State capacity and the triple COVID-19 crises:
An international comparison

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Abstract. The COVID-19 multidimensional crisis poses a formidable challenge for human society as it is simultaneously and globally damaging the public health, the economic activity and the social wellbeing. The complexity and severity of this crisis has revealed the weaknesses and heterogeneities of States' capacities to respond to the global pandemic. In this paper we raise the important question about which type of State capacity has been more effective for dealing with the negative effects of the pandemic. Our research proposes a hierarchical cluster analysis of countries that distinguishes three dimensions of the crisis (the health, the economic and the social crises) and measures both the States' efforts (the "inputs") for containing these crises, and the corresponding effects (the "outputs") that result from the previous inputs. We classify 99 countries worldwide into four groups in 2020. Our results reveal that there is no simple 'linear' representation of the COVID-19 multi-crises in terms of State capacity (each cluster of countries has its own and specific State characteristics and crisis effects). We thus reject the hypothesis that strong State capacity was a *sine qua non* condition for tackling the negative effects of the COVID-19 multi-crises during the first phase of the pandemic. In the end, the global emergency has emphasised the need to rethink the research on State capacity as the previous theoretical constructions have been unable to explain the significative international differences in terms of the public performances in minimising the negative effects of the pandemic.

Keywords. State capacity, COVID-19, international taxonomy, cluster analysis, global pandemic

1. Introduction

The COVID-19 pandemic represents a formidable challenge for the human society. The outbreak of the disease is a threat to the international public health with the capacity to unleash the deepest global socio-economic recession since the World War II. While the COVID-19 has created a complex and multidimensional worldwide crisis, it has also revealed the weaknesses and differences in terms of Governments capabilities to respond to the emergency.

The COVID-19 crisis has highlighted two issues of vital importance for public health and human development. First, the importance of global interdependencies, through which biological and social interactions shape —to a large extent— public policy making at both national and international levels. Second, the need to strengthen technical and institutional capacities and promote public goods —whether at the national, regional or global level— in order to deal with international crisis. The wide variety of responses to the emergency, and their different levels of success, reflect the heterogeneity across countries in terms of political and economic systems.

In this global context of multi-crises, the concept of "State capacity" (SC) is re-gaining importance as States are the main actors responsible for containing the pandemic and minimising its socio-economic effects. However, while the literature has tackled with individual dimensions of SC (thus mainly contributing with mono-dimensional analysis), an analytical multidimensional approach remains to be done. Thus, the main goal of this piece of research is to enrich the academic literature on SC performance during the COVID-19 crisis from a multidimensional perspective, trying to shed light on the complex interactions between socioeconomic and public health variables.

In this paper we raise the important question about which type of SC is more effective for dealing with the negative effects of the pandemic. Our hypothesis is that strong SC has been a *sine qua non* condition for minimising the negative effects of the COVID-19 multi-crises during the first phase of the pandemic —between January and October 2020.

In order to verify this hypothesis we build an international taxonomy that distinguishes three dimensions of the crisis (the health, the economic and the social crises) and measures both the States' efforts (the "inputs") for containing these crises, and the corresponding effects (the "outputs") that result from the previous inputs. We carry out a hierarchical cluster analysis that allows us to classify 99 countries worldwide into four reasonable groups with different SC levels and dissimilar effects of the crises.

The paper is structured as follows. After this introduction, section 2 briefly analyses the ample literature on SC. Section 3 reviews the recent studies on SC and the current COVID-19 multi-crises. Section 4 explains our multidimensional approach for building an international taxonomy of SC by means of a hierarchical cluster analysis. Section 5 presents and discusses the empirical results. Finally, section 6 concludes with the main implications derived from our piece of research.

2. The concept of State capacity

Broadly speaking, SC refers to the ability of the State to achieve its goals. However, from an academic perspective, its conceptualization is not so obvious. Since the 1980s, SC has been a subject of intense discussion across different scientific disciplines. Political scientists, institutionalists, political economists and sociologists, among others, developed a vast array of definitions and conceptual constructions. To this day, there is no clear consensus on how to define SC and thus the conceptual discussion persists (Cingolani, 2019).

The analysis of SC faces a sequence of three key analytical decisions that should be addressed: i) the definition of the object of analysis, ii) the identification of the main dimensions, and iii) the measurement of the selected dimensions.

Regarding the first analytical decision, the conceptualization of SC tends to be determined by the selected object of analysis, this is, the kind of relationship between the variables, where SC can operate as a dependent or as an independent variable. On the one hand, some studies focus on the determinants of SC, which are the underlying causes of the State' structure, configuration and performance. This branch of research considers SC as a dependent variable determined by multiple factors, such as wars (Tilly, 1975; Centeno, 2002), regime type (Dincecco, 2010), type of State formation (Charron *et al.,* 2012), and a variety of international, political, institutional and economic factors (Stein, 2004; Bull, 2016). On the other hand, other pieces of research are focused on the effects of SC, such as civil conflicts (Hendrix, 2010), industrialization (Evans, 2012), economic development (Dincecco and Katz, 2016) and innovation (Acemoglu *et al.,* 2016). Thus, as SC conceptualizations are adjusted depending on the analysed relationship between the variables, there are different multidimensional configurations of these studies. For instance, civil conflict analyses tend to focus on the coercive dimension of the SC, while economic growth and industrialization studies focus on the fiscal and bureaucratic dimensions.

Secondly, regarding the identification of the main dimensions of SC, according to Cingolani (2013) there are seven main dimensions: coercive, fiscal, administrative, transformative, relational, legal and political. Nevertheless, there is no clear empirical evidence assessing the relationships, hierarchies and boundaries between these dimensions. And this lack of evidence leads to arbitrary proposals with associated problems of overlapping, circularity and oversizing/undersizing (Lindvall and Teorell, 2016). There is also a persistent debate between different theoretical concepts —such as good governance and institutional quality—, which are not clearly differentiated from the concept of SC. A few studies have applied statistical techniques, such as factor analysis (Hendrix, 2010) and Bayesian analysis (Hanson and Sigman, 2013), to shed light on these concepts. These empirical exercises point to a greater weight and representativeness of the dimensions of coercion, fiscal extraction and administrative capacity.

Thirdly, regarding the measurement of the selected dimensions of SC, there are two recurrent problems. The first one relates to the constructing validity of the indicators. As shown by Hanson and Sigman (2013), there are multiple indicators for the extractive (Lieberman, 2002), coercive (Soifer, 2008) and administrative (Addison, 2009) dimensions. However, each indicator relates to different features of those dimensions. In this sense, it is critical that the selected indicators reflect the specific features of each SC dimension. Moreover, the second measuring problem relates to the limited availability of indicators, which inevitably leads to the use of suboptimal proxies. Therefore, researchers struggle in the search for an optimal equilibrium between the conceptual validity and the limited availability of information for measuring SC.

3. State capacity in a COVID-19 world

The emergence of the COVID-19 has been an unprecedented shock to the global economy because of its economic, social and public health implications. This also applies to the academic sphere, where the first wave of the pandemic radically shifted the research priorities in almost all disciplines (Jeppesen and Miklian, 2020). SC has become a great public concern as important differences have arisen in terms of States performances, especially —and surprisingly— in those developed countries that were expected to perform better, such as United States, United Kingdom, France and Spain. As a result, numerous studies have been published regarding public interventions effectiveness in dealing with the multidimensional crisis. However, there has been a limited conceptual and methodological discussion on the implications of the emergence of the COVID-19 crisis for the SC analyses.

The bulk of the new literature focuses on identifying the kind of public capacities that are effective in order to minimise the deleterious effects of the pandemic. The relationship between public health capacities and mortality has been the most prolific research agenda. These include national case studies (Dostal, 2020; Hamidian *et al.,* 2020), comparative analysis (Haj Bloukh *et al.,* 2020; Bosancianu *et al.,* 2020) and the conceptualization of specific features of public health capacities (Mazzucato y Kattel, 2020; Collins, 2020). And there has been an increasing interest in providing comprehensive measurements of global health security, such as the Global Health Security (GSH) index (NTI and Johns Hopkins University Centre for Health Security, 2022).

Another branch of literature has focused on the institutional, political and social determinants of public health capacities. Capano *et al.* (2020) show that national leadership, the relationship between the Government and the civil society, and the specific vulnerabilities of certain populations play a major role in the effectiveness of public interventions. Likewise, Greer *et al.,* (2020) consider the need for a wider approach beyond SC that considers some institutional and political features, including the role of regime types (democracy *versus* autocracy) and formal political institutions (federalism *versus* presidentialism). In this regard, a number of papers deal with the relationship between regime types and State effectiveness, for instance Kavanagh y Singh (2020) and Frey *et al.* (2020), who do not find an "autocratic advantage" in minimising the pandemic contagion. Moreover, other studies have analysed the relationship between the implementation of austerity measures during the last decade and the damage to the public health capacities (Navarro, 2020), and the impact of social capital and collaborative knowledge creation in the agility to respond to the crisis (Al-Omoush *et al.,* 2020).

In short, these studies go back to the problem with SC configurations *versus* determinants. The institutionalist approach focuses on public policy arrangements, configurations, resources and structures, independently from its political, social and economic context, thus offering a limited scope and leading to policy prescriptions that fail to understand the underlying factors for its success (the usual "one size fits all" problem). On the other side, the determinants-based approach tends to lead to limited policy prescriptions as the conclusions are raised in country-specific terms, with no generalizable patterns, as these are mostly linked to deterministic views of institutional path-dependence.

Beyond the health capacities, a key dimension is the economic. As shown by different studies (IMF 2020; Chetty *et al*. 2020; Bartik *et al*. 2020), the pandemic is having a major economic shock on the global economic activity, with a differentiated impact between developed and developing countries (Djankov and Panizza, 2020)[1].

In dealing with the economic crisis, two main issues arise. First, the kind of economic policies that should be implemented to counteract the effects of the pandemic, where there is a wide consensus on the need for expansive policies, both monetary (Cochrane, 2020) and fiscal (Gourinchas, 2020) policies[2]. As shown by Baldwin (2020), the COVID crisis has generated supply and demand shocks, forcing governments to implement extraordinary measures to protect and support their economies and citizens in order to mitigate the effect of the external shocks. The second issue relates to the economic impact of containment measures (lockdowns and mobility reductions) and whether these might be harmful in the long run. Deb *et al.* (2020) argue that containment measures are associated with stronger economic costs. They show that easing of containment measures has been more effective than tightening measures, but this depends on other factors, such

[1] In year 2020, China was the only country that, according to the estimations of The Economist (2020), surpassed its previous levels of GDP.
[2] For an extensive discussion on expansive macroeconomic policy before de COVID crisis see Blanchard and Summers (2019).

as population density, age composition, and the quality and capacity of the health systems. However, they do not deal with the trade-offs of maintaining light measures and the inevitable need for lockdown or more strict measures in the long run. Miles *et al.* (2020) do a first attempt to compare economic and sanitary benefits and costs in the UK and conclude that easing severe restrictions will render larger benefits than the costs associated with keeping the restrictions. Likewise, the Financial Times (2020) did an interesting exercise crossing falls in GDP and mortality rates. This exercise showed that those countries that handled virus outbreaks with more aggressive measures (such as China, South Korea and Vietnam) over-performed —sanitary and economically— those that applied less severe measures.

Another cause of concern is the asymmetric social effects of the pandemic (Horton, 2020)[3]. Firstly, there is consensus that the most disadvantaged people are affected largely (with higher mortality and a worsening of the disease) due to their poor living conditions (limited access to health services, reduced social distancing due to overcrowded accommodations, etc.) (Pattel *et al*., 2020). Thus, inequality is also seen as a vector for a wider diffusion of the pandemic (Ahmed *et al.,* 2020). Secondly, and complementarily, differentiated impact between social sectors may be reinforcing the pre-existing inequalities, leading to a vicious circle between disease infections and growing inequalities (Blundell *et al.,* 2020). Sumner *et al.* (2020) reinforce this idea by forecasting a global increase in the number of "new poor people" (who may increase from three to five billion). Thirdly, policy prescriptions aimed at reducing social impacts have ranged from universal basic income, targeted cash transfers and massive social protection policies (Gentolini 2020). In order to fund the expansion of social spending, the IMF (2020) suggests taxing the richer and those private sectors outperforming during the crisis, while taking advantage of the historically low interest rates in order to borrow cheaply in an environment of greater fiscal multipliers. And lastly, Botlhale (2021) highlights the importance of public revenue diversification as a successful strategy for developing countries in dealing with the crisis.

Yet, some researchers have attempted to raise awareness of the different dimensions of the crisis (sanitary, economic and social) from a SC point of view. The most analysed

[3] For a nuanced insight on the "syndemic approach" and its relationship with political and social factors, see Mendenhall (2020).

relationship is the one between health containment measures and their impact on the economic activity. However, there are contradictory results depending on geographical areas, time frames and indicators (König and Winkler, 2020; Deb *et al.,* 2020; Miles *et al.,* 2020). So far, the more holistic (and multidimensional) approach has been carried out by Raboisson and Lhermie (2020), which simultaneously considered health, economic and societal dimensions, while offering a sophisticated operational framework for evidence-based policy interventions.

All in all, the COVID-19 multidimensional crisis offers a "natural experiment" that is an opportunity to revisit the comparative analysis of SC. While the bulk of the studies has opted for a national driven methodology, a few have focused on the different needs, capabilities and performances between developed and developing countries (Gerard *et al*., 2020; Djankov and Panizza, 2020). Moreover, certain regional particularities have also been studied; for instance, the outstanding performance of East Asian countries, especially those characterized as "developmental States", such as Taiwan, South Korea, Singapore, Hong Kong and Japan (An and Tang, 2020).

4. Methodology

4.1. Dimensions and indicators of the analysis

The previous review shows that there is no clear consensus on the conceptualization of SC and, therefore, even less on its measurement. Besides, approaching SC from a COVID-19 perspective exacerbates some of these challenges. Taking into account the main goal of our piece of research (building an international taxonomy that considers the capacity of the States to deal with the effects of the COVID-19 emergency), we assume that the pandemic is simultaneously causing a triple-crisis: the health, the economic and the social crises. And, as a consequence, we need to measure, on the one hand, the States' efforts (the "inputs") for containing these multi-crises and, on the other hand, the corresponding effects (the "outputs") that result from the previous inputs.

Regarding the health crisis, we use the Global Health Security Index (*GHS*) as a proxy of each Government's effort (input) to deal with the pandemic. As for the output, we use the cumulative death rates per 100,000 inhabitants (*Deaths*), which is a standardised indicator for tracking the pandemic and guiding decision-making for COVID-19 mitigation, response and reopening.

In relation to the economic crisis, we use as an input the research and development expenditure (*R+D+i*) as a percentage of GDP, which is broadly considered as the crucial driver for economic growth in the long run (Romer, 1990). The real GDP growth (*Growth*) is used as an output. Our source is the global growth forecast from the International Monetary Fund, revised in October 2020.

And regarding the social crisis, we measure the input by means of the public expenditure as a percentage of GDP. In order to avoid potential biases, we detract military expenditure from the total public expenditure. As for the output, we measure economic inequality by means of the Palma ratio. Obviously, in the case of this output we do not have information for 2020 and, therefore, we are not able to measure the impact of the crisis in terms of inequality. Given this impossibility (which is applicable to any other social indicator that we can think of) we opt for considering the inequality situation of each country just before the global pandemic began, as this departing point will determine the eventual level of inequality.

Table 1 provides summary information of the dimensions, variables, periods and sources used in this piece of research. The selection of the proxies aims to maximize the sample size and to avoid redundant information.

Table 1. [Here]

4.2. Cluster analysis of States capacities

Cluster analysis is a numerical technique that is suitable for classifying a sample of heterogeneous countries in a limited number of groups, each of which is internally homogeneous in terms of the similarities between the countries that comprise it. Ultimately, the goal of cluster analysis is to provide classifications that are reasonably 'objective' and 'stable' (Everitt *et al.*, 2011): 'objective' in the sense that the analysis of the same set of countries by the same numerical methods produces similar classification;

and 'stable' in that the classification remains similar when new countries – or new characteristics describing them – are added. As Everitt *et al*. explain:

> Cluster analysis techniques are concerned with exploring data sets to assess whether or not they can be summarised meaningfully in terms of a relatively small number of groups or clusters of objects or individuals which resemble each other and which are different in some respects from individuals in other clusters. Everitt *et al*. (2011: p. 13)

Specifically, hierarchical cluster analysis allows one to build a taxonomy of countries with heterogeneous socio-economic levels in order to divide them into a number of groups so that: i) each country belongs to one – and only one – group; ii) all countries are classified; iii) countries of the same group are, to some extent, internally 'homogeneous'; and iv) countries of different groups are noticeably dissimilar. The advantage of this procedure is that it allows one to discern the 'association structure' between countries, which facilitates the identification of the key characteristics of each cluster.

Furthermore, cluster analysis deals with two intrinsic problems in the design of an international taxonomy. First, it facilitates the determination of the appropriate number of groups in which to divide the sample of countries. Second, given that each country has different values for the set of socio-economic indicators, cluster analysis allows a synthetic distribution that makes easier comparisons of the indicators across countries.

In our piece of research, we conduct a hierarchical cluster analysis using the Ward's method, computing the squared Euclidean distances between each element and standardising the variables in order to correct differences in scale.[4] The analysis includes 99 countries of different development levels (that is, 83% of the world population).[5]

[4] Regarding the standardisation method, we use the 'range -1 to 1' which is deemed to be preferable than other methods 'in most situations' (Mooi and Sarstedt, 2011: p. 247). The analysis was conducted using *SPSS* software.

[5] The countries not included in the analysis are either insular states with less than one million inhabitants (Antigua and Barbuda, Dominica, Fiji, Grenada, Kiribati, Maldives, Marshall Islands, Mauritius, Mayotte, Palau, Samoa, Sao Tome and Principe, Seychelles, Solomon Islands, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Tonga, Tuvalu and Vanuatu), or countries with limited statistical information (Afghanistan, Cuba, Eritrea, Kosovo, Lebanon, Libya, North Korea, Somalia, Sudan, Timor-Leste, Uzbekistan, West Bank and Gaza, and Zimbabwe).

Given the type of data used in this cluster analysis (six continuous variables), three possible clustering algorithms are the nearest neighbour method, the furthest neighbour method and the Ward's method (Everitt *et al.*, 2011, Mooi and Sarstedt, 2011).[6] Since there is no objective criterion for selecting the most appropriate method, the selection depends largely on the interpretability of the final results.

In our analysis we use the method proposed by Ward (1963), in which the fusion of two clusters is based on the size of an error sum-of-squares criterion. The objective at each stage is to minimise the increase in the total within-cluster error sum of squares. In practical terms, the Ward's method has been proven to be especially suitable for building clusters with similar sizes, when no outliers are present (Hands and Everitt, 1987; Everitt *et al.*, 2011, Mooi and Sarstedt, 2011).

Before the clustering process, one must examine the variables for substantial collinearity. The data set includes six variables that proxy an input and an output for each of the three crisis dimensions considered in the analysis. Thus, highly correlated variables would not be surprising (table 2).[7] The highest correlation coefficient (which is well below the 0.9 threshold) corresponds to the variables *GHS* and *R+D+i*, which are, respectively, inputs for the State capacity in the health crisis and the economic crisis.

Table 2. [Here]

The next stage is to decide on the number of country groups (that is, the number of clusters to retain from the data). This decision is based on the dendrogram. The dendrogram graphically displays the distances at which countries (and clusters of countries) are joined. The dendrogram is read from left to right. Vertical lines are countries joined together: their position indicates the distance at which the mergers take place[8]. This graph provides guidance regarding the number of groups to retain, suggesting that either a four-cluster solution (which implies a maximum distance of six out of 25) or a five-cluster solution

[6] See descriptive statistics of the data set in appendix 1.
[7] If highly correlated variables are used for cluster analysis, specific aspects covered by these variables will be overrepresented in the outcome. Everitt et al. (2011) and Mooi and Sarstedt (2011) argue that absolute correlations above 0.9 are problematic.
[8] *SPSS* re-scales the distances to a range of 0 to 25. Therefore, the last merging step to a 1-cluster solution takes place at a (re-scaled) distance of 25.

(distance of five) are appropriate. We prefer the four-cluster solution as it creates a lower number of groups (which eases the interpretation, assuming a minimal increase in the variability within clusters) and also creates a more balanced composition of clusters (in particular, in the four-cluster solution there are no groups integrated by a very low number of countries).

Figure 1. [Here]

Before comparing the characteristics of these four clusters, it is worthwhile distinguishing which variables are more influential in discriminating between countries. This step is particularly important as cluster analysis sheds light on whether the groups of countries are statistically distinguishable (that is, whether the clusters exhibit significantly different patterns in the muti-crises indicators).

In order to verify if there are significant differences between clusters, we perform a one-way ANOVA analysis to calculate the cluster centroids and compare the differences formally. According to this analysis, the six variables included in the classification are statistically significant at a 0.01 level (table 3). The size of the *F* statistics shows the relation between the overall between-cluster variation and the overall within-cluster variation and, therefore, it is a good indicator of the relevance of each variable for identifying groups of countries. According to this criterion, the variable with the greatest discriminating power is *R+D+i*, followed (in decreasing order of importance) by *Deaths per 100,000, GHS* and *GDP growth*. Hence, the variables with the lowest relative importance in the classification are *Palma index* and *Public expenditure*.

Table 3. [Here]

5. Main results and implications

As noted, the analysis classifies the 99 countries into four clusters, each of which includes countries that are scattered across different geographical regions that do not respond to the usual North-South divide[9] (map 1). A precise interpretation of the characteristics of

[9] Appendix 2 shows the complete set of countries classified by clusters.

the four groups involves examining the cluster “centroids” (that is, the variables’ average values of all countries in a certain cluster). This procedure enables us to compare the average characteristics of each group of countries (Table 4).

Table 4. [Here]

Cluster 1 consists of **33 countries with very low SC but low impacts in terms of COVID-deaths and GDP falls**. On average, these countries have the lowest SC inputs (in terms of health security capabilities, R+D+i investments and public expenditures) but, even so, they are being less severely affected by the pandemic than the rest of the clusters, in terms of deaths and economic growth (even when the growth rates are mainly negative). Another important feature of these countries is that they have significant inequalities in the two extremes of the income distribution (Palma ratio). Moreover, there is a certain level of heterogeneity among the countries included in this group. Particularly stands out the case of China: on the one hand, it has experienced —relatively— low impacts in terms of COVID-deaths and in economic terms (in fact, the Chinese GDP grew in 2020). But, on the other hand, it has higher GHS index than the majority of the countries in this cluster, and also much higher R+D+i investments and public expenditures.

Cluster 2 is composed of **38 countries with low SC and moderate impact of the pandemic in terms of deaths, but very negative impact in economic terms**. On average, these countries have low levels of SC inputs (GHS indexes, R+D+i investments and public expenditures) but they have experienced relatively low deaths per 1,000 inhabitants. In contrast, they have had a sharp decrease of the economic activity. These are also countries with moderate levels of inequality. As this is the cluster with the larger number of countries, there are some cases of heterogeneity. Especially dissimilar is the case of India, which had (at the beginning of the pandemic) a lower ratio of COVID deaths than the rest of the countries, a lower public expenditure and an acuter worsening of the economic activity.

Cluster 3 includes **10 countries with strong health security capabilities and high inequalities, but very high impact of the pandemic in terms of deaths and economic downturns**. On average, these countries have high GHS indexes but low R+D+i investments and public expenditures. They are experiencing very high deaths rates and severe economic declines. An important feature shared by these countries is that they have high levels of inequality. The two most heterogenous countries in this group of mainly Latin American nations are, precisely, the two only European countries, Spain and Italy, which have higher R+D+i investments and lower Palma ratios. Spain is also the country within this group with the highest GHS index.

Cluster 4 is composed of **18 developed countries with very high SC and low inequalities, but moderate impact of the pandemic in terms of deaths and economic downturns**. On average, these countries have the highest GHS indexes, R+D+i investments and public expenditures. But the average death rate is the second largest among the clusters, and the GDP downturn is more acute than in C1. They are also the most equal countries in terms of the Palma ratios. Despite been a homogeneous group of countries, the most dissimilar one is Israel, which has the lowest GHS index and the highest R+D+i investment.

An important implication of this taxonomy is that it allows us to identify the main differences across the clusters. A visual way to explore the magnitude of these gaps is by means of a "web graph". Hence Figure 2 shows that *C1* stands out for being the group with the lowest SC inputs (GHS, R+D+i and public expenditures) and the lowest impact of the crisis in economic and sanitary terms. C3 main characteristic is that it has both the highest levels of inequality and the highest COVID-death rates. *C4* are the countries with the greatest SC inputs and the lowest Palma index. And *C2*, in contrasts, does not have any maximum value, neither any minimum one, among the considered variables.

Figure 2. [Here]

Table 5 summarises the main characteristics of the clusters organizing them in four quadrants. These complex results show that there is no simple 'linear' representation of the multidimensional COVID-crisis in terms of the international difference in SC. We thus reject the hypothesis that countries with strong SC tend to have lower crisis impacts; and that countries with weak SC tend to have worse consequences. In fact, each cluster of countries has its own and specific SC characteristics and crisis effects; hence there is no group of countries with the best (or worst) indicators in all the indicators utilised here.

As a result, our taxonomy offers a nuanced understanding of the diversity of challenges associated with the multidimensional —sanitary, social and economic— crisis that all countries are facing nowadays.

Table 5. [Here]

Map 1. [Here]

6. Conclusions

The COVID-19 multidimensional crisis is a formidable public management challenge for the human society as it is simultaneously damaging the international public health as well as the global economic activity and the social wellbeing. In particular, the complexity and the gravity of the crisis have revealed the weaknesses and heterogeneities of the capacities of the States to successfully respond to the multi-crises.

In line with the tradition of SC studies and the recent concern raised by the COVID-19 emergency, our research proposes a multidimensional framework in order to compare State capacities across the world in dealing with the triple COVID-19 crises —in terms of public health, economic growth and social wellbeing.

By means of a hierarchical cluster analysis that covers 99 countries during the first phase of the COVID-19 pandemic in 2020, we reach six main results:

i. We classify the 99 countries into four clusters, each of which includes countries from different geographical regions.

ii. Cluster 1 consists of 33 countries with very low SC but low impacts in terms of COVID-deaths and GDP falls. China is included in this group as it has experienced —relatively— low impacts in terms of COVID-deaths and in economic terms, but it has higher SC inputs than the majority of the countries in this cluster.

iii. Cluster 2 is composed of 38 countries with low SC and moderate impact of the pandemic in terms of deaths, but very negative impact in economic terms. Specially interesting is the case of India, which had (at the beginning of the pandemic) a lower ratio of COVID-deaths than the rest of the countries but an acuter worsening of the economic activity.

iv. Cluster 3 includes 10 countries with strong health security capabilities and high inequalities, but very high impact of the pandemic in terms of deaths and economic downturns. This group is composed of Latin American nations with the exception of two European countries, Spain and Italy, which have higher R+D+i investments and lower levels of inequalities. Spain is also the country with the strongest health security capabilities within this group.

v. Cluster 4 is composed of 18 developed countries with very high SC and low inequalities, but moderate impact of the pandemic in terms of deaths and economic downturns.

vi. The complexity of these results reveals that there is no simple 'linear' representation of the COVID-19 multi-crises in terms of the international difference of SC. Hence, we reject the hypothesis that countries with strong SC have minimized the negative effects of the crisis —and *vice versa*. While this contradicts the assumption that strong SC is most effective in dealing with global threats —such as the COVID-19 emergency—, this should not come as a surprise to anyone. The specialized literature on SC determinants has shown that institutional success usually depends on factors that lie beyond institutional resources and capacities.

We also acknowledge some limitations of our analysis. Apart from the intrinsic weakness of building an international taxonomy using cluster analysis (which implies "generalizing" the features of each group of countries without paying detailed attention to each country specific characteristics), we have faced an important limitation in terms of information availability. In particular, the WHO figures of COVID deaths are volatile and there are doubts regarding the quality of the data across countries. The figures are also evolving rapidly which means that it will also be interesting to revisit the analysis once the pandemic has been overcome.

There is still work to do in order to better understand the underlying causes of national performance in dealing with global threats (such as the COVID-19 multi-crises). In addition to the differences in terms of SC, researchers should also explore the importance of other variables, such as specific elements from demographics, social structure, civic culture, and the process of decision-making at different levels. Moreover, two promising lines of investigation are, on one hand, the implementation of national-based methodologies that help us to identify singularities in order to better explain the international performance heterogeneities. And, on the other hand, we could benefit from other comparative statistical techniques (such as "qualitative comparative analysis" using fuzzy sets) that complement the cluster analysis that we have performed in this paper by providing further information on the causality relations between the SC inputs and the multi-crisis outputs. In the end, the COVID-19 pandemic has made it clear that we need to rethink the research on SC as the previous theoretical constructions have been unable to explain the significative international differences in terms of public performances in minimising the negative effects of the multi-crises.

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APPENDICES

APPENDIX 1. Descriptive statistics of the data set

	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
GHS	179	16.20	83.50	41.62	14.20
Deaths	197	0.00	123.76	13.28	20.80
R+D+i	116	0.01	4.95	0.92	1.02
Growth	200	-66.70	26.20	-5.25	7.06
Public expenditure	154	1.46	55.09	14.67	6.36
Palma	145	0.90	7.00	1.88	0.96
Valid N (listwise)	99				

Source: authors.

APPENDIX 2. Cluster membership of developing countries

Dimensions		Health crisis		Economic crisis		Social crisis	
Countries	**Cluster membership**	**GHS**	**Deaths**	**R+D+i**	**Growth**	**Public expenditure**	**Palma**
Algeria	1	23.6	4.1	0.5	-5.5	13.3	1.0
Angola	1	25.2	0.6	0.0	-4.0	8.7	2.1
Belarus	1	35.3	9.3	0.6	-3.0	14.6	0.9
Burkina Faso	1	30.1	0.3	0.7	-2.0	12.3	1.5
Burundi	1	22.8	0.0	0.2	-3.2	25.8	1.7
Chad	1	28.8	0.5	0.3	-0.7	1.5	2.2
China	1	48.2	0.3	2.2	1.9	14.7	1.7
Congo, Dem. Rep.	1	26.5	0.1	0.4	-2.2	6.3	2.1
Egypt, Arab Rep.	1	39.9	5.9	0.7	3.5	7.1	1.3
Eswatini	1	31.1	9.7	0.3	-3.5	21.3	3.5
Ethiopia	1	40.6	1.1	0.3	1.9	8.5	1.8
Gambia, The	1	34.2	4.8	0.1	-1.8	12.4	1.5
Guatemala	1	32.7	18.7	0.0	-2.0	10.7	2.9
Honduras	1	27.6	24.9	0.0	-6.6	11.8	3.4
Indonesia	1	56.6	4.2	0.2	-1.5	8.0	1.7
Kazakhstan	1	40.7	11.2	0.1	-2.7	8.3	1.0
Lesotho	1	30.2	1.9	0.0	-4.8	36.4	4.3
Lithuania	1	55.0	3.7	0.9	-1.8	15.0	1.6
Mali	1	29.0	0.6	0.3	-2.0	12.7	1.3
Mauritania	1	27.5	3.5	0.0	-3.2	9.9	1.3
Mongolia	1	49.5	0.0	0.1	-2.0	11.4	1.3
Mozambique	1	28.1	0.2	0.3	-0.5	22.0	3.9
Myanmar	1	43.4	1.0	0.0	2.0	15.4	1.7
Pakistan	1	35.5	3.0	0.2	-0.4	7.7	1.4
Paraguay	1	35.7	13.9	0.1	-4.0	10.8	3.0
Poland	1	55.4	7.6	1.2	-3.6	15.9	1.1
Rwanda	1	34.2	0.2	0.7	2.0	15.0	2.3
Senegal	1	37.9	1.9	0.6	-0.7	11.8	1.9
Serbia	1	52.3	8.7	0.9	-2.5	15.2	1.0
South Africa	1	54.8	29.4	0.8	-8.0	20.3	7.0
Sri Lanka	1	33.9	0.1	0.1	-4.6	7.5	1.9
Tajikistan	1	32.3	0.8	0.1	1.0	16.6	1.4
Vietnam	1	49.1	0.0	0.5	1.6	4.2	1.4
Armenia	2	50.2	34.1	0.2	-4.5	7.7	1.4
Bosnia and Herzegovina	2	42.8	27.6	0.2	-6.5	18.9	1.3

Bulgaria	2	45.6	12.7	0.8	-4.0	15.9	1.6
Costa Rica	2	45.1	20.1	0.4	-5.5	17.4	2.9
Croatia	2	53.3	7.6	1.0	-9.0	18.2	1.1
Cyprus	2	43.0	2.0	0.6	-6.4	14.8	1.4
Czech Republic	2	52.0	8.1	1.9	-6.5	19.1	0.9
El Salvador	2	44.2	13.5	0.2	-9.0	14.9	1.7
Estonia	2	57.0	5.1	1.4	-5.2	17.8	1.2
Georgia	2	52.0	1.8	0.3	-5.0	10.9	1.7
Greece	2	53.8	4.1	1.2	-9.5	17.1	1.5
Hungary	2	54.0	9.5	1.6	-6.1	18.3	1.1
Iceland	2	46.3	2.9	2.0	-7.2	24.3	1.0
India	2	46.5	7.7	0.6	-10.3	9.3	1.5
Iran, Islamic Rep.	2	37.7	33.2	0.8	-5.0	10.8	1.9
Iraq	2	25.8	24.1	0.0	-12.1	19.3	1.1
Ireland	2	59.0	36.8	1.1	-3.0	11.6	1.2
Jordan	2	42.1	1.4	0.7	-5.0	10.8	1.4
Kyrgyz Republic	2	49.3	16.5	0.1	-12.0	15.2	1.0
Latvia	2	62.9	2.1	0.6	-6.0	16.2	1.4
Luxembourg	2	43.8	20.6	1.2	-5.8	16.5	1.3
Madagascar	2	40.1	0.8	0.0	-3.2	13.7	2.1
Malaysia	2	62.2	0.5	1.4	-6.0	10.7	2.0
Malta	2	37.3	9.3	0.6	-7.9	16.8	1.1
Mauritius	2	34.9	0.8	0.3	-14.2	15.1	1.5
Moldova	2	42.9	35.3	0.3	-4.5	13.4	0.9
Montenegro	2	43.7	30.3	0.4	-12.0	16.7	1.2
Philippines	2	47.6	5.5	0.2	-8.3	11.4	1.9
Portugal	2	60.3	20.1	1.4	-10.0	15.1	1.5
Romania	2	45.8	27.3	0.5	-4.8	15.4	1.5
Russian Federation	2	44.3	15.3	1.0	-4.1	14.4	1.6
Seychelles	2	31.9	0.0	0.2	-13.8	20.0	2.6
Slovakia	2	47.9	1.0	0.8	-7.1	18.4	0.9
Thailand	2	73.2	0.1	1.0	-7.1	14.8	1.5
Tunisia	2	33.7	3.5	0.6	-7.0	18.6	1.3
Turkey	2	52.4	10.3	1.0	-5.0	13.2	2.1
Ukraine	2	38.0	10.9	0.5	-7.2	16.1	0.9
Uruguay	2	41.3	1.4	0.5	-4.5	13.1	1.8
Argentina	3	58.6	49.2	0.5	-11.8	14.4	1.9
Brazil	3	59.7	69.7	1.3	-5.3	18.8	4.0
Chile	3	58.3	68.9	0.4	-6.0	12.7	2.6
Colombia	3	44.2	53.4	0.2	-8.2	12.3	3.1
Ecuador	3	50.1	68.8	0.4	-6.3	12.1	2.4
Italy	3	56.2	59.7	1.4	-10.6	17.5	1.4
Mexico	3	57.6	62.1	0.3	-9.0	11.1	2.3
Panama	3	43.7	56.7	0.1	-9.0	11.7	3.3
Peru	3	49.2	100.1	0.1	-13.9	12.1	2.2
Spain	3	65.9	69.9	1.2	-12.8	17.5	1.5
Australia	4	75.5	3.5	1.9	-4.2	17.0	1.5
Austria	4	58.5	9.5	3.2	-6.7	18.5	1.1
Belgium	4	61.0	87.4	2.8	-8.3	22.3	1.0
Canada	4	75.3	25.3	1.6	-7.1	19.9	1.3
Denmark	4	70.4	11.5	3.1	-4.5	22.9	1.0
Finland	4	68.7	6.2	2.8	-4.0	21.7	1.0
France	4	68.2	49.5	2.2	-9.8	20.8	1.3

Germany	4	66.0	11.4	3.1	-6.0	19.1	1.2
Israel	4	47.3	20.4	5.0	-5.9	18.7	1.7
Japan	4	59.8	1.3	3.3	-5.3	18.9	1.2
Korea, Rep.	4	70.2	0.8	4.8	-1.9	14.6	1.2
Netherlands	4	75.6	38.1	2.2	-5.4	23.1	1.0
Norway	4	64.6	5.1	2.1	-2.8	22.8	1.0
Slovenia	4	67.2	6.8	1.9	-6.7	17.5	0.9
Sweden	4	72.1	58.3	3.3	-4.7	24.9	1.0
Switzerland	4	67.0	20.7	3.4	-5.3	11.2	1.2
United Kingdom	4	77.9	62.7	1.7	-9.8	17.1	1.3
United States	4	83.5	63.5	2.8	-4.3	11.0	2.0

Source: authors.

Tables and figures

Table 1. Dimensions and variables of the analysis

Dimensions	Input/Output	Proxies	Sources	Period
Health crisis	Input	**Global Health Security Index (*GHS*)** It provides a comprehensive assessment and benchmarking of health security and related capabilities of States to prevent and mitigate epidemics and pandemics.	The Nuclear Threat Initiative (NTI) (2020) and the Johns Hopkins Center for Health Security (JHU) (2019)	2019
	Output	**Cumulative death rates per 100,000 population (*Deaths*)**	World Health Organization (2020) and United Nations (2019)	2020 (until 9.10.2020)
Economic crisis	Input	**Research and development expenditure (% of GDP) (*R*+*D*+*i*)** It includes both capital and current expenditures in the four main sectors: business enterprise, Government, higher education and private non-profit. R&D covers basic research, applied research and experimental development.	UNESCO Institute for Statistics (2020)	Latest available year
	Output	**Real GDP growth (*Growth*)** Real GDP annual percentage change (projection for 2020).	International Monetary Fund (2020)	2020
Social crisis	Input	**Public expenditure (% of GDP) (*Public expenditure*)** It includes the general government final consumption expenditure without military expenditure.	World Bank (2020)	Latest available year
	Output	**Palma ratio (*Palma*)** Ratio of the richest 10 percent of the population's share of GNI divided by the poorest 40 percent's share.	UNDP (2020)	Latest available year

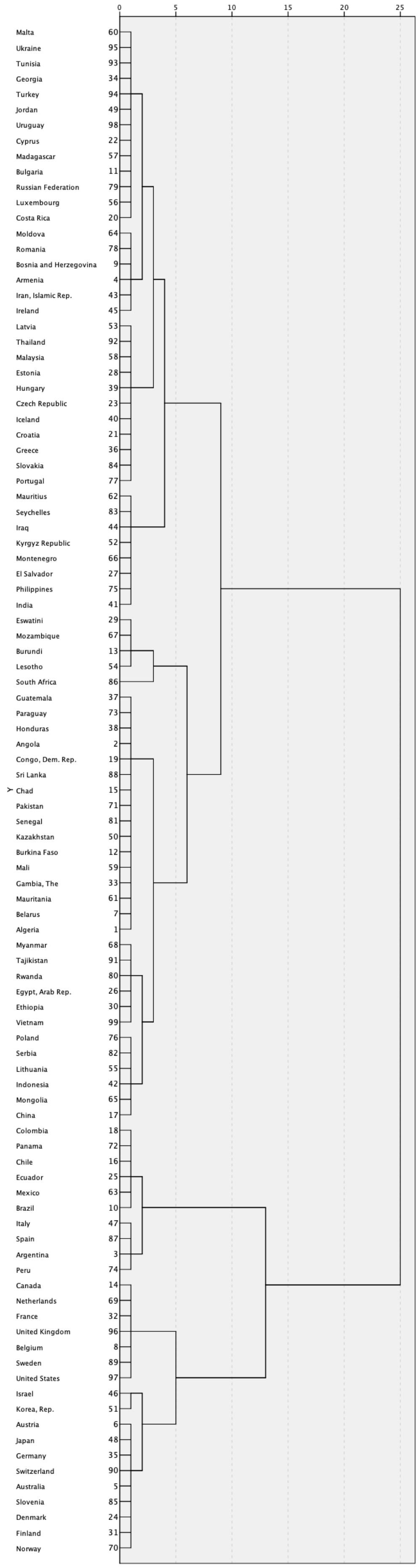
Source: authors.

Table 2. Correlation matrix

		GHS	*Deaths*	*R+D+i*	*Growth*	*Public expenditure*	*Palma*
GHS	Pearson Correlation	1	0.364	0.675	-0.022	0.125	-0.288
	Sig. (2-tailed)		0	0	0.774	0.124	0
	N	179	179	113	179	153	144
Deaths	Pearson Correlation	0.364	1	0.137	-0.18	0.084	0.046
	Sig. (2-tailed)	0		0.145	0.012	0.299	0.579
	N	179	197	115	197	153	145
R+D+i	Pearson Correlation	0.675	0.137	1	-0.068	0.305	-0.291
	Sig. (2-tailed)	0	0.145		0.467	0.001	0.003
	N	113	115	116	116	110	100
Growth	Pearson Correlation	-0.022	-0.18	-0.068	1	-0.177	0.012
	Sig. (2-tailed)	0.774	0.012	0.467		0.028	0.889
	N	179	197	116	200	154	145
Public expenditure	Pearson Correlation	0.125	0.084	0.305	-0.177	1	-0.024
	Sig. (2-tailed)	0.124	0.299	0.001	0.028		0.787
	N	153	153	110	154	154	134
Palma	Pearson Correlation	-0.288	0.046	-0.291	0.012	-0.024	1
	Sig. (2-tailed)	0	0.579	0.003	0.889	0.787	
	N	144	145	100	145	134	145

Source: authors.

Figure 1. Dendrogram of countries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20
25
Malta 60
Ukraine 95
Tunisia 93
Georgia 34
Turkey 94
Jordan 49
Uruguay 98
Cyprus 22
Madagascar 57
Bulgaria 11
Russian Federation 79
Luxembourg 56
Costa Rica 20
Moldova 64
Romania 78
Bosnia and Herzegovina 9
Armenia 4
Iran, Islamic Rep. 43
Ireland 45
Latvia 53
Thailand 92
Malaysia 58
Estonia 28
Hungary 39
Czech Republic 23
Iceland 40
Croatia 21
Greece 36
Slovakia 84
Portugal 77
Mauritius 62
Seychelles 83
Iraq 44
Kyrgyz Republic 52
Montenegro 66
El Salvador 27
Philippines 75
India 41
Eswatini 29
Mozambique 67
Burundi 13
Lesotho 54
South Africa 86
Guatemala 37
Paraguay 73
Honduras 38
Angola 2
Congo, Dem. Rep. 19
Sri Lanka 88
Y Chad 15
Pakistan 71
Senegal 81
Kazakhstan 50
Burkina Faso 12
Mali 59
Gambia, The 33
Mauritania 61
Belarus 7
Algeria 1
Myanmar 68
Tajikistan 91
Rwanda 80
Egypt, Arab Rep. 26
Ethiopia 30
Vietnam 99
Poland 76
Serbia 82
Lithuania 55
Indonesia 42
Mongolia 65
China 17
Colombia 18
Panama 72
Chile 16
Ecuador 25
Mexico 63
Brazil 10
Italy 47
Spain 87
Argentina 3
Peru 74
Canada 14
Netherlands 69
France 32
United Kingdom 96
Belgium 8
Sweden 89
United States 97
Israel 46
Korea, Rep. 51
Austria 6
Japan 48
Germany 35
Switzerland 90
Australia 5
Slovenia 85
Denmark 24
Finland 31
Norway 70

Table 3. ANOVA output of the clusters

		Sum of Squares	*Df.*	*Mean Square*	*F*	*Sig.*
GHS	Between Groups	11,675.50	3	3,891.83	44.76	0.000
	Within Groups	8,260.19	95	86.95		
	Total	19,935.69	98			
Deaths	Between Groups	30,956.86	3	10,318.96	47.97	0.000
	Within Groups	20,437.04	95	215.13		
	Total	51,393.90	98			
R+D+i	Between Groups	76.18	3	25.39	70.95	0.000
	Within Groups	34.00	95	0.36		
	Total	110.18	98			
Growth	Between Groups	667.04	3	222.35	30.67	0.000
	Within Groups	688.62	95	7.25		
	Total	1,355.66	98			
Public expenditure	Between Groups	416.16	3	138.72	6.05	0.001
	Within Groups	2,177.48	95	22.92		
	Total	2,593.64	98			
Palma	Between Groups	16.39	3	5.46	8.11	0.000
	Within Groups	64.02	95	0.67		
	Total	80.40	98			

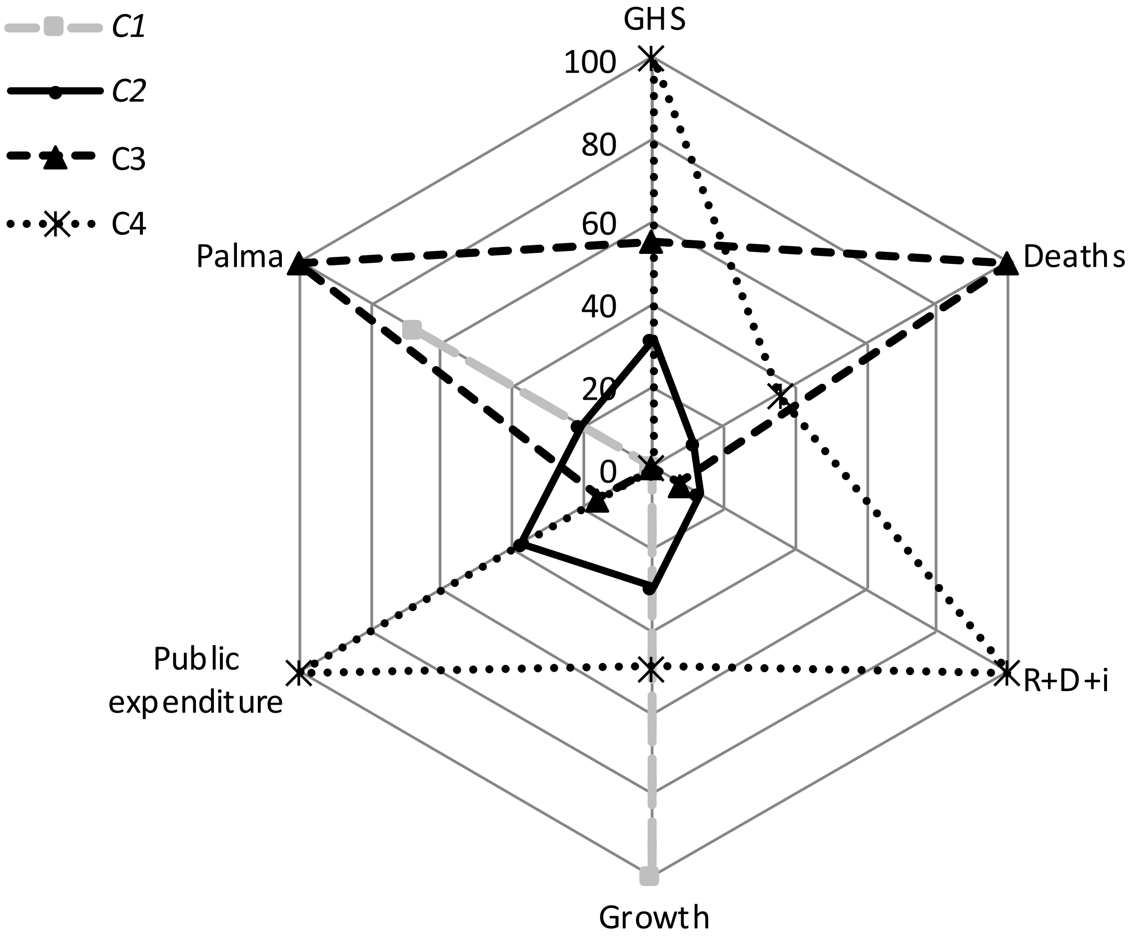
Source: authors.

Table 4. Cluster centroids

		GHS	*Deaths*	*R+D+i*	*Growth*	*Public expenditure*	*Palma*
C1	Mean	37.20	5.22	0.42	-1.91	13.12	2.06
	N	33	33	33	33	33	33
	Std. Deviation	10.19	7.29	0.45	2.65	6.66	1.24
C2	Mean	46.94	12.20	0.73	-7.11	15.31	1.47
	N	38	38	38	38	38	38
	Std. Deviation	9.42	11.60	0.52	2.89	3.40	0.45
C3	Mean	54.35	65.86	0.60	-9.29	14.02	2.47
	N	10	10	10	10	10	10
	Std. Deviation	7.23	14.11	0.50	2.96	2.85	0.81
C4	Mean	68.27	26.78	2.84	-5.71	19.00	1.22
	N	18	18	18	18	18	18
	Std. Deviation	8.35	26.52	0.95	2.13	3.89	0.28
Total	Mean	48.32	17.95	1.00	-5.34	15.12	1.72
	N	99	99	99	99	99	99
	Std. Deviation	14.26	22.90	1.06	3.72	5.14	0.91

Source: authors.

Figure 2. Differences across clusters' averages



Source: authors.

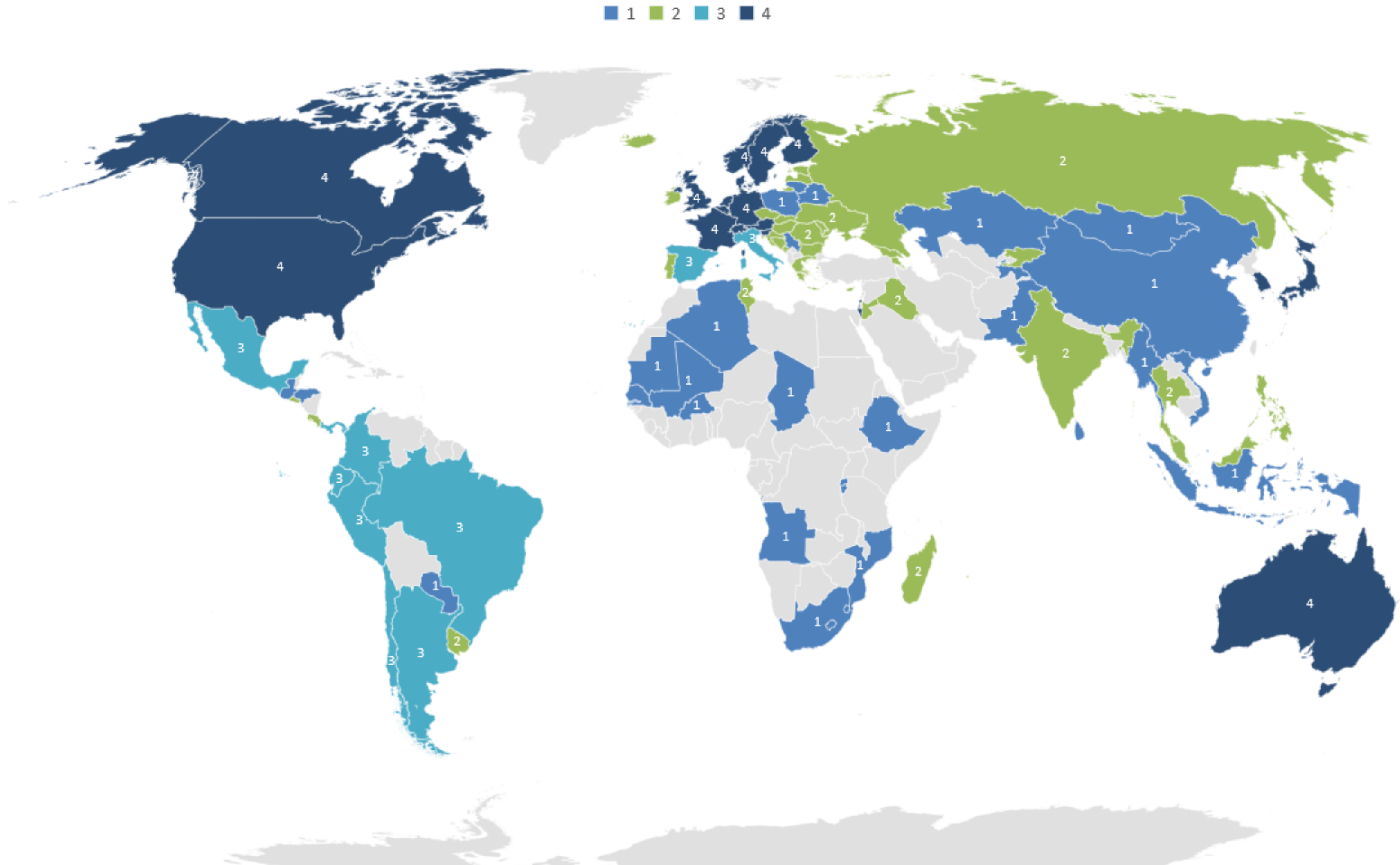
Note: centroids of each cluster and the total countries' average.

Table 5. Summary of clusters' characteristics

Lower ← **State capacity** → *Higher*	*Lower* ← **Impact of multi-crises** → *Higher*	
	Cluster 4: 18 developed countries with very high SC and low inequalities, but moderate impact of the pandemic in terms of deaths and economic downturns	**Cluster 3:** 10 countries with high health security capabilities and high inequalities but very high impact of the pandemic in terms of deaths and economic downturns
	Cluster 1: 33 countries with very low SC but low impacts in terms of COVID-deaths and GDP falls	**Cluster 2:** 38 countries with low Sate capacities and moderate impact of the pandemic in terms of deaths, but very negative impact in economic terms

Source: authors.

Map 1. World map of cluster memberships



Source: Author's elaboration