A novel dataset on governments' responses to COVID-19 all around the world

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Abstract: Responding to an outbreak of a novel COVID-19, governments all around the world implemented public health and economic measures to contain the spread of the virus and to support the economy. Public health measures include travel restrictions, bans on mass gatherings, school closing and domestic lockdown among others. Economic measures include wage support, cash transfers, interest rates cuts, tax cuts and delays, and support to exporters or importers. This paper presents a unique dataset of governments' responses to the COVID-19. The dataset codes the policy interventions with their dates at the country-level for more than 200 countries in the first quarter of 2020 (January 1st – April 14th, 2020). The generation of detailed datasets on the measures taken by governments is important and can help to generate robust evidence to support public health and economic decision making.

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BACKGROUND AND SUMMARY

The spread of the novel COVID-19 last December in China forced governments all around the world to adopt diverse public health policies and economic measures, unique in history. The dataset described in this paper creates two novel indices of governments' interventions to struggle against the COVID-19. The first index is the Rigidity of Governments' Responses to COVID-19 (RGRC) which tracks 10 national health public policies implemented to struggle against the spread of the COVID-19 in more than 200 countries. The second index is the Economic Responses to COVID-19 (ERC) which lists 5 indicators of economic interventions to face the economic downturn following the various public health measures. The indices capture on a country-daily basis the rigidity of governments' public health responses to the pandemic between January 1st 2020 and April 14th, 2020. The final dataset is made of 10,365 country-day observations. 217 countries are covered for at least one day and 184 countries are covered for at least 5 days.

The dataset is of interest for epidemiologists wishing to link governments' measures worldwide with the evolution of the number of cases (Xu et al. 2020). Several studies already assess the impact of travel restrictions (Chinazzi et al. 2020), human mobility restrictions (Kraemer et al. 2020) or various transmission control measures (Tian et al. 2020). We hope to contribute to this effort by allowing other researchers to use our coding of governments' measures to respond to the pandemic. The index built in the paper can be related to the effort of other academics to map governments' responses to the pandemic. Hale et al. (2020) provide a dataset of governments' responses which includes different variables related to public health, economic interventions, public campaigns and research incentives for a vaccine. Their great – and concomitant – work leads to the creation of a stringency index from 0 to 100. Our index differs in several manners from Hale et al. (2020). First, the focus of the dataset is exclusively on governments' public health responses, rather than including economic responses which often depends on independent institutions, e.g. central banks or regional institutions such as the European Union. Second, our dataset considers elections as a key variable. Elections are an important moment in democracies, and postponing elections might be interpreted as the will of the governing power to influence the results of elections. Finally, it covers in a detailed manner the responses to COVID-19 in developing countries, particularly African countries thanks to the information provided by our

sources. Other datasets mapping government interventions are found in economics. Elgin et al. (2020) created an index of economic policies to respond to COVID-19, by collecting information on the nature and the range of governments' economic interventions. Noy et al. (2020) provided an index of economic risk by world regions, depending on various indicators on economics, health and the spread of the pandemic. The latter provides insightful information on global risk but does not consider "outputs" such as government measures.

METHODS

An index of the rigidity of public health measures taken by governments

To measure the rigidity of governments' public health responses to the COVID-19, we create an index based on the number of measures taken by governments. The index is based on cross-country information reported by the Assessment Capacities Project (ACAPS; https://www.acaps.org/who-we-are/in-short), the International Monetary Fund (IMF; https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19), the International Institute for Democracy and Electoral Assistance (IDEA; https://www.idea.int/publications/catalogue/elections-and-covid-19) and the United Nations Educational Scientific and Cultural Organization (UNESCO; https://en.unesco.org/covid19/educationresponse).

The index is built using information on a set of 10 policies: bans on mass gatherings, bans on sporting and recreational events, restaurants and bars closing, domestic lockdown, school closing, travel restrictions, declaration of State emergency, public testing, enhanced surveillance and postponing elections. Each policy is coded 0, 0.5 or 1, depending on whether it is not implemented, partially implemented or nationally implemented. For example, school closure is coded 0 if no measure is taken, 0.5 if schools are partially closed at the national-level – e.g. only in a given region – and 1 if all schools are nationally closed. If restaurants are opened but limited in terms of individuals they can welcome, the variable is coded 0.5. Enhanced surveillance is coded 1 if mobile phone apps for tracing contaminated people are implemented and 0 either. Postponing elections is coded only if elections were postponed, and were coded as a missing variable if no elections were programmed. Countries like France or the United States, which

postponed only part of their elections, are coded as 0.5. Policies are coded on a daily basis: if a policy becomes more or less rigid, then its coding changes on the day of the implementation.

The final index of rigidity is the mean of the coded indicators and ranges between 0 and 1. When the indicator is not fulfilled, because it is not retrievable, the index is the mean of the indicators which are fulfilled. Figure 1 is a static map of the rigidity index on April 14th 2020 all around the world.

An index of economic measures taken by governments

Another index is based on the coding of economic interventions to deal with the economic downturn following public health measures of containment. The main sources of information are the IMF (https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19) and the International Growth Centre (https://www.theigc.org/covid-19/). We read for each country the list of measures listed by the IMF and followed the IGC in the creation of six categories of economic intervention: wage support, cash transfer, credit schemes, tax cuts and delays, support to importers and exporters, and interest rates cuts. The coding is done on a binary basis, 0 or 1 depending on whether the policy is implemented or not. As for the public health measures, the coding is done a country-daily basis and economic measures are coded on the day of their announcement by the government. As for public health measures, the coding does not control neither for the effectiveness of the economic measure, nor for the amplitude of the economic measure. The index of economic measures is the mean of the six variables coded and ranges between 0 and 1. Figure 2 is a static map of the index of economic measures on April 14th 2020 all around the world.

DATA RECORDS

The updated versions of the database can be downloaded from GitHub (https://github.com/simonporcher/COVID-19-Governments-Responses) in CSV and Stata formats, that can be imported it into a variety of software programs. We have also established a Github repository available at https://github.com/simonporcher/COVID-19-Governments-Responses where new data is uploaded. As the situation regarding the COVID-19 outbreak is continuously evolving. The repository lists all the future modifications of the database and codes to create maps. Each row in the database represents the situation in a country at a given date

between January 1st and April, 14th 2020. A description of the fields in the database is shown below and is available through a data dictionary on Github (https://github.com/simonporcher/COVID-19-Governments-Responses):

Table 1. Variables, sources and coding schemes

Variables	Source	Coding scheme
Public health measures		
Bans on mass gatherings	ACAPS / IMF	1 if the ban is national, 0.5 if the ban is localized and 0 if there is no ban.
Schools closure	UNESCO	1 if the closure is national, 0.5 if the ban is localized and 0 if there is no ban.
Travel restrictions	ACAPS / IMF	1 if the restriction is global (border closed / commercial flights cancelled), 0.5 if the restriction is targeted to some countries and 0 if there are no restrictions.
Domestic lockdown	ACAPS / IMF	1 if the lockdown is national, 0.5 if the lockdown is localized and 0 if there is no lockdown.
Cancellation of sporting and large events	ACAPS / IMF	1 if the cancellation is national, 0.5 if the cancellation is localized and 0 if there is no cancellation.
Restaurants closing	ACAPS	1 if the closing is global and national, 0.5 if the closing is localized or limited (e.g. number of customers is limited) and 0 if there is no closing.
Elections postponing	IDEA	1 if elections are postponed, 0.5 if some elections are postponed and 0 if elections were programmed but not postponed. N/A if no elections were to take place.
State of Emergency	ACAPS / IMF	1 if State emergency (or health emergency) is implemented, 0 if not.
Public testing	ACAPS	1 if public testing is (or aims at being) general, 0.5 if testing is done only at the hospital or people potentially contaminated, 0 if no testing is done. N/A if no information.
Enhanced surveillance	ACAPS	1 if monitoring app surveillance is active, 0 if not.
Economic measures		
Wage support	IMF / IGC	1 if wage support is implemented, 0 if not.
Cash transfer	IMF / IGC	1 if cash transfers are implemented, 0 if not.
Credit schemes	IMF / IGC	1 if credit schemes are implemented, 0 if not.

Tax cuts and delays	IMF / IGC	1 if tax cuts or tax delays are implemented, 0 if not.
Support to importers / exporters	IMF / IGC	1 if support to importers and exporters is implemented, 0 if not.
Interest rate cuts	IMF / IGC	1 if interest rate cuts are implemented, 0 if not.

TECHNICAL VALIDATION

The database was checked on a rolling basis by a research assistant using two complementary methodologies. The research assistant manually checked the coding of the data and then used Stata (https://www.stata.com/) to check whether that the coding was consistent before and after the implementation of a given policy. Discussions with the research assistant on a daily basis occurred via telephone.

For each index, the various measures constitute a homogeneous set of variables. For the index of rigidity relative to public health, the first component of the principal component analysis of the variables shows that they explain more than 70% of the variance and the weights of each variable is between 0.295 and 0.363 (see Table 2). The principal component analysis shows that the different variables seem to have a relatively equal weight. The table below reports the eigenvectors of the first component of the principal component analysis. The first component has an eigenvalue of 6.41 and explains 71.2% of the variance. Enhanced surveillance is dropped because of zero variance (few countries have implemented such surveillance).

Table 2. Eigenvectors for the first component of the PCA – public health measures

Variables	**First Component**
Bans on mass gatherings	0.346
Schools closure	0.363
Travel restrictions	0.327
Domestic lockdown	0.360
Cancellation of sporting and large events	0.349
Restaurants closing	0.329
Elections postponing	0.313
State of Emergency	0.295
Public testing	0.311

The principal component analysis of the variables related to economic measures shows that the variables are also relatively homogeneous. The first component explains 48% of the variance with an eigenvalue of 2.86. The eigenvectors of the first component are reported in Table 3.

Table 3. Eigenvectors for the first component of the PCA – economic measures

Variables	**First Component**
Wage support	0.450
Cash transfers	0.446
Credit schemes	0.399
Interest rate cuts	0.239
Tax cuts and delays	0.415
Support to exporters and importers	0.458

USAGE NOTES

The dataset is based on manual recording of policy measures implemented all around the world. Even though we made the best attempt to report data as accurately as possible, there might be some remaining errors and we apologize in advance for that. Please email the corresponding author if you wish to point some errors or leave a message on the GitHub repository.

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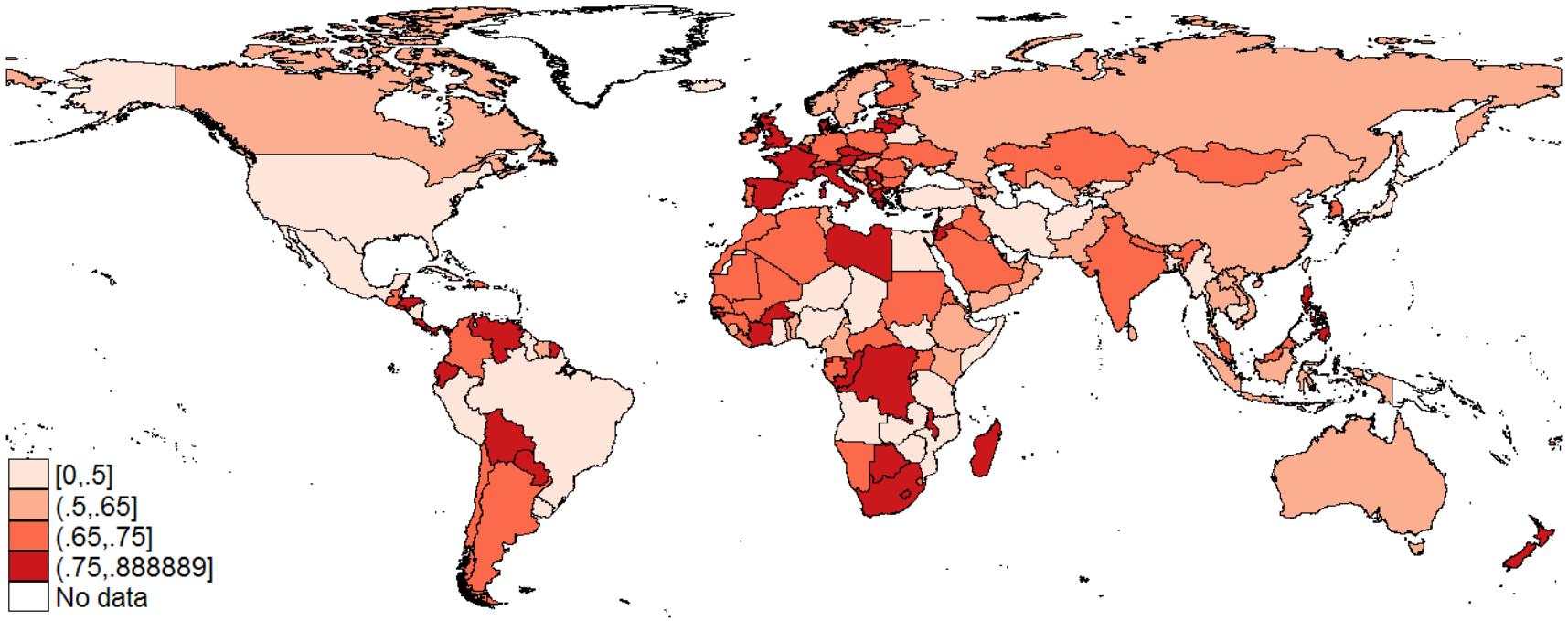
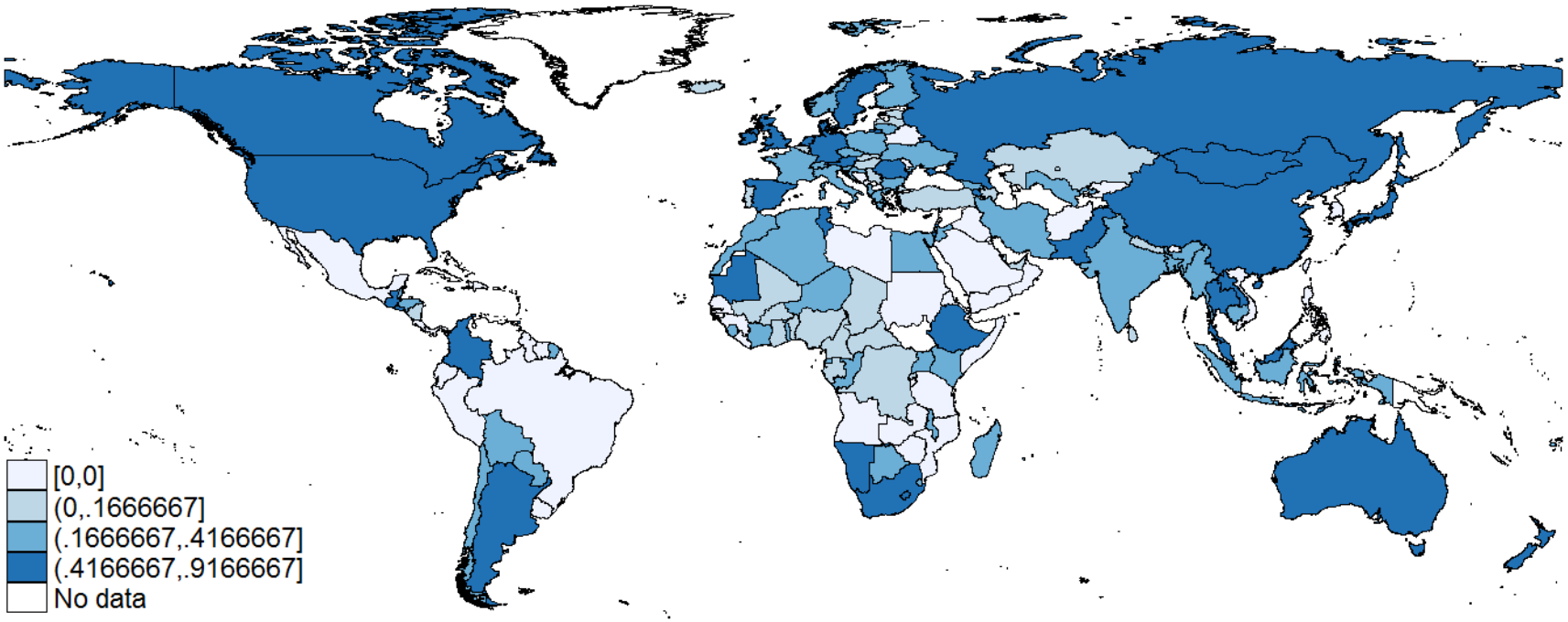
Figure 1: Static map of the Rigidity of Governments' Responses to COVID-19 as of April 14th 2020



Note: the index range between 0 and 1, 0 being the lowest possible value (no public health response to COVID-19) and 1 being the highest value (all potential listed policies are implemented at the national-level).

Figure 2: Static map of the index of Economic Responses to Covid-19 as of April 14th 2020



Note: the index range between 0 and 1, 0 being the lowest possible value (no economic response to COVID-19) and 1 being the highest value (all potential listed economic measures are implemented at the national-level).