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

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Abstract: Following the COVID-19 outbreak, governments all around the world have implemented public health and economic measures to contain the spread of the virus and to support the economy. Public health measures include domestic lockdown, school closures and bans on mass gatherings among others. Economic measures cover wage support, cash transfers, interest rates cuts, tax cuts and delays, and support to exporters or importers. This paper presents a unique living dataset of governments' responses to the COVID-19. The dataset codes the various policy interventions with their dates at the country-level for more than 200 countries in the first quarter of 2020. The generation of detailed data on the measures taken by governments can help to generate robust evidence to support public health and economic decision making.

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BACKGROUND AND SUMMARY

In December 2019, a new coronavirus appeared in Wuhan, China and nearly spread to every country in the first quarter of 2020. In the end of April 2020, there was more than 3.36 million confirmed cases and more than 239,000 deaths linked to the virus. The pandemic forced governments all around the world to adopt diverse public health policies and economic measures that are quite unique in history. Public policies data is needed in pandemics to best monitor the spread of infection, but also to understand the diversity in governments' responses. In order to provide accurate and openly available data, we collected data on 10 public health policies and 5 economic measures, at the country-level and on a daily basis, and merged it with the data on daily cases and deaths from the European Center for Disease Prevention and Control (https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases).

The dataset described in this paper is helpful to measure the impact of public health policies on the spread of the pandemic at the country-level. It is also helpful to measure the impact on economic measures on economic outcomes such as the gross domestic product or national financial market indices. We also make sense of our dataset by creating two novel indices of governments' interventions against the COVID-19. The first index measures the rigidity of governments' responses to COVID-19 and is based on the implementation of 10 public health policies. The second index quantifies the economic responses to COVID-19 based on the coding of 5 types 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' responses to the pandemic between January 1, 2020, and April 28, 2020. The final dataset is made of 14,590 country-day observations. 228 countries are included in the database. 215 countries are covered for public health measures and 196 are covered for economic measures.

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) built a dataset of governments'

responses that includes different variables related to public health, economic interventions, public campaigns and research incentives for a vaccine (www.bsg.ox.ac.uk/covidtracker). The data collection is based on news articles and government press releases and briefings. Their great and concomitant work leads to the creation of a stringency index from 0 to 100 for each country. Our index differs in several manners from that of Hale et al. (2020). First, our dataset clearly separates public health from economic measures, as the latter often depend on supranational institutions, e.g. central banks or regional institutions such as the European Union. Second, our dataset considers elections to be 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 and small Islands, thanks to the information provided by our sources.

Some other datasets tracking government interventions are more specific. Gentilini et al. (2020) track and update every weeks social protection and jobs responses to COVID-19 at the country-level. Elgin et al. (2020) created a static index of economic policies to respond to COVID-19, by collecting information on the nature and the range of governments' economic interventions in the end of March 2020. Noy et al. (2020) measure economic risk, at the sub-national level, relying on cross-country information and geo-localized indicators of economics, health and the spread of the pandemic.

METHODS

Public health measures taken by governments

The coding of public health measures is based on cross-country information reported by the Assessment Capacities Project (ACAPS; https://www.acaps.org/covid19-government-measures-dataset), the International Institute for Democracy and Electoral Assistance (IDEA; https://www.idea.int/publications/catalogue/elections-and-covid-19) for elections and the United Nations Educational Scientific and Cultural Organization (UNESCO; https://en.unesco.org/covid19/educationresponse) for schools closures. The main source of information is the ACAPS. Their dataset is particularly useful to have information on both the scale and the dates of the measures implemented. IDEA lists elections postponed or maintained

all around the world since the spread of the COVID-19. UNESCO provides a worldwide dataset of schools closures all around the world.

Ten public health measures were considered: bans on mass gatherings, bans on sporting and recreational events, restaurants and bars closures, domestic lockdown, travel restrictions, declaration of State emergency, public testing, enhanced surveillance, school closures and postponing the postponement of elections. Each measure is coded 1 or 0, depending on whether it is implemented or not, and as a missing variable if the country is not covered. Measures are coded on a daily basis: before the implementation, the measure is coded 0; from the day of the implementation, the measure is coded 1 until it is lifted.

The first eight measures were manually coded from the ACAPS dataset. The format of their dataset does not allow us to directly merge their dataset with another one, as they textually report the measures implemented or discussed. Their dataset requires some reading to qualify whether a given measure is implemented. Measures taken from the ACAPS were manually coded. Schools closures were directly taken from the UNESCO dataset which indicates on which scale schools are closed (local level, national-level or no schools closures). The dataset was simply merged with our baseline dataset. Finally, the IDEA simply reports the postponed or maintained elections with their dates so the coding was done manually.

Additionally, for eight measures, extra variables which equal 1 if the implementation of a given measure is partial or localized, and 0 if it is strict or national, were added. This coding allows researcher to differentiate the degrees of implementation of the measures. The following differentiations were made:

- Bans on mass gatherings: if the ban was localized, the measure was considered partial;
- Cancellation of sporting and large events: if the cancellation was localized or events could occur with a limited number of persons behind closed doors, the measure was considered partial;
- Travel restrictions: if commercial flights are still allowed, except for or from some countries, with recommendations to avoid all non-essential travel, the measure was considered partial;

- Restaurants and bars closures: when the closures were localized and/or the ban limited, e.g. a limited number of clients can still sit in the restaurants, the measure was considered partial;
- Public testing: when the public testing policy was targeted to certain categories of the population (e.g. health personnel), it was considered partial;
- Regarding elections, we followed IDEA which reports whether all elections were reported (strict) or only some elections were reported and some others maintained (partial);
- Schools, we followed the UNESCO which reports whether the closures are localized or national.

The ten public health measures can be used to create an index of the rigidity of governments' public health responses to the COVID-19. Figure 1 is a static map of the rigidity index on April 15, 2020, all around the world. To build the index represented in Figure 1, we recoded, for each measure, strict and/or national measures as 1, partial and/or localized measures as 0.5 and no measures as 0. The 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.

Economic measures taken by governments

Another index is based on the coding of economic measures taken to face the economic downturn following public health measures of containment. The information comes from 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 seven 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 measure is implemented or not. As for public health measures, the coding is done a country-daily basis. The day of the announcement is either reported in the country-profile of the IMF or in the list of economic measures of the ACAPS. The index of economic measures is the mean of the seven variables coded and ranges between 0 and 1. Figure 2 is a static map of the index of economic measures on April 15, 2020, all around the world.

DATA RECORDS

We have established a Github repository available at https://github.com/simonporcher/COVID-19-Governments-Responses where new data is uploaded twice a month. The updated versions of the database can be downloaded from GitHub in Excel and Stata formats and can be imported into a variety of software programs. The file "Sources.xls" in the repository reports for each country the sources used for the economic and public health measures.

As the situation regarding the COVID-19 outbreak is continuously evolving, the repository lists all the modifications of the database in the Stata do-files. Each row in the database represents the situation in a country at a given date between January 1, 2020 and April 28, 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):

- ***country*:** name of the country or the territory;

- ***iso***: three-letters country code;

- ***d***: date of the observation;

- ***cases***: number of cases reported on the given day by the European Centre for Disease Prevention and Control;

- ***deaths***: number of deaths reported on the given day by the European Centre for Disease Prevention and Control;

- ***school***: binary variable equal to1 if schools are closed and 0 either;

- ***school_local**:* binary flag to distinguish localized schools closures from other cases. 1 denotes that schools closures were implemented at the local level and 0 that schools closures were not implemented at the local level (either at the national level or no schools closures). The data on the nature of schools closures is imported from the UNESCO. The interaction of *school* and *school_local* allows researchers to create three levels of measures: no schools closures (*school*=0 and *school_local*=0), localized school closures (*school*=1 and *school_local*==1) or national schools closures (*school*=1 and *school_local*=0);

- ***domestic**:* binary variable equal to 1 if there is a domestic lockdown and 0 either;

- ***domestic_local***: binary variable to distinguish localized domestic lockdowns from other cases. 1 denotes that domestic lockdowns were implemented at the local level and 0 that domestic lockdowns were not implemented at the local-level (either at the national level or not implemented). The nature of the domestic lockdown is based on our reading of the measures reported by the ACAPS. The interaction of *domestic* and *domestic_local* allows researchers to create three levels of measures: no domestic lockdown (*domestic*=0 and *domestic_local*=0), localized domestic lockdowns (*domestic*=1 and *domestic_local*==1) or national domestic lockdowns (*domestic*=1 and *domestic_local*=0);

- ***travel*:** binary variable equal to1 if travel restrictions are closed and 0 either;

- ***travel_partial***: binary flag to differentiate partial travel restrictions from other cases. 1 denotes that travel restrictions were partial and 0 that travel restrictions were not partial (either strict or not implemented). The nature of the travel restrictions is based on our reading of the measures reported by the ACAPS. The interaction of *travel* and *travel_partial* allows researchers to create three levels of measures: no travel restrictions (*travel*=0 and *travel_partial*=0), partial travel restrictions (*travel*=1 and *travel_partial*=1) or strict travel restrictions (*travel*=1 and *travel_partial*=0);

- ***mass***: binary variable equal to1 if bans on mass gatherings are implemented and 0 either;

- ***mass_partial***: binary flag to distinguish localized bans on mass gatherings from other cases. 1 denotes that bans on mass gatherings were localized and 0 that bans on mass gatherings are not localized (either national or no bans implemented). The nature of the bans on mass gatherings is based on our reading of the measures reported by the ACAPS. The interaction of *mass* and *mass_partial* allows researchers to create three levels of measures: no bans on mass gatherings (*mass*=0 and *mass_partial*=0), localized bans (*mass*=1 and *mass_partial*=1) or national bans (*mass*=1 and *mass_partial*=0);

- ***elect***: binary variable equal to1 if some elections are postponed and 0 either;

- ***elect_partial***: binary flag to differentiate countries which postponed only some of the elections from the others. 1 denotes that countries both maintained and postponed elections and 0 that

elections were either postponed, maintained or were not scheduled. IDEA lists all maintained and postponed elections since the beginning of 2020. The interaction of *elect* and *elect_partial* allows researchers to differentiate three settings: all elections were maintained despite COVID-19 (*elect*=0 and *elect_partial*=0), some elections were maintained and others were postponed (*elect*=1 and *elect_partial*=1) or all elections were postponed (*elect*=1 and *elect_partial*=0);

- ***sport****:* binary variable equal to1 if bans on sporting and large events are implemented and 0 either;

- ***sport_partial****:* binary flag to distinguish partial bans and cancellations of sporting and large events. 1 denotes that bans on sporting and large events were localized or behind closed doors, 0 that bans on sporting and large events are not localized (either national or no measures implemented). The nature of the bans on sporting and large events is based on our reading of the measures reported by the ACAPS. The interaction of *sport* and *sport_partial* allows researchers to create three levels of measures: no bans (*sport*=0 and *sport_partial*=0), partial bans (*sport*=1 and *sport_partial*=1) or national bans on mass gatherings (*sport*=1 and *sport_partial*=0);

- ***rest****:* binary variable equal to1 if restaurants are closed and 0 either;

- ***rest_local***: binary flag to distinguish localized and/or partial restaurants and bars closures from other cases. The variable is coded 1 in the three following situations: localized closures, limitations on the number of customers in bars and restaurants, and closures of bars without mentioning restaurants. 0 indicates national closures or no closures at all. The coding is based on our reading of the measures reported by the ACAPS. The interaction of *rest* and *rest_local* allows researchers to create three levels of measures: no closures (*rest*=0 and *rest_local*=0), localized closures (*rest*=1 and *rest_local*=1) or national closures (*rest*=1 and *rest_local*=0);

- ***testing***: binary variable equal to1 if there is a public testing policy and 0 either;

- ***testing_narrow*****:** binary flag to distinguish narrow testing policies from large testing policies. 1 denotes that testing policies were targeted to some individuals, 0 that testing policies were not targeted (either large or not implemented). The nature of the testing policy is based on the information reported in the measures “mass population testing” and “testing policy” in the ACAPS. When the measure was targeted, *testing_narrow* was coded 1. On the contrary, when the

measure was not targeted, *testing_narrow* was coded 0. The interaction of *testing* and *testing_narrow* allows researchers to create three levels of measures: no testing policy (*testing*=0 and *testing_narrow* =0), narrow testing policy (*testing*=1 and *testing_narrow* =1) or large testing policy (*testing*=1 and *testing_narrow* =0);

- ***surveillance*:** binary variable equal to1 if mobile app or bracelet surveillance is implemented and 0 either;

- ***state***: binary variable equal to1 if the state of emergency is declared, 0 either;

- ***cash*:** binary variable equal to1 if cash transfers are implemented, 0 either;

- ***wage*:** binary variable equal to1 if wage support is implemented, 0 either;

- ***credit*:** binary variable equal to1 if credit schemes are implemented, 0 either;

- ***taxc*:** binary variable equal to1 if tax credits and tax cuts are implemented;

- ***taxd*:** binary variable equal to1 if tax credits and tax delays are implemented;

- ***export*:** binary variable equal to1 if supports to importers or exporters are implemented, 0 either;

- ***rate*:** binary variable equal to1 if the Central Bank lowered the interest rates, 0 either;

- ***Rigidity_Public_Health***: average of the ten coded public health measures. Public health measures are valued 0.5 if they are localized or partial, 1 if they are national or strict;

- ***Economic_Measures***: average of the coded economic measures.

TECHNICAL VALIDATION

The database was checked on a rolling basis using two complementary methodologies. One was manual and the other was machine enabled. We first exchanged with a research assistant and manually checked the accuracy of the coding of the data for each country on March 30 and April 17, 2020. Discussions occurred via the phone. For economic measures, the research assistant went through the two sources (IGC if the country was coded in their dataset, IMF if the country was not coded in the IGC) and orally listed for each country the economic measures implemented. We controlled in the dataset, using the "summarize" function in Stata 14

(https://www.stata.com/), that the coded measures were the same as the ones reported by the sources. When the coding was not accurate, we checked that the policy was not implemented after the last verification in the ACAPS dataset, and updated the dataset with a policy change or modified the mistake. The list of corrected mistakes in available in a Stata do file posted on the repository (verif.do).

The same manual methodology was used for public health measures: the research assistant filtered the ACAPS dataset on four categories of interventions (lockdown, movement restrictions, public health measures and social distancing) and orally listed the measures taken at the country-level with their dates. We checked that the coding was accurate using the "tabulate" function for all coded measures. The tabulate function in Stata allows summarizing information for a given country at a given date. As the ACAPS dataset records the dates of policy measures, modifications were directly made – if necessary – for measures implemented between the two rounds of data verification. All the modifications are listed in the abovementioned Stata do file (verif.do). For the list of democratic elections covered by IDEA, I directly did the secondary check on April 28, 2020.

The other verification was made in Stata to check that the coding was consistent before and after the implementation of a given policy. To do so, I used the "tsline" function in Stata to graph the time series of the indices. I did this for the 37 OECD countries to check that there was no break in the tendencies. If the trend was unexpected – e.g. with a decreasing trend at some date or values higher than 0 before any cases – I checked that the coding was accurate and particularly that, at date t-1 before the implementation of a given measure, the coding was 0, and that, at date t+1, the coding was 1.

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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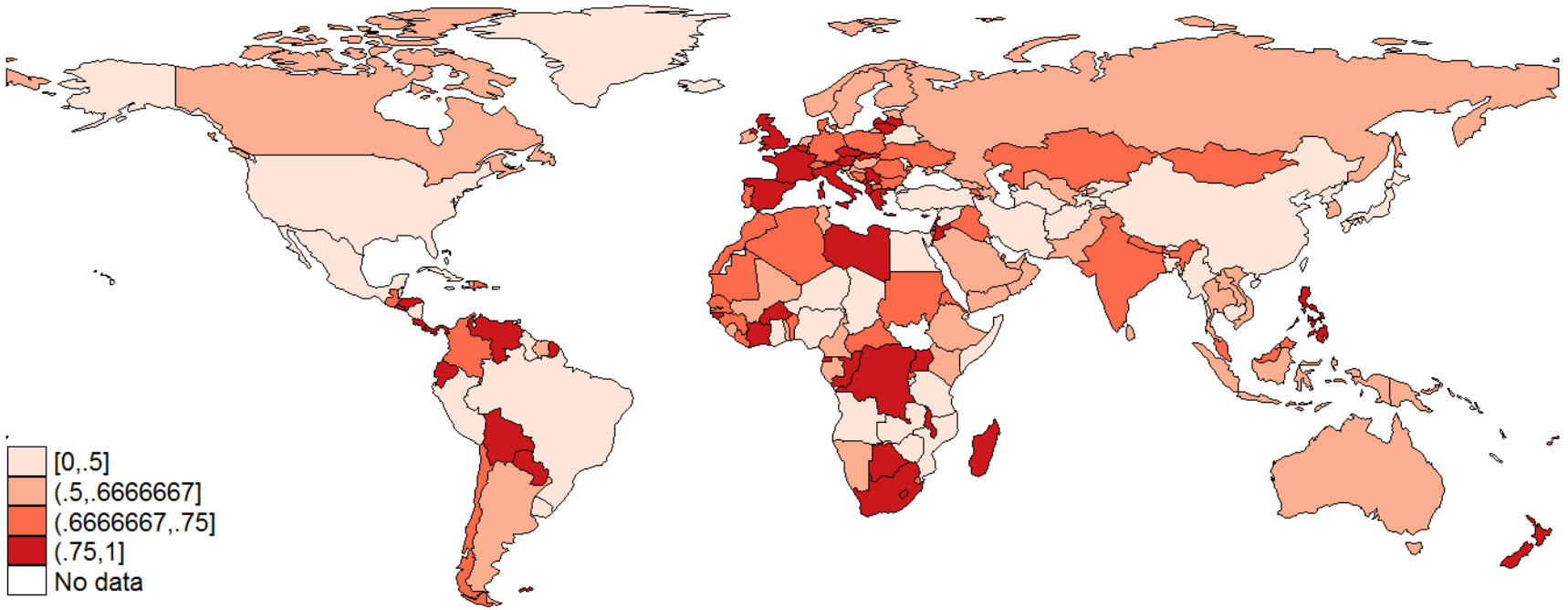
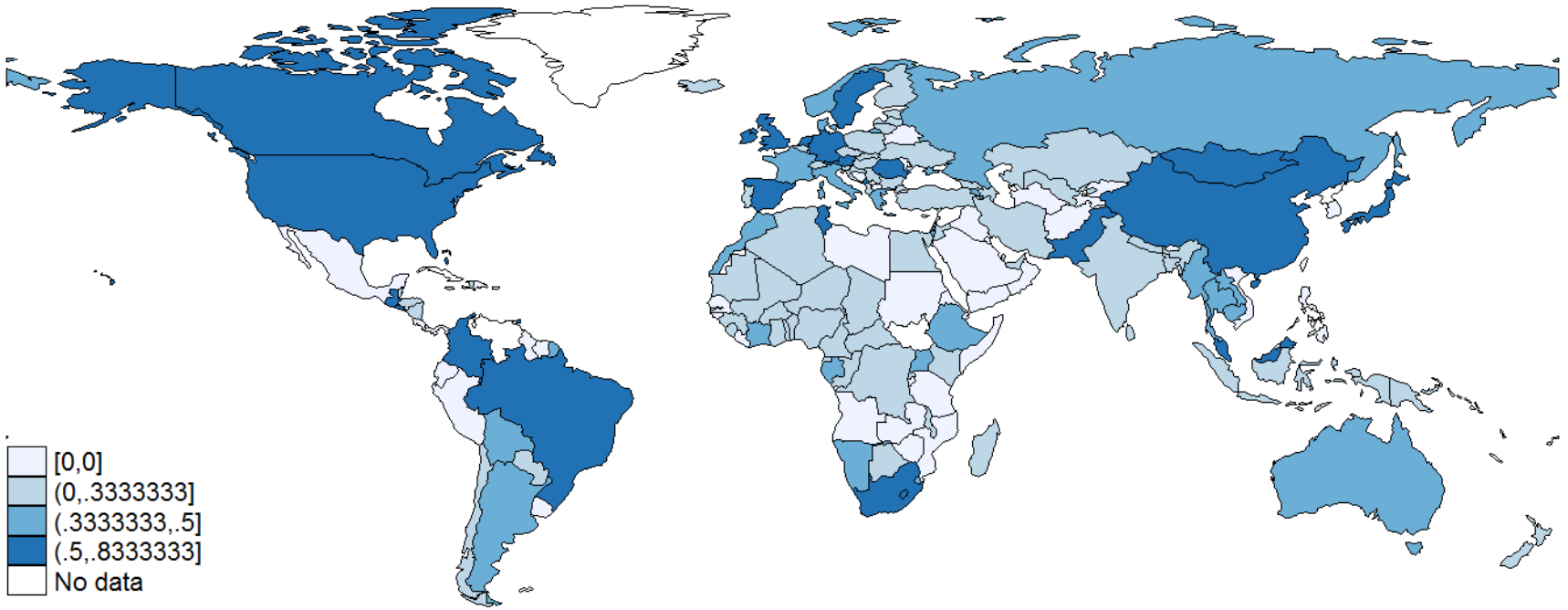
Figure 1: Static map of public health responses to COVID-19 as of April 15, 2020



Note: The index ranges between 0 and 1, with 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 15, 2020



Note: The index ranges between 0 and 1, with 0 being the lowest possible value (none of the considered economic responses to COVID-19 is implemented) and 1 being the highest value (all potential listed economic measures are implemented at the national level).