fragility in order to understand whether different groups of countries can be identified. The obtained results show that the two symptoms of state fragility are manifested differently among different groups of countries, thus lending support to the need for considering a disaggregated approach. Also, principal component analysis is used to reduce the multidimensionality of the concept. The first two principal components obtained from the application of this method also reflect these two symptoms. Bearing these results in mind, it is argued that constructing a disaggregated index of state fragility, by using an indicator of state effectiveness and another of political violence, would contribute to an improved operationalisation of the concept and to shed light on the discourse around fragile states.

The paper proceeds as follows: Section 2 provides a brief overview of existing measures and their limitations. In section 3 the theoretical framework underlying the proposed conceptualisation of state fragility is described. Section 4 gives more details about the data and the methodology used for the empirical analysis, while section 5 discusses the obtained results and their implications for future analysis. Finally, section 6 concludes.

2. Overview of existing approaches

As the term became more and more ingrained in the development discourse, there was also a concern with identifying the countries deemed as fragile states, which in turn required some form of quantitative assessment of fragility. In response to this need, a growing number of analytical tools emerged, which were based on a set of indicators, and were aimed at operationalising the concept and measuring different dimensions of state fragility.

The baseline of current proposals is the identification of a set of indicators that capture these perceived dimensions of state fragility. The latter are derived from a certain view of the state, which establishes its core functions and the properties that it needs to exhibit in order to fulfil them.[3] Despite their differences, in several cases the focus is on the effectiveness and legitimacy of the state (e.g. Goldstone et al, 2003; Marshall and Cole, 2014; Rice and Patrick, 2008). Others have proposed a three dimensional disaggregation, arguing that well-functioning states have authority, legitimacy and capacity. Though with slight changes in the denomination of the dimensions and in their definition, examples of these approaches include Carment, Prest and Samy (2009), Stewart and Brown (2009), Call (2010), and Gravingholt, Ziaja and Kreibaum (2012).

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[3] The theoretical underpinnings of existing proposals are discussed in more detail in the next section.

Frequently, though not exclusively, these indicators are then aggregated to obtain an index of fragility. A selected list of these indices is provided in Table A1 in Annex A. Although it was not created with the purpose of measuring fragility, the Country Policy and Institutional Assessment (CPIA) index is indisputably the most widely used measure. Given its emphasis on policies and institutions, it provides an indication of state performance, making it a suitable tool for quantifying fragility. Measures of state fragility used by the World Bank, the Development Assistance Committee (DAC) of the Organization of Economic Cooperation and Development (OECD), and several academic works (e.g. McGillivray, 2006; Chauvet and Collier, 2008; Feeny and McGillivray, 2009; Chauvet, Collier and Hoeffler, 2010) are based upon the application of this index. Others have attempted to measure state fragility by proposing new indices specifically designed for this purpose. These include the Fragile States Index, the Country Indicators of Foreign Policy (CIFP) Fragility Index (adopted by the Canadian International Development Agency), and the State Fragility Index[4]. Due to their emphasis on elements of state performance, as well as on conflict indicators, other indices have also been considered as providing a measure of state fragility. Examples include the Global Peace Index and the Peace and Conflict Instability Ledger.[5]

Also using specific indicators of the dimensions of fragility, other approaches have focused on the identification of different categories of fragile states, based on disaggregated measures. In some cases, the authors provide case examples, but not final lists of countries (for instance, Goldstone et al, 2003; Call, 2010). Lists of the latter type are provided by Stewart and Brown (2009), and Gravingholt, Ziaja and Kreibaum (2012). This is also the case in Carment, Prest and Samy (2009), who, alongside the aggregate results obtained with the CIFP Fragility Index, provide the lists of countries ranked according to the scores in each of the three dimensions identified by their framework, i.e. authority, legitimacy and capacity. The view underlying these approaches that state fragility is a multidimensional phenomenon is welcomed. The definition that results from the theoretical model of state fragility used in this paper, which is adopted as the working definition, also concurs to this view.

Still, a closer inspection of these measures and underlying conceptualisations of state fragility has revealed several caveats, as pointed out, for instance, in Di John (2010), Gutierrez Sanin (2011) and Gutierrez et al (2011). Focusing on the attempts of measurement, Fabra Mata and Ziaja's (2009) *User's Guide on Measuring Fragility* lists and compares indices of fragility, while Gutierrez Sanin (2011: 22) offers a critical analysis of existing indices of state fragility and related terms, focusing on what he designates as the *hard* or *structural problems* of poor state performance indices (PSPs), i.e. "those that cannot be circumvented, have no obvious solution, and generally stem from deeply hidden biases and assumptions", related to the definition, intrinsic ambiguity, and the issue of order.[6] From the assessment of the content validity of nine fragility indices, considering their conceptualisation, measurement and aggregation methods, Ziaja (2012) distinguishes between one group of "holistic" fragility indices, offering little use to the examination of the causes and

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[4] The institutions providing these indices are, respectively, the Fund for Peace (jointly with the Foreign Policy journal, which publishes the results), the Carleton University, and the George Mason University.
[5] I refer to Fabra Mata and Ziaja (2009), Gutierrez et al (2011) and Gutierrez Sanin (2011) for more extensive reviews of fragility indices.
[6] For more particular discussions of existing indices, see Bhuta (2012a, b), who focuses on the examination of the Failed States Index by the US Fund for Peace, and the USAID index. Being one of the most frequently used indices, the CPIA has also received extensive criticism as an indicator of fragility [see, for instance, Gravingholt, Ziaja and Kreibaum (2012: 2), Ikpe (2007: 88), or Baliamoune-Lutz and McGillivray (2008: 9)].

consequences of state fragility, from the remaining indices, which deal with more direct dimensions of state fragility and produce empirically distinguishable results.

The different caveats highlighted by these critical voices can be broadly grouped according to three aspects: i) the operationalisation of the concept (e.g. definitional confusion, mismatch between the dimensions identified and the variables used); ii) the technical aspects involved in the construction of the measurement tool (e.g. lack of transparency in the applied methodology, inadequacy of the aggregation procedures); and iii) the interpretation and presentation of the obtained results (e.g. establishment of an ad hoc cut-off point to distinguish between fragile and non-fragile states). Limitations associated with the second aspect refer specifically to the approaches based on fragility indices, while the other two aspects apply broadly to all measurement endeavours. The alternative measurement procedure proposed here takes these challenges into account and attempts to overcome some of the existing limitations. Particularly, by using a working definition based on a theoretical model which allows one to distinguish between causes, symptoms and consequences of state fragility. This is the topic of the next section.

3. Theoretical framework

As pointed out by Bhuta (2012a: 7), a key challenge of measuring state fragility is definitional. In fact, existing definitions of fragile states do not fall short of criticism. Notwithstanding the commonalities between the current views, the concept remains obscure.[7] Among the caveats pointed out to the fragile states term are its fuzzy character and the broadness and vagueness of current definitions. This is linked with the lack of a sound theoretical basis that plagues several of the approaches, and which frequently results in confusion between symptoms, correlates and causes of fragility (Besley and Persson, 2011; Gutierrez Sanin, 2011: 21). The working definition proposed here aims at overcoming this shortcoming by clarifying the concept of state fragility.

As briefly described in the previous sections, the theoretical frameworks used in the conceptualisation revolve around the main characteristics of well-functioning states, and frequently refer to the capacity, authority, and legitimacy (featuring alongside effectiveness in some cases) of the states. Although there is a concern with defining these terms and with identifying relevant proxies, the underlying theory of the state frequently lacks more clarity and detail. This is the case, for instance, of the approaches followed in Goldstone et al. (2003) and Marshall and Goldstone (2007), and also of the proposal made by Stewart and Brown (2009). Stronger cases are made by Carment, Prest and Samy (2009), Call (2010) or Gravingholt, Ziaja and Kreibaum (2012), who dedicate more extensive sections to explaining the theoretical roots of the focus on authority, legitimacy and capacity.

The view proposed here draws upon a similar view of the state, but departs from these approaches in that it is based on a particular theoretical model provided in Besley and Persson (2011) [BP hereafter]. The authors put forward a framework for analysing fragile states by exploring the origins of state fragility, and, more specifically, how different factors contribute to different types of fragile states. Still, this purely theoretical exercise is yet to be applied in detailed empirical

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[7] See Table A2 in Annex A for a selected list of the definitions of fragile states within the donor community. For detailed reviews of existing definitions see Cammack et al. (2006), Bertoli and Ticci (2012) and Nay (2013).

analysis. This paper also tries to take some steps in this direction by using this approach in the conceptualisation of fragility.

My starting point is the discussion of the role of the state in society. Definitions of state abound and diverge according to different theoretical foundations. Weber's widely used concept of state explains it "as a human community that (successfully) claims the monopoly of the legitimate use of physical force within a given territory" (cited in Di John, 2010: 12). Developing a theoretical framework which explains the importance of the state in society implies both a normative standpoint and positive judgements. I start by establishing my approach for the expected role of the state based on political economy theory, and later I use the theoretical model developed by BP to describe what the actual role of the state is.

3.1. The role of the state in society

The role of the state has been approached by several fields in development studies[8]. Given the aims of this paper, I adopt a political economy view of the state. I consider that promoting economic development entails more than stimulating economic growth; it also involves a concern with improving welfare. This approach is aligned with the "post-Washington Consensus" view of economic development (Stiglitz, 1998; 2002). According to this line of thought, it is assumed that the economic role of the state is to address market failures, by supporting and complementing the market.

In order to do that, the state must provide a set of public goods (Wolfensohn, 1999, and Sen, 1999, provide similar detailed lists). I follow the framework proposed in the World Development Report (WB, 1997) which classifies the functions of the state as 'minimal', 'intermediate' and 'activist' functions (WB, 1997: 27 – Table 1.1), according to the degree to which the activities require state intervention. For the present analysis I consider the minimal functions of the state, namely, providing pure public goods: defence, law and order, property rights, macroeconomic management, and public health (WB, 1997: 27). The overall framework is represented in Fig.1.[9]

Fig. 1. The normative standpoint on the role of the state in society

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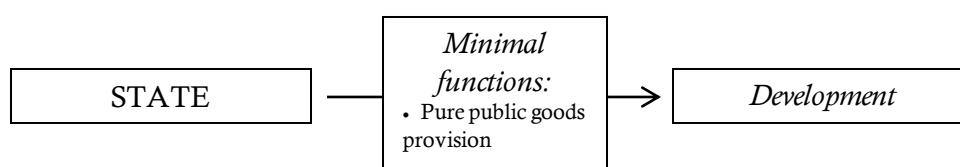
[8] See Milliken and Krause (2002) for a discussion of the evolution of statehood and a critical view of the state as the solution for the problem of political order, and Rotberg (2004) for a conceptualisation of nation-states.

[9] By adopting this view of the state, I align my proposal with what Hameiri (2007) has labelled as the "neo-Weberian institutionalist approaches", which "evaluate states in terms of institutional capacity and compare their performance to a Weberian ideal-type" (Hameiri, 2007: 133). This view has been criticised as narrow and inadequate, and said to suffer from analytical reductionism (Boege et al, 2009; Nay, 2013: 333), given that it overlooks the arenas external to the state sphere, particularly networks and informal economies. Additional criticisms revolve around its intrinsic relational and normative character (Bertoli and Ticci, 2012: 216). I acknowledge these limitations and the need to better incorporate the role of non-state actors. However, for the moment these efforts remain for future analysis.

Having established what the expected performance of the state is, one is then interested in understanding whether and why the actual role deviates from this standard, in which case there is an indication of state fragility. The performance of the functions identified will be dependent on state capacity as well as on state effectiveness. The latter differs from the first in that it corresponds not only to the ability of the state to perform the described functions, but is also dependent on the willingness of those in power to use that capacity to meet the demand of the society.[10] In order to understand the state's decision-making process, I follow BP's two-period model of investments in state capacity and violence, described in the next subsection.

3.2. Defining state fragility

BP divide the society into two groups: i) the Incumbent – the elements of society who hold the power (the state hereafter); and ii) the Opposition – those who have incentives to fight for power. In the first period, the state – endowed with an initial level of state capacity – chooses: i) its policies (transfers and public goods provision); ii) the investments in state capacity (legal and fiscal capacity) for the second period; and iii) the investment in violence (the means to hold on to power). Between the two periods, there is a possibility of a transition in power, which will be dependent on the investments in violence by both the state and the opposition.

According to the authors, a peaceful state with high levels of state capacity will emerge if institutions are sufficiently cohesive and there is a common interest in providing public goods. However, if this is not the case, then two pathologies of the state can emerge. Either there is: i) "*state ineffectiveness* in enforcing contracts, protecting property, providing public goods and raising revenues"; or there is ii) "*political violence* either in the form of repression or civil conflict"; or even iii) both pathologies are present at the same time (Besley and Persson, 2011: 373).

I follow their approach and use these two elements as representing the symptoms of state fragility. If, in order to recognise a disease, one considers the list of symptoms of the patient, I argue that the definition of state fragility should be based on these symptoms. Thus, for the purposes of this analysis, there is state fragility when the country exhibits one or both of these symptoms; and the higher the level of these symptoms, the greater will be the degree of state fragility. Bearing this in mind, I will avoid using the term 'fragile states' interchangeably with 'state fragility' as I recognise that the first implies a defined group of countries, distinguishable from non-fragile states, whereas the second suggests a continuum in which countries may exhibit different degrees of state fragility.

BP claim that their model enables them to unravel the roots of state fragility, which allows them to clarify the distinction between symptoms and causes. According to the outcomes of the hypotheses in the model, the determinants of state fragility are: i) the strength of common interests; ii) the extent of cohesive institutions; iii) the amount of resource rents (or foreign aid); and iv) the technologies for organising and conducting violence (Besley and Persson, 2011: 386). If there are common interests and institutions are cohesive, then the peaceful state with high levels of investment state capacity mentioned above will emerge. But the absence of either or both these elements will lead to either one or both the symptoms of fragility, a result which will be dependent on parameters iii) and iv).

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[10] This follows closely the approach in the World Development Report (WB, 1997: 3).

This differentiation between determinants, symptoms and consequences based on a grounded theoretical framework is the main strength of BP's approach. Therefore, adopting their theoretical framework as a basis for the conceptualisation of state fragility allows me to overcome the limitations in previous approaches. The following diagram depicts the relationships described.

Fig. 2. State fragility: determinants, symptoms and outcomes

Determinants	*State decisions*	*Symptoms*	*Outcomes*
• Common interests • Cohesive institutions • Resource rents/ aid • Violence technology	• Policies • Inv. in state capacity • Inv. in violence	• State effectiveness/ ineffectiveness • Peace/ violence	• Economic development
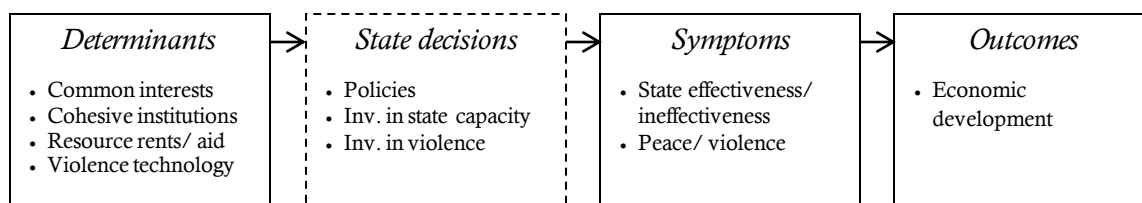
One further advantage of the proposed approach is the fact that it allows one to consider not only the different symptoms associated with state fragility, but also the interrelations between them. This can be concluded from the fact that there is a common set of determinants underlying the two symptoms and also by the matrix of the state space that the authors derive from the model. This matrix distinguishes different categories of state fragility, according to different combinations of the two symptoms and their underlying determinants. Table 1 represents an adapted version of BP's matrix.

Table 1. Different categories of state fragility

<table>
<tr><td rowspan="2" style="writing-mode:vertical"></td><td></td><td colspan="3">State (in)effectiveness</td></tr>
<tr><td></td><td>Weak</td><td>Redistributive</td><td>Common interest</td></tr>
<tr><td rowspan="7">Political violence</td><td>Peace</td><td>Low i), ii)</td><td>High i)
Low ii), iii)</td><td>High i), ii)</td></tr>
<tr><td>Repression</td><td>Low i), ii), iii), iv)^{opp}
High iv)^{state},</td><td>Low i), ii), iii),
High iv)^{state}, iv)^{opp}</td><td>N/A</td></tr>
<tr><td>Civil war</td><td>Low i), ii), iv)^{opp}
High iii), iv)^{state}</td><td>Low i), ii), iv)^{state}
High iii), iv)^{opp}</td><td>N/A</td></tr>
</table>

Notes: i), ii), iii) and iv)^{state} and iv)^{opp} are used with the following meanings: i) common-interests; ii) institutional cohesiveness; iii) resource dependence; iv)^{state} costs of fighting for the state; and iv)^{opp} advantage of the opposition in terms of violence technology.
Source: Besley and Persson (2011: 386, Table A1) – adapted.

Weak states are characterised by weak common interests and non-cohesive institutions. In redistributive states institutions are non-cohesive, though the extent of common interests varies. The costs of investing in violence for both the state and the opposition will determine whether there is peace, repression or civil war. A high degree of resource dependence (or, similarly, of foreign aid dependence) will increase the likelihood of a civil war rather than repression.

Summing up, making use of BP's theoretical model allows me to: i) derive a definition of state fragility based on its symptoms rather than its consequences, and ii) to test hypotheses about the underlying causes of state fragility. The empirical analyses held in the next sections are built upon the basis of this conceptualisation.

4. Data and methodology

4.1. Data

The dataset includes data for a total of 215 countries[11] for the period 1990-2012 for the 21 variables represented in Table 2. These were selected as proxies for the different elements encompassed by the two symptoms of state fragility identified in the previous section[12], and based on data availability. After raw data was collected from the different data sources, a unique identifier was attributed to the 215 countries (some territories and small islands were left out of the dataset as very limited information was available for specific variables[13]). The year 1960 was initially established as the beginning of the period, but it was later changed to 1990 due to data availability.

Table 2. Variables used in the analyses

Symptom	Elements	Proxies
State (in)effectiveness	Contract enforcement	Rule of law Regulatory quality Enforcing contracts Control of corruption
	Protection of property	Property rights enforcement
	Public goods provision	Government effectiveness Public spending on education Public health expenditure Access to improved water
	Raising revenue	Tax revenue
	Political institutions	Executive constraints Checks and balances Magnitude of regime change
Political violence	Repression	Arms imports Civil liberties Political terror scale
	Civil conflict	Major episodes of civil violence Armed conflict Coups d'état Revolutionary wars Ethnic wars

Table B2 in Annex B includes more information about the variables used, namely their definitions, scales and ranges, and data sources. In general terms, with exception of the variables enforcing contracts and magnitude of regime change, higher levels of the variables in the first group will be associated with higher levels of state effectiveness, and thus, it is expected that they will be negatively associated with state fragility. In terms of the variables used as proxies for political violence, it is expected that they will be positively correlated with state fragility.

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[11] Table B1 in Annex B includes the list of countries.
[12] These elements can also be linked with the different categories of state fragility identified in the matrix represented by Table 1. This is obvious for the two types of political violence – repression and civil conflict. In terms of state ineffectiveness, weak and redistributive states may be empirically distinguished by analysing the balance between state revenues and the distribution of public goods.
[13] Monserrat, Faeroe Islands, French Polynesia, Curacao, Isle of Man, St. Martin, Northern Mariana Islands, and Sint Maarten.

Table 3 represents the summary statistics for the 21 variables. The number of observations indicates that some variables have a significant number of missing values, namely enforcing contracts and civil liberties. It is also straightforward to observe the widely differing scales and magnitudes of the variables.

Table 3. Summary statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Rule of law	2902	-0.0106857	0.9980109	-2.67	2
Regulatory quality	2839	-0.0074639	1.000525	-2.68	2.25
Enforcing contracts	1291	639.3052	308.9286	120	1800
Control of corruption	2845	-0.0059051	1.002898	-2.06	2.59
Property rights	2832	48.71645	24.0254	0	95
Government effectiveness	2839	-0.0069355	1.002741	-2.45	2.43
Education	2134	4.602609	2.126889	0	44.334
Health	3355	3.696615	2.330438	0.009062	21.56899
Access to water	4356	83.84959	18.80902	4.8	100
Tax revenue	2198	16.9643	7.820383	0.022898	65.9029
Executive constraints	3602	4.77457	2.118861	1	7
Checks and balances	3871	2.814131	1.715751	1	18
Magnitude of regime change	3755	0.1057257	0.534885	0	3.5
Arms imports	2345	0.9464673	1.80603	0	17.3492
Civil liberties	1373	3.171886	1.825363	1	7
Political terror scale	4093	2.48925	1.131832	1	5
Episodes of civil violence	3788	0.6034847	1.535637	0	10
Armed conflict	3927	0.2429335	0.6741424	0	9
Coups d'état	3787	0.0414576	0.2278144	0	4
Revolutionary wars	3752	-0.331823	0.7208996	-0.5	4
Ethnic wars	3758	-0.1717669	0.9329212	-0.5	4

The analysis of the scatterplot matrix (not represented here) is used for an initial exploration of the data. It shows clear linear relationships between: i) rule of law and regulatory quality, control of corruption, property rights, and government effectiveness; ii) regulatory quality and control of corruption, property rights, and government effectiveness; iii) control of corruption and property rights, and government effectiveness; and iv) property rights and government effectiveness. In a lower degree, there seems to be some linear relationship between: i) civil liberties and rule of law, regulatory quality, and government effectiveness; iii) political terror scale and rule of law, regulatory quality, and control of corruption; and iv) revolutionary wars and ethnic wars. The relationships portrayed for the rest of the variables are not as clear, which is in part explained by the discrete nature of some of the variables.

The observation of the correlation matrix (represented in Table B3 in Annex B) also provides some insights into the relationships among the different variables. It is shown that there is a very high positive correlation between: i) rule of law and regulatory quality, control of corruption, property rights, and government effectiveness; ii) regulatory quality and government effectiveness; iii) control of corruption and property rights, and government effectiveness; iv) property rights and government effectiveness; and v) major episodes of civil violence and ethnic wars. It can also be concluded that, among the variables with the lowest levels of correlation with other variables, generally public spending on education, public health expenditure, and tax revenue can be highlighted.

4.2. Methodology

The first part of the next section discusses the empirical results obtained through cluster analysis. By applying this method, I hope to gain insight into how countries are grouped by similarities. In a previous analysis, Gravingholt, Ziaja and Kreibaum (2012) have used a mixture model also to identify clusters of countries according to their scores in authority, legitimacy and capacity. Cluster analysis is used to partition data, grouping individuals that are "close" according to some appropriate criterion in order to form homogenous groups, which differ among each other as much as possible (Hardle and Simar, 2007: 271). This renders it a suitable method given that the aim is to compare different countries according to their degree of state fragility, and not to understand why they have that degree. Additionally, it does not require the pre-establishment of critical values for group parameters (Neack, 1993), which allows one to avoid using a particular dominant analytical framework to classify fragile states.

Given the nature of the analysis, a hierarchical method of clustering will be applied, which starts with each object in an individual cluster and then continuously joins clusters together, until all objects belong to only one cluster (Cox, 2005: 87). From the different hierarchical methods, the Ward method was chosen, as it optimises the minimal variance within the clusters it produces, i.e. its objective is to join two clusters at each step in a way that minimises the variance for the joined clusters (Neack, 1993; Kronthaler, 2005).

The second part of the discussion focuses on the results obtained with principal components analysis (PCA). PCA is a procedure to reduce a set of highly correlated variables into a smaller number of components (groups of variables), minimising their correlation. Each of the obtained principal components is a linear combination of the original variables, and its variance indicates the amount of information conveyed (Afifi, Clark and May, 2004). A similar approach was followed by Larru (2009) in order to identify the principal components of state fragility in Sub-Saharan African countries and in Mediterranean countries.

Thus, the goal of reducing the number of variables describing state fragility without losing much of the information can be achieved by choosing to analyse only the first few principal components. An additional advantage of this method is that the obtained principal components are uncorrelated. Hence, applying this technique will enable: i) the investigation of which dimensions of state fragility are more closely related with each other; and ii) the reduction of the number of dimensions of state fragility in a non-arbitrary procedure.

5. Results analysis

5.1. Cluster analysis

5.1.1. Transformation of the dataset

The application of the cluster method requires a balanced panel, which led to the need to transform the original dataset described in section 3.1. Firstly, five countries were dropped given that, unlike the rest of the countries in the sample, they had no information for any of the variables in some of the years included in the period of analysis. From the remaining dataset of 210 countries, the analysis was restricted to the period spanning from 1993 to 2012.

In a similar analysis, Neack (1993) applies the cluster analysis techniques over different time periods using approximately the same sample. I adopt the same strategy here and divide the full period into two 10-year periods. The new sample was obtained by first taking the averages for each variable for each country. Other changes were made in order to obtain the balanced panels[14]. The resulting sample includes data for 145 countries for 16 variables (enforcing contracts, education, tax revenue, civil liberties and arms imports were dropped).

5.1.2. Discussion of the results

a) Period 1993-2002

I consider the period 1993-2002 first. Since the variables have different metrics, the first step was to standardise them. The standardised variables were then used in the cluster analysis with the Ward method, without specifying the maximum number of clusters.

In implementing cluster analysis, the first decision to be made concerns the choice of the "true" number of clusters. One way to address this issue is to consider the Duda and Hart Je(2)/Je(1) index or the Calinski and Harabasz pseudo-F index. In both cases, larger values (and smaller pseudo T-squared values) indicate more distinct clustering (StataCorp., 2009: 159). Table 4 represents the results for the stopping rules using each of the indices. The highest value for both indices corresponds to an optimal number of 2 clusters.

Table 4. Results for the Duda-Hart and Calinski-Harabasz indices (period 1993-2002)

Nr of clusters	Duda-Hart index		Calinski-Harabasz pseudo-F
	Je(2)/Je(1)	Pseudo T-squared	
1	0.6815	66.83	
2	**0.8151**	23.37	**66.83**
3	0.7441	8.94	54.00
4	0.6806	9.39	48.42
5	0.7975	19.04	44.24
6	0.6740	9.19	41.69
7	0.5581	30.09	40.06
8	0.6941	15.43	38.88
9	0.5970	2.70	37.77
10	0.7755	11.00	37.42
11	0.4484	1.23	36.73
12	0.7158	4.76	36.10
13	0.0000	.	35.56
14	0.4518	6.07	35.12
15	0.5388	5.99	34.69

Notes: Highest value for each index highlighted in bold.

However, given the goals of the analysis, I am interested in exploring the results with a higher number of clusters. I use an additional heuristic procedure to choose the number of clusters. This consists of observing the dendrogram in order to detect any apparent clusters, and to compare it with the expectations based on what is known about the structure of the data (Neack, 1993: 350).

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[14] Initially, countries with a number of missing values higher or equal to 10 were dropped (as this meant that they had missing values for at least five variables for at least one of the periods). Then, the variables with 30 or more missing values were dropped: enforcing contracts, education, tax revenue and civil liberties. Afterwards, countries with more than 2 missing values were dropped, and, finally, the only variable with 10 or more missing values – arms imports – was also dropped from the dataset.

The dendrogram is a visual illustration of the clusters, which continually branches from the top, with the final branches at the bottom leading to the objects that are being clustered (Cox, 2005: 87). It indicates the sequence of, and distance between, entities as they are clustered. The height of the vertical lines represents the strength of the clustering, with long vertical lines indicating that the groups represented by those lines are highly distinct from one another. Figure 3 depicts the dendrogram obtained by considering a cut number of 10 clusters.

Figure 3. Dendrogram for the cluster analysis, period 1993-2002
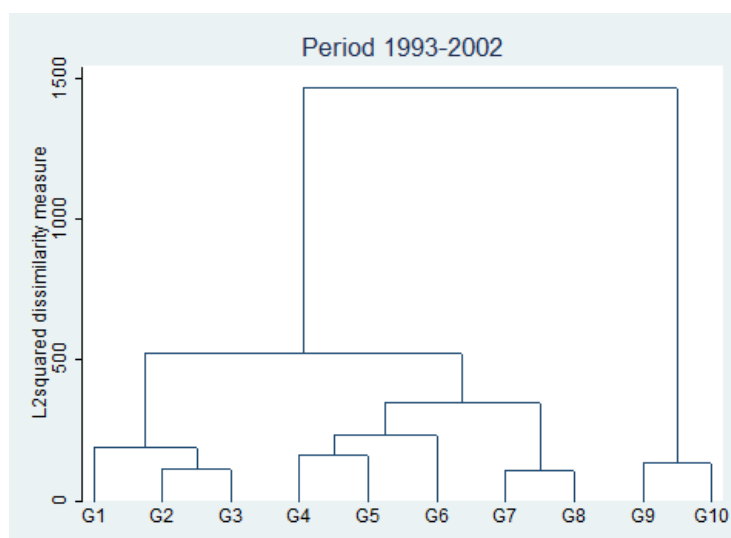
Notes: Cluster analysis applying the agglomerative hierarchical Ward method. Cut number: 10.

If an analysis from the top to the bottom of the dendrogram is considered, there are two distinct opposing clusters, which correspond to the cluster including G9 and G10, and the cluster including groups G1 to G8. The groups in the latter are more similar to each other than to the joint group G9 and G10. However, it seems to be reasonable to consider at least three distinct groups within the first cluster: i) groups G1 to G3; ii) groups G4 to G6; iii) and groups G7 and G8. Considering the analysis from the bottom to the top of the dendrogram, groups G2 and G3, and G7 and G8, are most similar and join together first in the branching diagram. These are followed by groups G9 and G10, and then by groups G4 and G5. On the next level, group G1 joins with the cluster of G2 and G3. Considering one level up, the group including G4 and G5 is joint with G6, which, on the next level, join with the cluster of groups G7 and G8, forming four distinct clusters; and so on, until one unique cluster is obtained.

The observation of the dendrogram seems to suggest the analysis with four clusters, an option that also corresponds to high values of the indices mentioned previously[15]. These four clusters correspond to the division of countries listed in Table 5, while Table 6 represents the means for each variable, considering the four different clusters.

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[15] The analyses corresponding to the choices of 5 and 3 groups of clusters were also considered, but neither served the purpose of the analysis. In the first case, one of the clusters included only one country. In the case of the analysis with only three clusters, G2 and G3 are included in the same cluster. Despite the fact that this could also be of relevance, it is my belief that the observed variation in G2 and G3 is important, given the goals of pursuing a nuanced approach to state fragility.

Table 5. Resulting four clusters of countries, period 1993-2002

Cluster 1		Cluster 2	Cluster 3	Cluster 4
Albania	Lesotho	Algeria	Angola	Australia
Argentina	Macedonia	China	Azerbaijan	Austria
Armenia	Madagascar	Colombia	Burundi	Belgium
Bahrain	Malawi	Congo, Rep.	Cote d'Ivoire	Botswana
Bangladesh	Mali	Croatia	Guinea-Bissau	Canada
Belarus	Mauritania	Egypt, Arab Rep.	Sierra Leone	Chile
Benin	Mexico	Guatemala		Costa Rica
Bolivia	Moldova	India		Cyprus
Brazil	Mongolia	Indonesia		Czech Republic
Bulgaria	Morocco	Israel		Denmark
Burkina Faso	Mozambique	Myanmar		Estonia
Cambodia	Namibia	Nepal		Finland
Cameroon	Nicaragua	Peru		France
Cape Verde	Niger	Philippines		Germany
Central African Rep.	Nigeria	Russian Federation		Greece
Chad	Oman	Rwanda		Hungary
Cuba	Pakistan	Senegal		Ireland
Djibouti	Panama	South Africa		Italy
Dominican Republic	Papua New Guinea	Sri Lanka		Japan
Ecuador	Paraguay	Tajikistan		Korea, Rep.
El Salvador	Qatar	Turkey		Latvia
Equatorial Guinea	Romania	Uganda		Lithuania
Ethiopia	Saudi Arabia			Luxembourg
Fiji	Suriname			Malaysia
Gabon	Swaziland			Mauritius
Gambia, The	Syrian Arab Republic			Netherlands
Georgia	Tanzania			New Zealand
Ghana	Togo			Norway
Guinea	Tunisia			Portugal
Guyana	Turkmenistan			Singapore
Haiti	Ukraine			Slovak Republic
Honduras	Un. Arab Emirates			Slovenia
Iran, Islamic Rep.	Uzbekistan			Spain
Jamaica	Venezuela			Sweden
Jordan	Vietnam			Switzerland
Kazakhstan	Yemen, Rep.			Thailand
Kenya	Zambia			Trinidad & Tobago
Kuwait				United Kingdom
Kyrgyz Republic				United States
Lao				Uruguay

Table 6. Means by categories of the cluster analysis, period 1993-2002

		1	2	3	4
	Rule of law	-0.6	-0.5	-1.4	1.2
	Regulatory quality	-0.4	-0.3	-1.2	1.2
	Control of corruption	-0.5	-0.5	-1.0	1.3
	Property rights	43.4	45.5	28.6	77.4
State	Gov. effectiveness	-0.5	-0.3	-1.2	1.2
effectiveness	Health	2.6	2.4	1.8	5.0
	Access to water	74.2	79.6	59.6	98.2
	Executive constraints	4.0	4.5	3.0	6.8
	Checks and balances	2.5	2.8	1.7	4.1
	Mag. regime change	0.0	0.0	1.0	0.0
	Political terror scale	2.5	3.8	3.7	1.4
	Eps. civil violence	0.1	2.5	2.7	0.0
Political	Armed conflict	0.1	1.1	0.6	0.0
violence	Coups d'état	0.0	0.0	0.4	0.0
	Revolutionary wars	-0.5	0.3	0.6	-0.5
	Ethnic wars	-0.5	0.8	0.9	-0.5

There is a clear opposition between clusters 3 and 4. Cluster 3 has: i) the lowest mean values for the variables representing state effectiveness (having also the highest value for magnitude of regime change); and ii) high values for the means of the variables representing civil conflict. In contrast, cluster 4 has: i) the highest mean values for the variables representing state effectiveness; ii) the lowest mean values for the variables representing repression; and iii) and the values for variables representing civil conflict indicate that, on average, there were no conflict events in these countries. Clusters 1 and 2 seem to be more intermediate groups. Comparing the two: i) in general, cluster 1 has lower mean values for the variables representing state effectiveness; and ii) cluster 2 has higher mean values for the variables representing repression and civil conflict.

Following the proposal made by Gravingholt, Ziaja and Kreibaum (2012: 13), I use an indicator of typicality to identify the countries that are more representative of each group. This indicator is obtained by computing the sum of the squared differences of a country's scores in each variable from the respective medians of its group, standardised to a 0 to 1 scale. The more representative a country is of its cluster, the lower will be its score in the indicator. The most typical countries for cluster 3, with the lowest levels of state effectiveness and high levels of civil conflict, are Azerbaijan, Guinea-Bissau and Cote d'Ivoire. On the opposite extreme of the spectrum, Japan, Spain and Belgium feature as the most representative among the countries with highest levels of state effectiveness and with no conflict. Ethiopia, Ghana and Kyrgyz Republic are typical countries in cluster 1, which has low mean values in the indicators of state effectiveness. Typical countries for 2, characterised by higher mean values of the variables representing repression and civil conflict, include Indonesia, Senegal and China.

b) Period 2003-2012

A similar strategy was carried out for the period 2003-2012. Table 7 represents the results for the stopping rules using the Duda and Hart Je(2)/Je(1) and the Calinski and Harabasz pseudo-F indices. The highest value for the Duda-Hart index corresponds to 3 clusters, while the optimal number of clusters considering the Calinski-Harabasz index would be 2.

Table 7. Results for the Duda-Hart and Calinski-Harabasz indices (period 2003-2012)

Nr of clusters	Duda-Hart index		Calinski-Harabasz pseudo-F
	Je(2)/Je(1)	Pseudo T-squared	
1	0.6853	65.66	
2	0.7812	26.89	**65.66**
3	**0.8392**	16.29	56.01
4	0.5880	6.31	45.98
5	0.5597	35.40	41.61
6	0.8374	16.31	40.12
7	0.7972	12.72	40.21
8	0.1139	7.78	40.76
9	0.8255	10.36	41.62
10	0.5689	18.95	42.04
11	0.7471	6.43	41.88
12	0.5296	5.33	42.36
13	0.7171	11.05	41.97
14	0.6234	4.83	41.82
15	0.6907	4.03	41.76

Notes: Highest value for each index highlighted in bold.

Again, I use the dendrogram as well to provide some indication of the ideal number of clusters to consider. The dendrogram represented in Figure 4 is significantly different from the one obtained for the period 1993-2002. It seems to suggest that there are three very distinct groups, although there is some heterogeneity within the groups, which could also be captured in six different subgroups. I opt for the first option[16].

Figure 4. Dendrogram for the cluster analysis, period 2003-2012
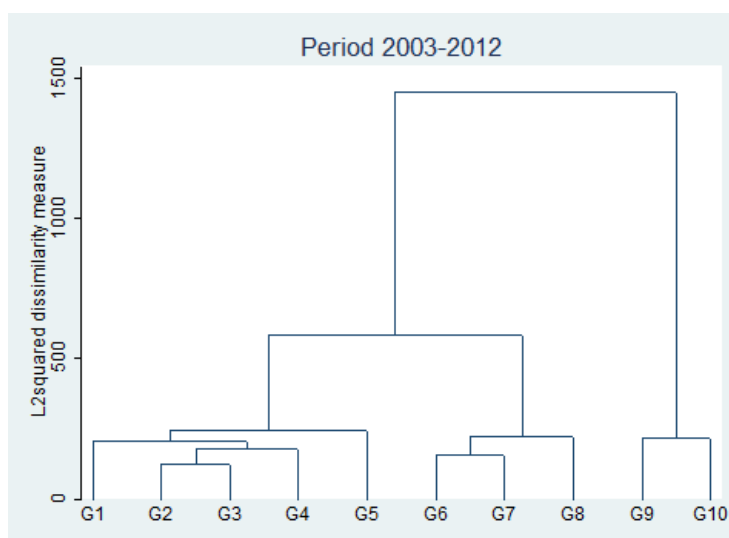
Notes: Cluster analysis applying the agglomerative hierarchical Ward method. Cut number: 10.

These three clusters correspond to the division of countries listed in Table 8, while Table 9 represents the means for each variable, considering the three different clusters.

Cluster 1, which includes the highest number of countries, has: i) the lowest mean values for almost all of the variables representing state effectiveness (having also the highest value for magnitude of regime change); and ii) high values for the means of the variables representing repression and civil conflict. The countries included in cluster 2 have the highest mean values for the variables representing civil conflict. And finally, cluster 3 has: i) the highest mean values for the variables representing state effectiveness; ii) the lowest mean values for the variables representing repression; and iii) and the values for variables representing civil conflict indicate that, on average, there were no conflict events in these countries.

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[16] For purposes of comparability with the results obtained for the period 1993-2002, the analysis was also carried out considering 4 clusters. The main difference was a division of the first cluster into two clusters, one of them containing Cote d'Ivoire only.

Table 8. Resulting four clusters of countries, period 2003-2012

Cluster 1		Cluster 2	Cluster 3	
Albania	Kenya	Colombia	Australia	United Kingdom
Algeria	Kyrgyz Republic	India	Austria	United States
Angola	Lao	Israel	Bahrain	Uruguay
Argentina	Lesotho	Mexico	Belgium	
Armenia	Madagascar	Myanmar	Botswana	
Azerbaijan	Malawi	Pakistan	Bulgaria	
Bangladesh	Malaysia	Philippines	Canada	
Belarus	Mali	Russian Federation	Cape Verde	
Benin	Mauritania	Sri Lanka	Chile	
Bolivia	Moldova	Thailand	Costa Rica	
Brazil	Mongolia	Turkey	Croatia	
Burkina Faso	Morocco		Cyprus	
Burundi	Mozambique		Czech Republic	
Cambodia	Namibia		Denmark	
Cameroon	Nepal		Estonia	
Central African Rep.	Nicaragua		Finland	
Chad	Niger		France	
China	Nigeria		Germany	
Congo, Rep.	Papua New Guinea		Greece	
Côte D'Ivoire	Paraguay		Hungary	
Cuba	Peru		Ireland	
Djibouti	Romania		Italy	
Dominican Republic	Rwanda		Japan	
Ecuador	Saudi Arabia		Korea, Rep.	
Egypt, Arab Rep.	Senegal		Kuwait	
El Salvador	Sierra Leone		Latvia	
Equatorial Guinea	South Africa		Lithuania	
Ethiopia	Suriname		Luxembourg	
Fiji	Swaziland		Macedonia	
Gabon	Syrian Arab Republic		Mauritius	
Gambia, The	Tajikistan		Netherlands	
Georgia	Tanzania		New Zealand	
Ghana	Togo		Norway	
Guatemala	Trinidad And Tobago		Oman	
Guinea	Tunisia		Panama	
Guinea-Bissau	Turkmenistan		Portugal	
Guyana	Uganda		Qatar	
Haiti	Ukraine		Singapore	
Honduras	Uzbekistan		Slovak Republic	
Indonesia	Venezuela		Slovenia	
Iran, Islamic Rep.	Vietnam		Spain	
Jamaica	Yemen, Rep.		Sweden	
Jordan	Zambia		Switzerland	
Kazakhstan			Un. Arab Emirates	

Table 9. Means by categories of the cluster analysis, period 2003-2012

		1	2	3
	Rule of law	-0.7	-0.3	1.1
	Regulatory quality	-0.5	-0.1	1.1
	Control of corruption	-0.7	-0.4	1.1
	Property rights	32.0	41.2	70.4
State	Gov. effectiveness	-0.6	-0.1	1.1
effectiveness	Health	2.9	2.6	5.5
	Access to water	77.9	91.7	98.7
	Executive constraints	4.3	5.4	6.3
	Checks and balances	2.5	3.9	3.5
	Mag. regime change	0.1	0.0	0.0
	Political terror scale	2.9	4.0	1.5
	Eps. civil violence	0.2	3.2	0.0
Political	Armed conflict	0.1	1.5	0.0
violence	Coups d'état	0.0	0.0	0.0
	Revolutionary wars	-0.4	0.3	-0.5
	Ethnic wars	-0.4	1.2	-0.5

Similarly to the analysis in the previous period, I use the same indicator of typicality to assess the degree to which each country is representative of its group. Typical examples in cluster 1, and thus representative of the countries with the lowest mean values for state ineffectiveness and high values for the indicators of repression and civil conflict, are Benin, Dominican Republic and Honduras. The typical countries in the group with the highest levels of civil conflict (cluster 2) include Sri Lanka and Russia. Finally, among the best performers in both dimensions, the most representative countries include Spain, Portugal and Hungary, with the first of these featuring as typical of this cluster in both periods.

By considering the main features of the different clusters in terms of their levels in the two symptoms of state fragility, some insights can be gained in terms of the comparison between the two periods. Starting from one extreme, I will compare the countries in the clusters with highest levels of state effectiveness and low levels of political violence, namely countries in cluster 4 in period 1993-2002 and countries in cluster 3 in period 2003-2012. Malaysia and Trinidad and Tobago have moved from cluster 4 to cluster 1, characterised by the lowest levels of state effectiveness and high levels of repression and civil conflict. Hence, their position in terms of state effectiveness deteriorated. Moving in the opposite direction, Bahrain, Cape Verde, Croatia, Kuwait, Macedonia, Oman, Panama, and the United Arab Emirates moved from cluster 1 in period 1993-2002, which was characterised by low levels of state effectiveness to cluster 3 in period 2003-2012, thus demonstrating an improvement in this dimension.

Considering the levels of political violence, a movement to cluster 2 in period 1993-2002, which is characterised by the highest values of the variables representing civil conflict, can be interpreted as a deterioration in the situation of the country in terms of civil violence. This is the case of Thailand, which moved from cluster 4 to cluster 2. Similarly, Mexico and Pakistan moved from cluster 1 in period 1993-2002 (characterised mainly by low levels of state effectiveness) to cluster 2 in the second period. The remaining countries in this cluster were already included in a cluster characterised by high levels of repression and civil conflict.

The analysis carried out in this section was exploratory and the conclusions that can be derived are limited. Still, when comparing the clusters obtained for the two periods, it seems that in 1993-2002 a group of "fragile states" can be more clearly identified. The countries in cluster 3 are characterised by the lowest levels in state effectiveness and the highest levels in terms of political violence. However, in the second period, this distinction is not as clear-cut and this group seems to have disappeared. Instead, the clusters now indicate one group of countries with the lowest levels of state effectiveness (cluster 1) and another cluster with the highest levels of political violence (cluster 2).

In light of the obtained results, it may be concluded that the two symptoms of state fragility are manifested differently among different groups of countries. This concurs to the argument that state fragility shall not be regarded as a dichotomy: there is no clear division between fragile and non-fragile states. Additionally, it corroborates the inference made by Gravingholt, Ziaja and Kreibaum (2012: 13) that a multidimensional concept such as fragility would not be appropriately measured by a one-dimensional index score. As highlighted in the previous paragraphs, the resulting clusters show diverse performances across the indicators for the two dimensions. However, and considering broadly the two symptoms, it is not possible to determine how much one dimension could compensate for the other (Gravingholt, Ziaja and Kreibaum, 2012: 14). Cluster analysis allows one to take some steps further in the identification of non-comparable groups. Still, the results also seem to indicate that further empirical analysis considering a disaggregated approach

to the two symptoms of state fragility may shed light into the understanding of state fragility. The following section further contributes to this argument.

5.2. Principal component analysis

5.2.1. Exploratory analysis of sample adequacy

Firstly, an exploratory analysis was held to determine the adequacy of the sample, using three criteria: i) a scale for the sample size proposed in Comrey and Lee (1992: 127); ii) the Kaiser-Meyer-Olkin (KMO) measure of sample adequacy; and, finally, iii) the value of Rho, indicating the percentage of the total variance that is explained by the retained principal components.

Comrey and Lee (1992: 217) propose the following scale for determining the adequacy of the sample size: 50 – very poor; 100 – poor; 200 – fair; 300 – good; 500 – very good; and 1000 or more – excellent. Others have proposed that, considering the variable:factor ratio, a minimum of 1:5 should be required, the ideal being a ratio of 1:20. So, in the present analysis, the aim is to obtain at least 200 observations, the ideal being around 400 observations.

The second criterion used to determine whether the sample is appropriate is the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. This measure ranges from 0 to 1, with small values indicating that overall there is too little in common between the variables to permit a PCA analysis. A scale is proposed to assess the results: between 0.00 and 0.49, 'unacceptable'; between 0.50 and 0.59, 'miserable'; between 0.60 and 0.69, 'mediocre'; between 0.70 and 0.79, 'middling'; between 0.80 and 0.89, 'meritorious'; and between 0.90 and 1.00, 'marvellous' (StataCorp., 2009: 309). Thus, the aim is to obtain a minimum value of 0.5.

Finally, the value of Rho, indicating the percentage of the total variance that is explained by the retained principal components, will also be used as an indicator of the appropriateness of the analysis.

Table 10 represents the results for different sets of analyses, considering the insights into the data obtained in section 4.1. A command was used to apply the Kaiser-Guttman criterion and only the principal components with eigenvalues greater than one were retained. The idea behind this rule is that any principal component with variance less than 1 contains less information than one of the original variables, and thus should not be retained (Jolliffe, 2002: 114).

Initially, all the variables were considered, but the number of observations was lower than the minimum required. Given that enforcing contracts has the lowest number of observations, this variable was dropped from the analysis. There was an increase in the number of observations, enough to fulfil the criteria for sample adequacy. Also, according to the value of the KMO measure, the sample is 'meritorious', and approximately 79% of the total variance is explained by the retained 5 principal components. The second lowest number of observations corresponds to civil liberties, so I perform the analysis dropping this variable instead. The number of observations increased, but is lower than the obtained when dropping enforcing contracts. Also, both the values of Rho and KMO are lower than those obtained in the previous analysis. I then drop both variables to observe whether there are improvements in either of these parameters. The number of observations increased significantly. Although there was an improvement in terms of sampling adequacy, the proportion of the information explained by the retained principal components (4 instead of the 5 obtained for the previous analysis) is the lowest. In light of these conclusions, alternative B1 is the preferred option.

Table 10. Exploratory analysis of sample adequacy

Description of different analyses	Obs.	Nr comps.	Rho	KMO
A. All variables	190	5	0.7338	0.7690
B1. Drop enforcing contracts	**342**	**5**	**0.7876**	**0.8443**
B2. Drop civil liberties	246	5	0.7294	0.7833
B3. Drop enforcing contracts and civil liberties	648	4	0.7238	0.8642
C1. Drop public spending on education	334	4	0.6814	0.7735
C2. Drop public health expenditure	190	5	0.7448	0.7661
C3. Drop tax revenue	258	5	0.7264	0.7754
C1.1 Drop enforcing contracts and pub. sp. education	527	4	0.7490	0.8552
C2.1 Drop enforcing contracts and pub. health exp.	342	5	0.7918	0.8288
C3.1 Drop enforcing contracts and tax revenue	412	4	0.7438	0.8593
C1.2 Drop civil liberties and pub. sp. education	411	4	0.6721	0.7969
C2.2 Drop civil liberties and pub. health exp.	246	5	0.7407	0.7782
C3.2 Drop civil liberties and tax revenue	333	5	0.7232	0.7755
D1. Drop magnitude regime change	190	5	0.7429	0.7751
D1.1 Drop mag. reg. change and enforcing contracts	342	4	0.7476	0.8510

One of the assumptions of PCA is factorability, i.e. there should be at least some correlation amongst the variables. Given that the analysis of the correlation matrix held in section 4.1 indicated that public spending on education, public health expenditure, and tax revenue had the lowest levels of correlation with other variables, the following set of alternative analyses consists of dropping each variable at a time. The obtained results showed no significant improvements. Each of these hypotheses was combined with the possibilities tested in the previous set. In other words, firstly enforcing contracts was dropped together with each of these variables at a turn, and then the same process was repeated for civil liberties. Again, the obtained results showed no significant improvements when compared with option B1.

Finally, I consider dropping the variable magnitude of regime change – first alone, and then combined with enforcing contracts – because it revealed some of the lowest scores in the KMO measure in the previous analyses. The results show no considerable improvement. Thus, alternative B1 is considered the preferred option from this preliminary analysis.

5.2.2. Discussion of the results

a) Initial results

The analysis was carried out using the standard method of PCA. Given that PCA is not scale invariant and that the variables included in the dataset differ greatly in their ranges and scales, the correlation matrix is preferred to the covariance matrix in order to treat all variables on an equal basis.

One of the decisions embedded in the application of the PCA is the number of components to interpret. This was determined by two exploratory procedures. The first was based on the Kaiser-Guttman criterion, according to which one should retain the components with eigenvalues (estimated variances of the principal components) over 1. A command was used to apply this criterion and the results indicated that five principal components, with eigenvalues greater than one, would be retained. Table 11 shows the eigenvalues of the correlation matrix, ordered from smallest to largest, and the proportion of the overall variance explained by each component (only the information about the retained five principal components is represented).
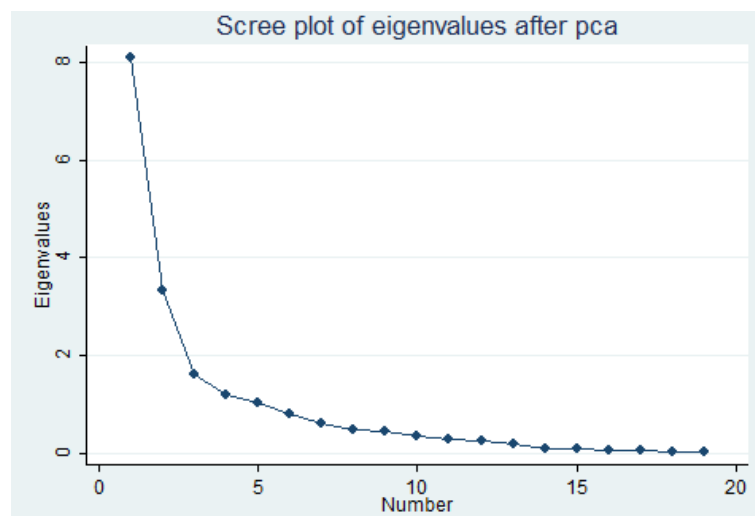
Table 11. Principal components (eigenvalues)

		Nr observations	342
		Nr components	5
		Trace	20
		Rho	0.7876

Component	Eigenvalue	Proportion	Cumulative
Comp1	8.53727	0.4269	0.4269
Comp2	3.37801	0.1689	0.5958
Comp3	1.5985	0.0799	0.6757
Comp4	1.21846	0.0609	0.7366
Comp5	1.01963	0.0510	0.7876

The second procedure consists in the observation of the scree plot to check the choice regarding the number of principal components retained. The scree plot represents the principal component number on the horizontal axis versus the individual eigenvalues. The idea is to consider the number of principal components that corresponds to a cutoff point where, at the left, lines are relatively steep and, at the right, lines are relatively flat. The scree plot in Figure 5 seems to suggest the cutoff point in number 4, rather than 5 as used earlier. For the moment, I will choose to still retain 5 principal components to maintain a higher proportion of the variance explained.

Figure 5. Scree plot

The principal components (eigenvectors) are represented in Table 12, which includes only the loadings with values greater than 0.3. Given that the analysis considers the correlation matrix, the variables are standardised to have unit variance. Each loading represents the correlation between a component and a variable.

Table 12. Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5
Rule of law	0.3238				
Regulatory quality	0.3201				
Control of corruption	0.3178				
Property rights	0.3100				
Gov. effectiveness	0.3161				
Education				0.4779	
Health					
Access to water					
Tax revenue				0.6147	0.3886
Executive constraints					
Checks and balances		0.3141			-0.4958
Mag. regime change			0.6869		
Arms imports		0.3612			
Civil liberties					
Political terror scale					
Eps. civil violence		0.4486			
Armed conflict		0.4383			
Coups d'état			0.6903		
Revolutionary wars		0.3529			
Ethnic wars		0.3738			

The first component can be said to represent state effectiveness, with a focus on the legal system. The variables with the higher correlation with component 2 are checks and balances, arms imports, major episodes of civil violence, armed conflict, revolutionary wars, and ethnic wars. Thus, the second principal component can be interpreted as an indicator of political violence together with checks and balances. The third component is an indicator of successful and attempted changes in regime. The fourth component reflects the state effectiveness in raising revenue and providing public goods. And, finally, the fifth component contrasts tax revenue with checks and balances.

The loadings obtained for the first three principal components are of similar size, which made their interpretation relatively easy. However, interpreting the remaining two principal components, especially the fifth, is not as straightforward (which may also indicate that the restriction of the analysis to four components – as suggested by the observation of the scatter plot – may be preferable). Some methods have been proposed to aid interpretation, one of them being the rotation of the principal components. After deciding that the first m components account for the most variation in the dataset, it may be argued that simply interpreting the m-dimensional space defined by these components is more relevant than it is to interpret each individual component (Jolliffe, 2002: 270). So, the axes are rotated within this m-dimensional space in such a way that the interpretation of the axes is simplified as much as possible, and hopefully more conceptually appealing. I consider this strategy and discuss the results obtained for the PCA when rotation is considered.

b) Results obtained with rotation procedure

There are several procedures for rotation; but, following similar previous analyses (e.g. Larru, 2009), the orthogonal varimax method of rotation is used. Orthogonal procedures lead to new coordinated axes which are perpendicular to one another. The varimax method consists in the rotation of the coordinate axes in order to maximise the varimax criteria, which maximises the sum of the variances of the square loadings within each column of the loading matrix (Dunteman, 1989: 49). This method is applied first in its "raw" form and then with Kaiser normalisation, which

means that in the computation of the optimal rotation, all rows have the same weight (StataCorp., 2009: 617).

Table 13 contains the rotated components ordered by decreasing order of variance, without and with Kaiser normalisation. The cumulative proportion of the variance explained by the retained rotated components is identical to the total variance explained by the leading principal components. Tables 14 and 15 report the loadings of the rotated principal components, respectively, without and with the Kaiser normalisation. The results obtained with the Kaiser normalisation are similar to those obtained with the "raw" varimax method.

Table 13. Rotated principal components (variance)

			Nr observations	342
			Nr components	5
			Trace	20
			Rho	0.7876

Component	Variance	Proportion	Cumulative
Without Kaiser normalisation			
Comp1	6.64036	0.3320	0.3320
Comp2	3.63273	0.1816	0.5137
Comp3	2.18708	0.1094	0.6230
Comp4	1.66888	0.0834	0.7065
Comp5	1.62281	0.0811	0.7876
With Kaiser normalisation			
Comp1	5.8773	0.2939	0.2939
Comp2	3.8358	0.1918	0.4857
Comp3	2.74401	0.1372	0.6229
Comp4	1.66807	0.0834	0.7063
Comp5	1.62668	0.0813	0.7876

Table 14. Rotated principal components (eigenvectors), without Kaiser normalisation

Variable	Comp1	Comp2	Comp3	Comp4	Comp5
Rule of law	0.3853				
Regulatory quality	0.3552				
Control of corruption	0.3711				
Property rights	0.3794				
Gov. effectiveness	0.4028				
Education				0.5872	
Health					
Access to water	0.3314				
Tax revenue				0.7443	
Executive constraints			0.4501		
Checks and balances			0.6226		
Mag. regime change					0.6995
Arms imports		0.4356			
Civil liberties			-0.3302		
Political terror scale					
Eps. civil violence		0.4619			
Armed conflict		0.4190			
Coups d'état					0.6974
Revolutionary wars			0.3801		
Ethnic wars		0.4815			

Table 15. Rotated principal components (eigenvectors), with Kaiser normalisation

Variable	Comp1	Comp2	Comp3	Comp4	Comp5
Rule of law	0.3825				
Regulatory quality	0.3458				
Control of corruption	0.3692				
Property rights	0.3806				
Gov. effectiveness	0.4073				
Education				0.5844	
Health					
Access to water	0.3461				
Tax revenue				0.7442	
Executive constraints			0.4627		
Checks and balances			0.5989		
Mag. regime change					0.6998
Arms imports		0.3846			
Civil liberties			-0.3672		
Political terror scale					
Eps. civil violence		0.4773			
Armed conflict		0.4474			
Coups d'état					0.6966
Revolutionary wars			0.3244		
Ethnic wars		0.4682			

Comparing the rotated principal components with the principal components obtained without rotation, the most striking differences are in the third and fifth principal components, with smaller differences in the first two principal components. In terms of the first rotated principal component, it is now also highly correlated with the variable access to water. The variables checks and balances and revolutionary wars are not highly correlated with the second rotated principal component, which can still be interpreted as an indicator of political violence. The third rotated principal component is very different from the previously obtained without rotation, and encompasses indicators of the quality of political institutions as well as dimensions of political violence, namely civil liberties and revolutionary wars. The fourth rotated component is very similar to the one previously obtained, while the fifth rotated principal component is similar to the third principal component obtained without rotation.

Given that the interpretation of the rotated principal components is not significantly different from that of the obtained without rotation, I believe that the use of the non-rotated results is preferable. A further reason for this choice is the fact that some of the properties of the principal components are destroyed by the rotation procedure, namely the first rotated component no longer has maximal variance, the second rotated component no longer has maximal variance among those linear combinations to the first component, and so on (StataCorp., 2009: 576).

5.3. Implications for an alternative measure of state fragility

In the light of these results, it seems that the first two principal components could be further used to represent the two symptoms of state fragility – state ineffectiveness (interpreted as the inverse of the first principal component) and political violence, respectively –, thus providing a starting point for the construction of a disaggregated index of state fragility. This can be done by considering the scores for each country obtained using the retained principal components, which allow one to summarise the original data. These scores result from the application of the elements of the corresponding eigenvector to the standardised values of the original observations for each country (Rabe-Hesketh and Everitt, 2004: 261), and will originate new variables.

This proposal is in line with the view expressed recently in the OECD's report on states of fragility, which highly commends the analysis of multiple dimensions of fragility: "[t]his highlights the need for new approaches to assessing and monitoring fragility using metrics that do not reduce fragility measures to a single index but rather allow for tracking multiple (and potentially uncorrelated) dimensions" (OECD, 2015: 45). The obtained indices could be used to identify categories of countries according to their performance in the two dimensions of fragility, avoiding the establishment of thresholds, which are frequently neither theoretically nor empirically justified. In addition, it can serve as a useful tool for empirical analysis, namely in regression analysis applied to derive the determinants of fragility, or to assess the impact of development assistance in different countries, according to their degree of state fragility.

Despite the pitfalls of applying indices of state fragility, this type of measurement instrument is still valuable for the analysis. As highlighted in Ziaja and Fabra Mata (2010: 1), this can be a useful tool for development policy for: "determining which countries need a different approach; monitoring larger trends of global political stability; evaluating the overall impact of development aid; and for investigating the dynamics of state fragility". Furthermore, in comparison with the approaches based on disaggregate measures (briefly described in section 2), they allow one to consider state fragility as a continuum rather than a discrete variable. As argued by Carment, Prest and Samy (2008: 3), fragility is a matter of degree not kind, and "[w]hile some countries are in fact failing or failed, in general aspects of fragility can be identified in virtually all states". Thus, an empirical analysis applying the proposed approach would depart from the "erroneous" understanding of fragility as an "either-or phenomenon" (Engberg-Pedersen, Andersen and Stepputat, 2008: 7).

When compared with existing fragility indices, adopting this approach would bring additional advantages in terms of the aggregation procedure. First, by considering indicators of state effectiveness and indicators of political violence separately, one avoids the assumption that different components of fragility can compensate each other. As reminded in Ziaja and Fabra Mata (2010: 3), one of the arguments in the literature discussing state formation is that "the security dimension is a necessary condition for stabilizing states – it should thus be modelled as such and the index should not allow other dimensions like economic growth to compensate for security". By keeping the two indicators separate, instead of aggregated into one index of fragility, the proposed approach overcomes this limitation. Second, by using PCA to obtain the aggregated scores for state effectiveness and political violence, one avoids the establishment of ad hoc weights to the different indicators. This is common in existing indices of fragility, and the underlying assumption overlooks the dynamics that exist between the different components of fragility.

As a preliminary analysis I include a rough comparison of the results obtained with both methods for the period 2003-2012[17]. Countries were ranked according to the results obtained with cluster analysis (and ordered according to their score in the indicator of typicality), and matched with the respective rankings and scores according to the first two principal components obtained with PCA. These are represented in Table 16.

Considering the first group of countries, which corresponds to the cluster characterised by the highest levels of political violence, one can conclude that the scores for the index of political violence are also the highest in this list of countries. Similarly, when comparing the country scores

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[17] Note that, due to data availability, the scores obtained with PCA only refer to the years from 2006 until 2012. When a score for more than one year was obtained, the final index score results from the arithmetic average of these values.

for the state effectiveness index, one may observe that the countries with the lowest scores are included in the second group of the cluster analysis (characterised by the lowest levels of state effectiveness). Finally, the cluster with the "best performing" countries is also matched by high scores in the state effectiveness index and low scores in the political violence index. Thus, overall the results of PCA seem to contribute to the conclusions derived from cluster analysis.

Table 16. Comparison of the results obtained with cluster analysis and PCA, period 2003-2012

Cluster - characteristics	Country	State effectiveness scores		Political violence scores	
		Rank	Score	Rank	Score
Cluster 2 Highest levels of political violence	Sri Lanka	23	-3.076	56	-0.921
	Russian Federation	15	-3.875	7	1.462
	Philippines	14	-3.906	5	2.563
	Thailand	35	-2.480	8	0.852
	Pakistan	2	-5.807	2	4.279
	Israel	56	0.087	4	3.268
	Colombia	30	-2.808	3	3.692
	India	9	-4.336	1	10.450
Cluster 1 Lowest levels of state effectiveness	Benin	36	-2.383	72	-1.583
	Guatemala	32	-2.757	64	-1.238
	Bolivia	40	-2.092	70	-1.477
	Senegal	37	-2.226	69	-1.465
	Armenia	39	-2.193	61	-1.153
	Gambia, The	21	-3.270	74	-1.638
	Mongolia	47	-1.486	63	-1.212
	Kyrgyz Republic	22	-3.207	78	-1.718
	Morocco	34	-2.562	83	-1.966
	Ghana	49	-1.018	58	-0.997
	El Salvador	46	-1.655	57	-0.974
	Burkina Faso	28	-2.880	85	-2.003
	Zambia	20	-3.434	73	-1.633
	Indonesia	29	-2.828	48	-0.680
	Azerbaijan	10	-4.326	84	-1.981
	Egypt, Arab Rep.	24	-3.021	59	-1.025
	Rwanda	33	-2.582	66	-1.407
	Paraguay	38	-2.196	51	-0.747
	Peru	42	-1.899	44	-0.455
	Tanzania	25	-3.004	89	-2.223
	Cambodia	8	-4.835	88	-2.134
	Georgia	41	-2.053	62	-1.194
	Bangladesh	5	-4.944	75	-1.648
	Sierra Leone	16	-3.844	80	-1.780
	Belarus	18	-3.632	81	-1.872
	Algeria	31	-2.762	17	0.307
	Jamaica	51	-0.868	47	-0.675
	Namibia	53	-0.544	77	-1.666
	Kenya	27	-2.934	67	-1.436
	Lao	4	-5.089	91	-2.663
	Tunisia	44	-1.806	79	-1.771
	Togo	13	-4.082	90	-2.326
	Brazil	48	-1.124	42	-0.362
	South Africa	55	-0.168	45	-0.623
	Romania	50	-0.941	37	-0.303
	Lesotho	60	0.721	82	-1.889
	Syrian Arab Rep.	11	-4.283	87	-2.103
	Uganda	17	-3.753	55	-0.912
	Angola	7	-4.838	92	-2.788
	Iran, Islamic Rep.	6	-4.888	65	-1.276
	Madagascar	12	-4.271	86	-2.035
	Malaysia	52	-0.620	35	-0.270
	Nepal	19	-3.466	71	-1.533
	Mali	26	-2.956	60	-1.112
	Central African Rep.	1	-6.186	34	-0.218
	Ethiopia	3	-5.340	10	0.703

Cluster 3	Spain	70	1.695	21	0.173
Highest levels of	Portugal	71	1.810	36	-0.270
state effectiveness	Hungary	67	1.482	43	-0.408
+ Lowest levels	Japan	73	1.965	28	0.074
of political	Estonia	75	2.083	38	-0.303
violence	Belgium	79	3.108	30	0.047
	Italy	62	0.856	40	-0.349
	Uruguay	61	0.723	52	-0.806
	Lithuania	64	0.891	46	-0.636
	Korea, Rep.	59	0.624	15	0.383
	Slovak Republic	63	0.876	39	-0.323
	France	78	2.738	32	-0.138
	United Kingdom	82	3.269	18	0.252
	Czech Republic	69	1.671	27	0.094
	Botswana	68	1.535	54	-0.870
	Cyprus	77	2.690	41	-0.357
	Chile	72	1.867	23	0.164
	Switzerland	80	3.114	29	0.073
	Australia	83	3.340	9	0.789
	Slovenia	74	2.013	26	0.100
	Ireland	85	3.397	24	0.162
	Austria	86	3.408	20	0.229
	Germany	81	3.237	14	0.514
	Latvia	65	0.929	31	-0.136
	Canada	84	3.372	12	0.553
	New Zealand	91	4.112	33	-0.185
	Croatia	58	0.346	53	-0.832
	Finland	87	3.895	22	0.168
	Cape Verde	57	0.240	50	-0.744
	Sweden	89	4.028	19	0.247
	Norway	88	4.002	13	0.523
	United States	76	2.197	6	1.624
	Bulgaria	54	-0.468	49	-0.704
	Netherlands	90	4.035	11	0.591
	Denmark	92	4.832	16	0.313
	Bahrain	45	-1.722	68	-1.443
	Singapore	66	1.178	25	0.119
	Oman	43	-1.820	76	-1.655

Notes: Total number of countries: 92. For consistency with the presentation of the results, countries are ranked from 1-92 from the lowest to the highest levels of state effectiveness (i.e. from the highest to the lowest levels of state ineffectiveness) in the third column, and from the highest to the lowest levels of political violence in the fifth column.

The goal of this preliminary exercise was exclusively to put into perspective and compare the results obtained with the two methods. However, when considered individually, cluster analysis was important to analyse whether the distinction between the two symptoms of state fragility identified in BP was also verified by empirical evidence. The results seem to corroborate that hypothesis. In its turn, PCA is useful to obtain aggregate indices for each of these symptoms, which, as described before, can be used in further empirical analysis. That remains in the agenda for future work.

6. Conclusion

This paper aimed at throwing some light on the operationalisation of the concept of state fragility, in order to establish the foundations for an alternative measure. This was done by first considering a working definition of state fragility which results from a clear theoretical framework. After establishing the adopted view of the state and its functions, Besley and Persson's (2011) model for analysing state fragility was adopted to identify the symptoms of fragility. The resulting working

definition assumes that there is state fragility when the country exhibits one or both of two symptoms: i) "*state ineffectiveness* in enforcing contracts, protecting property, providing public goods and raising revenues"; or there is ii) "*political violence* either in the form of repression or civil conflict"; or even iii) both pathologies are present at the same time (Besley and Persson, 2011: 373).

Based on this concept, the empirical analysis was conducted in two steps. Firstly, cluster analysis methods were applied to understand whether there were distinct groups within the sample of countries. The results provide some insights into how countries can be grouped considering their performance in terms of state effectiveness and political violence. Although the conclusions from this analysis are limited, it was possible to observe a division of countries according to the two symptoms and to compare these trends between the two periods considered.

In a second stage, PCA was used to reduce the multidimensionality associated with the concept and to determine which dimensions of state fragility were more related to each other. From the five principal components retained from the analysis, the first two seem to represent the two symptoms of state fragility used in the working definition. The inverse of the first principal component is an indicator of state ineffectiveness, whereas the second seems to be representative of political violence.

Finally, it was argued that the later results can be used as the starting point for future analysis, namely to build a new disaggregated index of state fragility, considering both an indicator for state effectiveness and an indicator for political violence. As pointed out by Ziaja (2012: 60), "measuring better specified «partial regimes» of state fragility is crucial for investigating its causes and consequences". In so doing, one would overcome several of the limitations of the existing approaches. First, this new proposal is built upon a sound theoretical framework, which distinguishes between determinants, symptoms and consequences of state fragility, thus avoiding definitional confusion and its consequences for the soundness of the resulting measurement tool. Second, it is based on the view of state fragility as a multidimensional phenomenon, which takes into account the diverse performance of countries in different aspects of fragility (as demonstrated by the results of the cluster analysis). Thirdly, by considering separate indices for the two symptoms of state fragility and by using PCA to construct them, it avoids the problems related to aggregation that have plagued existing fragility indices. Lastly, it offers a potential for a better understanding of state fragility. It can be used not only to identify categories of countries according to their performance in the two dimensions of fragility, without the establishment of pre-determined thresholds, but also as a continuous variable suitable to use in empirical analyses (e.g. regression analysis). Overall, the proposed approach provides a more transparent operationalisation of the concept as opposed to the black box that is frequently associated with the indices of state fragility.

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Annexes

Annex A. Definitions and measures of state fragility

Table 1. Selected list of indices of state fragility

Index	*Institution (Reference)*	*Purpose*	*Scale*	*Indicators*	*Methodology*	*Application*
CIFP Fragility Index	Carleton University (Carment and Samy, 2012; CIFP website, 2015)	The CIFP is a robust assessment tool which assesses state performance along each of the three dimensions of statehood (authority, legitimacy, and capacity).	1-9 (low fragility to high fragility)	More than 70 indicators, representing performance measures along several dimensions: governance, economics, security and crime, human development, demography, and environment.	During the first level of analysis, structural indicators are grouped into six clusters corresponding to each dimension, and a composite index for country performance along those dimensions is constructed. The results for each country are then averaged in each subject cluster (ALC).	Countries have scores for the different components of the ALC approach and an overall score. Overall fragility scores above 6.5 are considered serious.
Country Policy and Institutional Assessment (CPIA)	World Bank (WB, 2011)	The goal is to assess the quality of a country's present policy and institutional framework, in terms of how conducive it is to fostering poverty reduction, sustainable growth, and the effective use of development assistance.	1-6 (low to high)	16 criteria related to economic management, structural policies, policies for social inclusion/equity, and public sector management and institutions.	The CPIA criteria include the indicators for the four clusters. For each criterion, countries are rated on a scale of 1 (low) to 6 (high). The rating process includes: i) a benchmarking phase, during which there is the rating of a small but representative sample of countries selected from all regions; and ii) a second phase, during which the remaining countries are rated using the scores from the benchmark countries as guideposts. Each of the four clusters weighs 25% of the overall score.	Fragile states are countries with a CPIA score of 3.2 or less. "Fragile Situations" have: either a) a harmonized average CPIA country rating of 3.2 or less, or b) the presence of a UN and/or regional peace-keeping or peace-building mission during the past three years. (WB, 2013)
Fragile states index (FSI)	Fund for Peace; Foreign Policy journal (Fund for Peace and Foreign Policy, 2014)	It allows the identification of, not only the normal pressures that all states experience, but also when those pressures are pushing the state towards the edge of failure. It enables political risk assessment and early warning of conflict.	1-120 (low fragility to high fragility)	12 key political, military, social and economic indicators (and more than 100 sub-indicators).	The Conflict Assessment Software Tool (CAST) is used to attribute a score to each indicator representing the significance of the various pressures to each country with. The overall assessment is a result of a triangulation of these results, quantitative analysis and a qualitative examination of the major events in the countries.	In the report countries are categorized by score quartiles: alert (90-120), warning (60-90), stable (30-60), and sustainable (0-30).
Index of state weakness in the developing world (ISW)	Brookings Institution (Rice and Patrick, 2008)	It allows the identification of potential patterns of state weakness, either within geographical regions or across functional areas by capturing state performance across its four areas of responsibility: economic, political, security and welfare.	0-10 (worse to best)	20 indicators, with 5 indicators for each basket: economic, political, security and social welfare.	Within each basket, the indicator scores are standardized and aggregated, creating individual indicator and basket scores ranging from 0.0 (worst) to 10.0 (best). The four basket scores are averaged to obtain an overall score for state weakness, ranging from just above 0 to just short of a perfect 10.	The classification is as follows: 'Failed states' (three weakest countries); 'Critically weak states' (those in the bottom rank quintile); 'Weak states' (those in the second rank quintile); and 'States to watch' (states with a significantly low score in at least one of the four dimensions).

Index	Institution (Reference)	Purpose	Scale	Indicators	Methodology	Application
State fragility index (SFI)	George Mason University (Marshall and Goldstone, 2007; Marshall and Cole, 2014)	It is a measure of fragility in a country, which is closely associated with the state capacity to manage conflict, make and implement public policy, and deliver essential services, and its systemic resilience in maintaining system coherence, cohesion, and quality of life, providing and effective response to challenges and crisis, and sustaining progressive development.	0-25 (no fragility to extreme fragility)	8 indicators on effectiveness and legitimacy across four dimensions: security, political, economic and social.	Each of the Matrix indicators is rated on a four-point fragility scale, with the exception of the Economic Effectiveness indicator, which is rated on a five-point fragility scale. The categories are: 0 - no fragility; 1 - low fragility, 2 - medium fragility; 3 - high fragility. These scores are then combined in two scores, one for effectiveness and one for legitimacy. The State Fragility Index results from the sum of these two scores.	The overall index is the basis for a ranking of countries according to their score.

Notes: Gutierrez et al. (2011), Fabra Mata and Ziaja (2009) and Ziaja (2012) provide more extensive and complete accounts of the existing indices.

Table A2. Definitions used by selected major institutions within the donor community

Institution	Concept	Definition
World Bank (WB)	Fragile states	The World Bank adopted the term fragile states "in the interests of harmonization" (WB, 2005: 1) as corresponding to their definitions of Low Income Countries Under Stress (LICUS). "The Bank identifies fragile states by weak performance on the Country Policy and Institutional Assessment (CPIA). They share a common fragility, in two particular aspects: • State policies and institutions are weak in these countries: making them vulnerable in their capacity to deliver services to their citizens, to control corruption, or to provide for sufficient voice and accountability. • They face risks of conflict and political instability. (…)" (WB, 2005: 1).
	Fragile and conflict affected situations (FCS)	The CPIA considers 16 criteria, group in 4 clusters (economic management, structural policies, policies for social inclusion and equity, and public sector management and institutions) for rating countries on a scale from 1 to 6. A country is considered fragile if its score is equal to or below 3.2. Fragile situations are "[p]eriods when states or institutions lack the capacity, accountability, or legitimacy to mediate relations between citizen groups and between citizens and the state, making them vulnerable to violence." (WB, 2011: xvi) "Fragile Situations" have: either a) a harmonized average CPIA country rating of 3.2 or less, or b) the presence of a UN and/or regional peace-keeping or peace-building mission during the past three years. (WB, 2013)
Asian Development Bank (ADB)	Weakly performing countries (WPCs)	"Many of the region's poor people live in DMCs [developing member countries] that have weak governance, ineffective public administration and rule of law, and civil unrest. These countries have been referred to variously as WPCs, fragile states, low-income countries under stress (LICUS), and difficult partnership countries. Service delivery systems in such countries seldom function well, and the government's ability to guarantee the basic security of its people is often limited. WPCs are more likely to experience large-scale and civil conflict than other low-income countries." (ADB, 2007: 1) "While WPCs may exhibit aspects of fragility, the primary focus on weak performance is consistent with the performance-based allocation systems of ADB, African Development Bank, and the LICUS approach of the World Bank." (ADB, 2007: 1)
African Development Bank (AfDB)	Fragile states	"Fragility is an imbalance between the strains and challenges (internal and external) faced by a state and society and their ability to manage them. At the extreme, fragility is expressed as conflict or collapse of state functions. (…) Fragility is thus the opposite side of the coin to state resilience, which is the ability of the state to manage such strains through effective institutions, processes and capacities that build legitimacy and societal cohesion." (AfDB, 2014: 2)
European Commission	Situations of fragility	"Fragility refers to weak or failing structures and to situations where the social contract is broken due to the State's incapacity or unwillingness to deal with its basic functions, meet its obligations and responsibilities regarding service delivery, management of resources, rule of law, equitable access to power, security and safety of the populace and protection and promotion of citizens' rights and freedoms." (European Commission, 2007: 5)
OECD	Fragile states	"A fragile region or state has weak capacity to carry out basic governance functions, and lacks the ability to develop mutually constructive relations with society. Fragile states are also more vulnerable to internal or external shocks such as economic crises or natural disasters. More resilient states exhibit the capacity and legitimacy of governing a population and its territory. They can manage and adapt to changing social needs and expectations, shifts in elite and other political agreements, and growing institutional complexity. Fragility and resilience should be seen as shifting points along a spectrum." (OECD, 2012)

Institution	Concept	Definition
g7+	Fragile states	"A state of fragility can be understood as a period of time during nationhood when sustainable socio-economic development requires greater emphasis on complementary peacebuilding and statebuilding activities such as building inclusive political settlements, security, justice, jobs, good management of resources, and accountable and fair service delivery." (g7+, 2013: 1)
DFID	Fragile states	"Although most developing countries are fragile in some ways, DFID's working definition of fragile states covers those where the government cannot or will not deliver core functions to the majority of its people, including the poor. The most important functions of the state for poverty reduction are territorial control, safety and security, capacity to manage public resources, delivery of basic services, and the ability to protect and support the ways in which the poorest people sustain themselves. DFID does not limit its definition of fragile states to those affected by conflict." (DFID, 2005: 7) More recently, the expression Fragile and Conflict Affected States (FCAS) has also been used.
USAID	Fragile states	"USAID uses the term *fragile states* to refer generally to a broad range of failing, failed, and recovering states. However, the distinction among them is not always clear in practice, as fragile states rarely travel a predictable path of failure and recovery, and the labels may mask substate and regional conditions (insurgencies, factions, etc.) that may be important factors in conflict and fragility. It is more important to understand how far and quickly a country is moving from or toward stability than it is to categorize a state as failed or not. *Therefore, the strategy distinguishes between fragile states that are vulnerable from those that are already in crisis.* USAID is using *vulnerable* to refer to those states unable or unwilling to adequately assure the provision of security and basic services to significant portions of their populations and where the legitimacy of the government is in question. This includes states that are failing or recovering from crisis. USAID is using *crisis* to refer to those states where the central government does not exert effective control over its own territory or is unable or unwilling to assure the provision of vital services to significant parts of its territory, where legitimacy of the government is weak or nonexistent, and where violent conflict is a reality or a great risk." (USAID, 2005: 1)
Canadian International Development Agency (CIDA)	Fragile states	"According to CIFP's [Country Indicators for Foreign Policy] conceptualization, the state is the primary unit of analysis and needs to exhibit the three fundamental properties of authority, legitimacy and capacity (ALC) to function properly (or to use the World Bank's language – security, justice and jobs). Fragility measures the extent to which the actual characteristics of a state differ from their ideal situation; states are constrained by both internal and external forces that are constantly changing over time. Consequently, all states are, to some extent, fragile; weakness in one or more of the ALC dimensions will negatively impact the fragility of a particular country. In that sense, we need to consider not only the extreme cases of failing, failed and collapsed states but also the ones that have the potential to fail." (Carment and Samy, 2012: 4)

Notes: See Box 1 in Cammack et al (2006: 17) for a more comprehensive list of working definitions of fragile states used by donor organisations.

Annex B. Data

Table B1. List of countries used in the empirical analysis

Afghanistan	Dominican Republic	Liechtenstein	Saudi Arabia
Albania	Ecuador	Lithuania	Senegal
Algeria	Egypt, Arab Rep.	Luxembourg	Serbia
American Samoa	El Salvador	Macao SAR, China	Seychelles
Andorra	Equatorial Guinea	Macedonia, FYR	Sierra Leone
Angola	Eritrea	Madagascar	Singapore
Anguilla	Estonia	Malawi	Slovak Republic
Antigua and Barbuda	Ethiopia	Malaysia	Slovenia
Argentina	Fiji	Maldives	Solomon Islands
Armenia	Finland	Mali	Somalia
Aruba	France	Malta	South Africa
Australia	French Guiana	Marshall Islands	South Sudan
Austria	Gabon	Martinique	Spain
Azerbaijan	Gambia	Mauritania	Sri Lanka
Bahamas	Georgia	Mauritius	St. Kitts And Nevis
Bahrain	Germany	Mexico	St. Lucia
Bangladesh	Ghana	Micronesia, Fed. Sts.	St. Vincent and the Grenadines
Barbados	Greece	Moldova	Sudan
Belarus	Greenland	Monaco	Suriname
Belgium	Grenada	Mongolia	Swaziland
Belize	Guam	Montenegro	Sweden
Benin	Guatemala	Morocco	Switzerland
Bermuda	Guinea	Mozambique	Syrian Arab Republic
Bhutan	Guinea-Bissau	Myanmar	Taiwan, China
Bolivia	Guyana	Namibia	Tajikistan
Bosnia & Herzegovina	Haiti	Nauru	Tanzania
Botswana	Honduras	Nepal	Thailand
Brazil	Hong Kong SAR, China	Netherlands	Timor-Leste
Brunei Darussalam	Hungary	Netherlands Antilles (Former)	Togo
Bulgaria	Iceland	New Caledonia	Tonga
Burkina Faso	India	New Zealand	Trinidad and Tobago
Burundi	Indonesia	Nicaragua	Tunisia
Cambodia	Iran, Islamic Rep.	Niger	Turkey
Cameroon	Iraq	Nigeria	Turkmenistan
Canada	Ireland	Niue	Tuvalu
Cape Verde	Israel	Norway	Uganda
Cayman Islands	Italy	Oman	Ukraine
Central African Rep.	Jamaica	Pakistan	United Arab Emirates
Chad	Japan	Palau	United Kingdom
Chile	Jersey, Channel Islands	Panama	United States
China	Jordan	Papua New Guinea	Uruguay
Colombia	Kazakhstan	Paraguay	Uzbekistan
Comoros	Kenya	Peru	Vanuatu
Congo, Dem. Rep.	Kiribati	Philippines	Venezuela
Congo, Rep.	Korea, Dem. Rep.	Poland	Vietnam
Cook Islands	Korea, Rep.	Portugal	Virgin Islands (U.S.)
Costa Rica	Kosovo	Puerto Rico	West Bank And Gaza
Côte D'Ivoire	Kuwait	Qatar	Yemen, Rep.
Croatia	Kyrgyz Republic	Réunion	Zambia
Cuba	Lao PDR	Romania	Zimbabwe
Cyprus	Latvia	Russian Federation	
Czech Republic	Lebanon	Rwanda	
Denmark	Lesotho	Samoa	
Djibouti	Liberia	San Marino	
Dominica	Libya	São Tomé And Principe	

Table B2. List of definitions, measures and data sources for the variables used in the analysis

Symptom	Dimension	Proxy	Definition	Measure	Data source
State ineffectiveness	Contract enforcement	Rule of law	Captures perceptions of the extent to which agents have confidence in and abide by the rules in society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	The aggregate measure ranges from around -2.5 to 2.5, with higher values corresponding to better outcomes.	Worldwide Governance Indicators (WB, 2014a)
		Regulatory quality	Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	The aggregate measure ranges from around -2.5 to 2.5, with higher values corresponding to better outcomes.	Worldwide Governance Indicators (WB, 2014a)
		Enforcing contracts	Measures the efficiency of the judicial system in resolving a commercial dispute.	Represents the number of days to resolve a commercial sale dispute through the courts (in calendar days).	Doing business (WB, 2014b)
		Control of corruption	Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	The aggregate measure ranges from around -2.5 to 2.5, with higher values corresponding to better outcomes.	Worldwide Governance Indicators (WB, 2014a)
	Protection of property	Property rights enforcement	Measures the extent to which a country's legal framework allows individuals to freely accumulate private property, secured by clear laws that are enforced effectively by the government.	The scale is formed by scores ranging from 0 to 100 (0, 10, 20... 100), with the possibility of assigning intermediate scores, such as 75 or 45. Higher scores correspond to a more effective system of legal protection.	Index of Economic Freedom (Miller et al, 2014)
	Public goods provision	Government effectiveness	Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	The aggregate measure ranges from around -2.5 to 2.5, with higher values corresponding to better outcomes.	Worldwide Governance Indicators (WB, 2014a)
		Public spending on education	Includes government spending on education institutions (both public and private), education administration, and transfers/subsidies for private entities (students/households and other private entities). Measured as a percentage of GDP.	Expressed as a percentage of GDP in that year.	World Bank (WB, 2014c)
		Public health expenditure	Consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds. Measured as a percentage of GDP.	Expressed as a percentage of GDP in that year.	World Bank (WB, 2014c)
		Access to improved water	Percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection).	Expressed as a percentage to the total population.	World Bank (WB, 2014c)
	Raising revenues	Tax revenue	Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Refunds and corrections of erroneously collected tax revenue are treated as negative revenue. Measured as a percentage of GDP.	Expressed as a percentage of GDP in that year.	World Bank (WB, 2014c)
	Political institutions	Executive constraints	Captures the extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities.	Seven-category scale, with higher values representing more constraints to executive authority.	Polity IV (Marshall et al, 2013)
		Checks and balances	Captures the extent of which legislatures are competitively elected.	Unitary increments are made according to different assessment criteria. Higher values correspond to higher levels of checks and balances.	Database of Political Institutions (Keefer, 2013)
		Magnitude of regime change	General score of the magnitude of a regime change, based on the scores of failure of state authority, collapse of democratic institutions, and violence associated with adverse regime changes.	Each of the magnitude scores ranges from 1 to 4. All decimal averages are assigned to decimal scores of "0.5". A score of 0 was assigned *a posteriori* to periods	Armed Conflict and Intervention (Marshall, 2013)

				with no regime change. Higher vales correspond to higher magnitudes.	
Political violence	Repression	Arms imports	Arms transfers cover the supply of military weapons through sales, aid, gifts, and those made through manufacturing licenses. Data cover major conventional weapons such as aircraft, armoured vehicles, artillery, radar systems, missiles, and ships designed for military use. Excluded are transfers of other military equipment such as small arms and light weapons, trucks, small artillery, ammunition, support equipment, technology transfers, and other services. Measured as percentage of the global volume.	Data relates to actual deliveries of major conventional weapons. The volume of international transfers is measured by the trend-indicator value (TIV) developed by SIPRI. The TIV is based on the known unit production costs of a core set of weapons and is intended to represent the transfer of military resources rather than the financial value of the transfer. Expressed as percentage of the world volume.	World Bank (WB, 2014c)
		Civil liberties	Measures the score of a country in 15 civil liberties indicators, grouped into four subcategories: freedom of expression and belief, associational and organizational rights, rule of law, and personal autonomy and individual rights.	A country or territory is assigned a rating of 1 (highest) through 7 (lowest degree of freedom), based on the scores for each of the individual indicators.	Freedom House (2014)
		Political terror scale	Measures the level of political violence that a country experiences in a given year, based on the amount of violations of physical or personal integrity rights carried out by a state (or its agents).	Uses a 5-point coding scheme, with higher levels representing higher levels of "terror".	Political Terror Scale (Gibney et al, 2013)
	Civil conflict	Major episodes of civil violence	Total summed magnitudes of all societal major episodes of political violence involving the state in a certain year, namely episodes of civil violence, of civil warfare, of ethnic violence and of ethnic warfare.	Total summed magnitudes of the four magnitude scores, each scaled from 1 (lowest) to 10 (highest) for each episode.	Armed Conflict and Intervention (Marshall, 2013)
		Armed conflict	Number of armed conflicts defined as contested incompatibilities that concern government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths.	The number of different types of conflict (extrasystemic, interstate, internal and internationalised) was considered, and a value of 0 was assigned *a posteriori* to periods with no armed conflict.	UCDP/PRIO (Themner and Wallensteen, 2014)
		Coups d'état	Total sum of successful coups and attempted (but ultimately unsuccessful coups d'état.	Sum of the number of successful coups and of attempted coups d'état that occurred in the year of record.	Polity IV (Marshall et al, 2013)
		Revolutionary wars	Measures the annual magnitude of episodes of violent conflict between governments and politically organized groups (political challengers) that seek to overthrow the central government, to replace its leaders, or to seize power in one region. It is based on the average scores of number of rebel combatants or activists, annual number of fatalities related to fighting, and portion of country affected by fighting.	Each of the magnitude scores ranges from 0 to 4. All decimal averages are assigned to decimal scores of "0.5". A score of -0.5 was assigned *a posteriori* to periods with no regime change. Higher vales correspond to higher magnitudes.	Armed Conflict and Intervention (Marshall, 2013)
		Ethnic wars	Measures the annual magnitude of episodes of violent conflict between governments and national, ethnic, religious, or other communal minorities (ethnic challengers) in which the challengers seek major changes in their status. It is based on the average scores of number of rebel combatants or activists, annual number of fatalities related to fighting, and portion of country affected by fighting.	Each of the magnitude scores ranges from 0 to 4. All decimal averages are assigned to decimal scores of "0.5". A score of -0.5 was assigned *a posteriori* to periods with no regime change. Higher vales correspond to higher magnitudes.	Armed Conflict and Intervention (Marshall, 2013)

Table B3. Correlation matrix

	rlaw	regqual	enfcont	ccorr	proprig	goveff	educ	heal	awat	taxrev	execons	checbal	magrc	armimp	civlib	pts	epciviol	armconf	coup	revwar	ethwar
rlaw	1																				
regqual	**0.8499**	1																			
enfcont	-0.2830	-0.3542	1																		
ccorr	**0.8767**	0.7745	-0.3336	1																	
proprig	**0.8422**	0.7629	-0.1057	**0.8232**	1																
goveff	**0.9106**	**0.8658**	-0.2804	**0.8597**	**0.8065**	1															
educ	0.3095	0.1569	-0.1233	0.3058	0.3128	0.2522	1														
heal	0.2946	0.3318	-0.2165	0.3127	0.2076	0.2035	0.4511	1													
awat	0.4863	0.5133	-0.0527	0.4096	0.4091	0.6039	0.1551	0.1661	1												
taxrev	0.1583	0.1995	-0.1706	0.1943	0.1787	0.1689	0.5424	0.3437	0.1254	1											
execons	0.1930	0.3942	0.0798	0.1469	0.2396	0.2084	0.2125	0.3989	0.2527	0.3117	1										
checbal	0.1084	0.1219	0.2417	0.0180	0.1451	0.0765	-0.0197	0.0204	0.0710	-0.0897	0.4286	1									
magrc	-0.0515	-0.0657	0.1103	-0.0416	0.293	-0.0382	-0.0583	-0.0842	-0.1194	-0.0808	-0.1325	-0.0550	1								
armimp	0.1381	-0.0130	0.3546	0.0910	0.2023	0.1460	-0.1489	-0.3597	0.1439	-0.1443	0.0634	0.3025	-0.0466	1							
civlib	-0.5081	-0.6027	0.1504	-0.4188	-0.4280	-0.4023	-0.3217	-0.5235	-0.2125	-0.3173	-0.7432	-0.2642	-0.0039	0.1273	1						
pts	-0.5679	-0.5546	0.5402	-0.5417	-0.3458	-0.4662	-0.2139	-0.4258	-0.1210	-0.2394	-0.1553	0.0938	0.1496	0.2351	0.4505	1					
epciviol	-0.1901	-0.2111	0.5543	-0.2407	-0.0616	-0.1493	-0.2519	-0.2825	0.0220	-0.2985	0.1255	0.3942	-0.0204	0.6219	0.2036	0.5361	1				
armconf	-0.1316	-0.2148	0.4626	-0.1974	-0.0653	-0.1020	-0.2035	-0.3089	-0.0099	-0.2591	0.0882	0.5671	0.0031	0.5608	0.1932	0.4400	0.7845	1			
coup	-0.0380	-0.0205	0.0710	-0.0648	-0.0384	0.0184	-0.0934	-0.1194	0.0312	-0.0195	-0.0961	-0.0335	0.5930	-0.0541	0.0169	0.1182	0.0265	0.0641	1		
revwar	0.0064	-0.0139	0.5760	-0.0367	0.1095	0.0078	-0.0440	0.0411	0.0461	-0.1591	0.1776	0.4506	-0.0293	0.4686	0.0099	0.2948	0.6312	0.5705	-0.0343	1	
ethwar	-0.2083	-0.2347	0.3375	-0.2610	-0.1066	-0.1566	-0.2597	-0.3791	-0.0102	-0.2761	0.0582	0.2973	0.0450	0.4910	0.2313	0.5066	**0.8282**	0.7271	0.1022	0.2084	1

Notes: Values over 0.8 highlighted in bold.