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The timing and aggressiveness of early government response to COVID-19: Political systems, societal culture, and more

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A R T I C L E   I N F O

Article history:
Accepted 8 May 2021
Available online 16 May 2021

JEL codes:
I18
H11
H12
I90

Keywords:
COVID-19
Containment policies
Political regimes
Economic freedom
Gender

A B S T R A C T

Factors that drove the early timing and strictness of government responses to COVID-19 for over 150 countries are examined using the daily Coronavirus Government Response Tracker data provided by the University of Oxford. Results show that authoritarian regimes tended to have an initial policy response somewhat weaker relative to democratic regimes at the early stages of the pandemic but pursued more aggressive containment policies over the latter part of the six-month period analyzed. Unitary regimes tended to have stronger policy measures in place early on relative to federalist states but relaxed these restrictions sooner. Countries with greater freedom (political rights and civil liberties) and those that spend less on public health also exhibited slower early policy responses, but caught up within three to four months after the pandemic reached their country. There is no evidence that women leaders, viewed as a whole, put in place more aggressive polices to combat the virus relative to their male counterparts. Nor is there any evidence that either island nations or countries that experienced the start of the pandemic later in the global wave pursued different policies that other nations. Policy implications are discussed as the how nations should prepare for future pandemics.

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1. Introduction

Determining the proper policy response to confronting the COVID-19 pandemic has been a daunting challenge faced by all governments around the globe. Information about its nature, origins, and severity after it was first identified in December 2019 was limited both due to the novelty of the disease and the location of where it started. Relevant data from its origins to guide policy making was slow to reach the outside world including the World Health Organization. While the virus has some similarities to the SARS outbreak that occurred at the turn of the century, there are key differences with COVID-19 including its severity and ease of transmission. Further, SARS was also more geographically contained. All of this contributed to considerable uncertainty after the onset of the disease as to what the appropriate policy response should be, even among health care experts. How the disease and the related policy response would impact the economy added to the challenges that government officials faced in determining the best course of action to deal with a pandemic that turned out to be global in nature.

The goal of this analysis is to gain a better understanding as to what factors drove the timing and strictness of the government responses in the early stages of the pandemic. Over 150 countries are included in the analysis. Factors considered include a comparison of how democratic and autocratic regimes addressed the crisis (executive authority). Further, how the policy response to the virus threat was related to the form of democracy (i.e., federalist versus non-federalist systems), political institutions surrounding political rights and civil liberties, public health care policy, and the cultural values of the population are also considered. Finally, the timing of when the virus first appeared in a country, the gender of the head of government leading the response, and any role that geography (island nations) played in setting pandemic control and containment policies are also addressed.

Given that this epidemic continues to play out at the time of this writing, the analysis is restricted to the six-month period beginning in February 2020.¹ For the purpose of this exercise the Coronavirus Government Response Tracker tool developed by the University of Oxford's Blavatnik School of Government is used to measure each country's policy response to the pandemic and its

¹ Prior to February 1, 2020 no country other than China had more than 15 total reported cases of COVID-19.
timing. The Stringency Index is constructed and updated daily using 17 indicators of government policy response, including containment measures (e.g., closure policies and travel restriction), economic policies (e.g., income support to citizens), and health care system policies (e.g., testing). It is scaled from zero to 100 with higher values indicating a stronger or more aggressive policy response by the government.

The data reveal a great deal of variation in the value of the Stringency Index among countries over the six-month period ending in August 2020. In particular, the maximum Index score for this period ranged from a low of 11 (Fiji, Gambia, Nicaragua) to the maximum of 100 in 13 countries. This variation masks the timing of the government response after COVID cases appeared in a country. Some countries moved aggressively, for example, by the time the first 50 confirmed cases were identified the Stringency Index already stood at 90 or over in 20 countries. In contrast, the Index was zero in Egypt and Sweden at the point in time the case load reached that magnitude in those countries.

For a disease characterized by rapid transmission among the population epidemiological studies have shown that a delay in policy response of even two or three weeks after its arrival can have substantial implications for containing the disease and minimizing causalities. For example, a lock down in Wuhan China was not put in place until more than seven weeks after the first recorded case of the virus. One study concluded that had control measures been put in place three weeks earlier the disease caseload would have been 95% lower (Page & Wei, 2020) and Lai, et al., (2020). Both U.S. and British policy makers have also been widely criticized for their slow response. For example, one recent study concluded that over 50% of COVID-related cases and deaths in the U.S. as of May 2020 could have been avoided if the same control measures ultimately put in place had been implemented a week earlier (Pei, Kandula, & Sharman, 2020). Similarly, an Imperial College London epidemiologist estimated that over half of the 50,000 lives lost to the pandemic (as of May 2020) would have been saved if their March 23 lockdown had been put in place earlier in the month, similar to what several other European nations did.

Beyond the initial policy response, the 6-month time frame considered in this analysis has spanned a long enough time such that the restrictions put on place by many nations were then relaxed. The timing of this will also be addressed in the analysis presented below.

It is important to point out that it is beyond the scope of this paper to gauge the effectiveness of policy actions once they were put in place, nor is the actual “mix” of policy tools and how that varied across countries considered. Further, the degree of enforcement of the measures put in place in each county is also not addressed. Finally, much of the data on coronavirus cases and outcomes depend on individual country reporting and the consistency and accuracy of that reporting of that data has also been called into question (Morris & Reuben, 2020). No effort is made below that and accuracy of that reporting of that data has also been called into question. No effort is made below that and accuracy of that reporting of that data has also been called into question.

The objective of this analysis is not so much to guide policy makers as they confront later “waves” of the current COVID-19 pandemic. Instead, the contribution should be seen in terms of how it might help guide policy makers in confronting similar or worse pandemics in the future. The timing of future events is difficult to predict, yet in an increasing interconnected world they are judged to be inevitable (Osterholm & Olshaker, 2020; Nuzzo et al., 2019; Smith et al., 2014; Jones et al., 2008; World Health Organization, 2007). Learning from the successes and failures in confronting the current pandemic, especially during its early stages, is essential for improving pandemic preparedness and for mitigating the spread of infectious diseases and the ravages they can inflict on public health in the future.

The remainder of this paper is organized as follows: In the next section the data used in this analysis is described further. The general econometric model is presented in Section III and the findings are summarized in Section IV. Robustness analysis is carried out in Sections V and VI and concluding remarks along with policy implications are discussed in Section VII.

2. Description of data used

Data on individual country coronavirus cases and outcomes are drawn from the Our World in Data COVID-19 website, an organization that takes their data from the European Center for Prevention and control (ECDC). The ECDC collects that data from individual country national health agencies for all countries, including those outside of Europe. Data are collected daily, and the dataset is updated accordingly. The starting point for data varies by country and reflects the fact that the disease’s origins can be traced to China and then spread in uneven fashion to other countries around the globe.

The Coronavirus Government Response Tracker and the associated Stringency Index captures in a consistent fashion a wide range of measures that governments used to combat the spread of the virus and to deal with the related fallout on society and the real economy. It is comprised of 17 factors addressing a government’s response to the pandemic in three areas: containment and closure policies, economic policies, and health system policies. Containment and closure policies include requirements dealing with school and workplace closings, restrictions on gatherings, stay at home requirements, and travel restrictions. Economic policies include case payments for people who lose their jobs or cannot work and laws freezing financial obligations for households (e.g., banning evictions). Public information campaigns, access to testing, and contact tracing are the health policies considered. For each indicator, efforts are made to account for the degree of policy stringency and comprehensives of geographic area covered by the policy. The Stringency Index used in this analysis considers all eight containment/closure factors and policies pertaining to public information campaigns and weights them equally in the construction of the index. It is scaled from zero to 100 with higher values indicating a stronger government policy response to the pandemic.

Statistics on COVID-19 cases are available for 207 countries while data on government policy responses are available for 180 countries. Missing values for other variables used in the models reported below resulted in data for approximately 160 countries used in the analysis. Omitted counties were primarily small island nations. Data used in the analysis are month-day, beginning for most countries on February 1, 2020 and ending in mid-August of that year (most recent available at the time of this writing).

3. Modeling the policy response to the pandemic

The general form of the model used to analyze the international policy response to COVID-19 is as follows:

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2 Max Roser, Hannah Ritchie, Esteban Ortiz-Ospina and Joe Hasell (2020) - "Coronavirus Pandemic (COVID-19)". Published online at OurWorldInData.org. Retrieved from: https://ourworldindata.org/coronavirus-source-data

3 For further details, see: https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker and https://github.com/OurCGRU/covid-policy-tacker/blob/master/documentation/codebook.md

4 For some countries where the impact of the coronavirus was delayed, the reporting on confirmed caseload started later than February 1.
Selecting a different threshold standard, such as first 100 cases, would have made the days since 50 ship with the threshold was crossed. A positive relationship with Days since 50 is expected as more aggressive policies are expected to be put in place in the period following the date the threshold was crossed.6

For many countries up to six months elapsed since their threshold date was crossed based on the COVOID tracking data used in this analysis (data set ends in mid-August 2020). As a result, enough time may have transpired in some countries for a “loosening” of the restrictions to the extent that the policy measures achieved some success in “flattening the curve”. Also, warmer summer weather may have tempered disease transmission and COVID caseload by this time, thus allowing countries to draw back their restrictions.7 To address this, a quadratic relationship between Days since 50 and the government response variable is expected. The model therefore includes a quadratic version of the Days since 50 variable with a negative time expected for the parameter estimated for the quadratic version of this variable.

To account for the role that demographics, specifically population age, might play in pandemic response policy setting, Elderly Population is included in the model as an additional control variable. As is well known, the risk for severe illness from the coronavirus increases with age hence governments may want to put in place more aggressive policies for containment and control if the size of the older population is relatively large in their country.8 For present purposes, Elderly Population is defined as the percentage of the population in a country that is over 65 years old. That population share varies widely among countries in the data set, from a low of 1.1% to a high of 27.9%.9

Per capita GDP (GDPpc) serves as a proxy for the economic resources available in a country to fight the pandemic, including serving an indicator of the overall quality of health care system.10 It also is closely linked to other potentially relevant factors that may influence pandemic response, including educational attainment, urbanization, state stability, and the overall strength of institutions. More educated societies may better understand the need for control/containment measures to combat the pandemic, thereby raising political support for such measures. Nations that are more urbanized may face greater disease transmission challenges given the closer geographic proximity of the population, and stable nations with strong institutions may be in a better position to mandate control and containment measures. On the other hand, control and containment measures such as lockdowns typically exclude “essential” sectors (e.g., agricultural, groceries, health) and these tend to make up a greater share of the economy in low-income countries. As a result, the economic cost of stringency measures on the overall economy in terms of lost employment and production can be expected to be lower in such nations. With these exclusions, the political opposition to imposing stronger stringency measures on the remaining sectors of the economy may be lower (Gottlieb, et al., 2020). Because of all this, the relationship between GDP with the government response variable could potentially be positive or negative.

Next, a continental fixed effect variable (Continent) is included in the model to account for regional influences that might be expected to influence government response to the pandemic, including such factors as culture and previous experience in confronting other contagion-related diseases (e.g., SARS) and the development of infectious-disease surveillance networks.11

Regarding the former, a comparison of responses will be made between democratic and authoritarian regimes, federalist versus non-federalist (unitary) systems, and among states with varying degrees of government intervention in the economy (political rights and civil liberties). In the second category, the role that cultural differences between individualistic and collective societies will be examined, along with the priority a government gives to public health, the timing when the first cases arrived in a county, possible different response of island nations, and leadership gender.

4. Results

Tables 1 and 2 summarize the findings that political institutions play in the COVID-19 response, while Table 3 addresses the results for the cultural and other factors considered in this analysis. Robustness exercises will be carried out in the following section, and the results of an overall “summary” model will be presented in Section VI.

4.1. Political institutions

4.1.1. Democratic versus autocratic regimes

Attention is first given to understanding response differences between democratic and autocratic regimes. For this purpose, a

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5 The 50-case threshold was based on what was used in many popular media accounts at the time, such as The Economist (see March 17, 2020 issue) and CNN (https://edition.cnn.com/interactive/2020/health/coronavirus-maps-and-cases/). Selecting a different threshold standard, such as first 100 cases, would have made little difference in the analysis presented below as the simple correlation between Date since 50 cases used in the analysis and an alternative Date since 100 cases is 0.99.

6 In subsequent analysis, presented below, consideration is given to the possibility that countries impacted by the virus later in the pandemic wave “learned” from the experience of other nations affected earlier and took that into account when they formulated their own strategies to confront the threat in their own nation.

7 Thanks to an anonymous referee for pointing this out.

8 https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html.

9 Retrieved from: https://ourworldindata.org/coronavirus-source-data.

10 For example, for the data set used in this analysis, the correlation between per capita GDP and the general government health expenditure as a share of GDP stood at 0.80. GDP and elderly population share also are correlated (0.47 in this data set), but that population demographic is separately controlled for in Equation (1).

11 It is important to point out at natural susceptibility to the disease is widely viewed to be similar everywhere, that differences in disease rates across nations and continents is taken to vary with respect to socially constructed realms of the disease such as the demographic structure of the population (e.g., age) instead (Capano, et al., 2020).
and authoritarian. The Polity scale is used to assign each country into political regimes are broken down into two categories, democratic classifications with pressure groups may also be less important in authoritarian regimes. In the latter, forming a coalition of a small group of political actors around a certain policy may be sufficient to retain power more generally. Examples in this regard cited surrounding the opportunity to achieve even greater authoritarianism and political retributions down the line. Transparency is less likely to face meaningful elections and this can cut two ways. The executive may enact much needed, but unpopular, policy actions promptly to confront the crisis (e.g., face masks) without the fear of political retributions down the line. Transparency is less relevant in such political regimes. Alternatively, without the democratic constraints authoritarian executives can adopt policies to maximize their own wellbeing, which public choice theory tells us may not align with optimizing social wellbeing. Further, even in cases where the policy response has merit, rapid response by authoritarian regimes may lead to rulers using the crisis as an opportunity to achieve even greater authoritarianism and political power more generally. Examples in this regard cited surrounding the current coronavirus crisis include Rodrigo Duterte in the one of the two categories with a polity2 value of 7.5 on that scale used as the threshold cutoff for this assignment.13 Authoritarian regimes are further classified as:

- Monarchies
- Military
- Multi-party
- One-party
- Other

Multiple parties are allowed to exist under “Multi-party” regimes, but the system still does not rise to the level of democracy as defined above. The “Other” category includes no party systems as well as theocracies, those in civil war and under foreign occupation. See Hadenius and Teorell (2007) for further details on these classifications.

Of interest here is to assess and compare the record of authoritarian versus democratic regimes in undertaking swift action to address the pandemic. The importance of recognition and timely early policy response had been demonstrated by epidemiologists that have studied the transmission of the disease and was noted in the introductory section above. With that in mind, it is important to keep the analysis is therefore short-run and limited in it focus. Which type of regime will perform better in the long run is beyond the scope of this paper, indeed, such as analysis will have to await a future time after the COVID-19 threat has ended.

When it comes to short-term policy responses, authoritarian regimes may have an advantage over democracies in implementing an expeditious strategy to address a national crisis because of the faster decision-making process.14 In a democratic setting, policy choice and authority by the executive is contained by the constitution and the “checks and balances” of other players in the institutional setup, including the legislative and judicial branches of government. Relative to democracies, time-consuming negotiations with pressure groups may also be less important in authoritarian regimes. In the latter, forming a coalition of a small group of political actors around a certain policy may be sufficient to retain power (Ghardallou and Sridi, 2020). Moreover, the relevant time horizon for most democratic leaders is the election cycle, and the next scheduled election may be some time off in which case even the negative effects of a delayed short-term policy response to adversity may still be rectified before election time.

Of course, authoritarian regimes by their very nature are not likely to face meaningful elections and this can cut two ways. The executive may enact much needed, but unpopular, policy actions promptly to confront the crisis (e.g., face masks) without the fear of political retributions down the line. Transparency is less relevant in such political regimes. Alternatively, without the democratic constraints authoritarian executives can adopt policies to maximize their own wellbeing, which public choice theory tells us may not align with optimizing social wellbeing. Further, even in cases where the policy response has merit, rapid response by authoritarian regimes may lead to rulers using the crisis as an opportunity to achieve even greater authoritarianism and political power more generally. Examples in this regard cited surrounding the current coronavirus crisis include Rodrigo Duterte in the

13 For details on the Polity scale see, http://www.systemicpeace.org/inscrdata.html

14 The relationship between political regimes and economic outcomes has been extensively studied in the literature, particularly the link between democratic institutions and economic growth. That linkage has shown to be ambiguous, both theoretically and empirically (Ghardallou and Sridi, 2020). However, outcomes such as economic growth is by its very nature a long-term phenomenon and not directly relevant for present purposes.

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Table 1
Early Response to Initial COVID-19 Confirmed Cases.

| Dependent Variable: Stringency Index | Days after first 50 reported cases in a country |
|--------------------------------------|-----------------------------------------------|
|                                       | Seven | Fourteen | Twenty-One |
| **Regime Type**                       |       |          |            |
| Military                              | −3.867(0.4) | −3.847(0.5) | 6.582(1.2) |
| Monarchy                              | 13.240(1.4) | 11.207(1.7) | 12.918(2.0) |
| Multi-party                           | −0.437(0.1) | −3.549(0.7) | −3.736(0.8) |
| One-party                             | −4.902(0.3) | −3.836(0.4) | 11.402(2.0) |
| Other                                 | −7.272(0.7) | −8.222(0.9) | −4.436(0.5) |
| **Continental**                       |       |          |            |
| Asia                                  | 0.748(0.2) | 5.733(1.2) | 7.412(1.6) |
| Europe                                | 6.502(0.7) | 11.068(1.3) | 14.032(1.6) |
| North America                         | −1.237(0.1) | 3.060(0.4) | 8.805(1.1) |
| Oceania                               | −2.657(0.1) | 8.012(0.5) | 6.853(0.5) |
| South America                         | 13.380(2.3) | 14.711(3.2) | 14.924(3.2) |
| **Elderly Population**                | −0.718(1.1) | −0.792(1.4) | −0.334(0.6) |
| **Per Capita GDP**                    | −0.00066(3.3) | −0.00043(3.1) | −0.00034(2.5) |
| Number of Observations                | 26,612 | 26,922 | 26,017 |
| Number of Countries                  | 158 | 160 | 154 |

**Table 2**
COVID-19 Response: Political Institutions.

| Dependent Variable: Stringency Index | Days since 50 | Freedom Score | Freedom Score Days since 50 |
|--------------------------------------|---------------|---------------|-----------------------------|
| **Authoritarian Regime**             | −5.839(1.2)   | −0.416(2.2)   | 0.004(2.1)                  |
| Authoritarian                        | 0.142(2.7)    |               |                             |
| **Regime X Days since 50**           | −10.346**     | 0.180**       | 0.004(2.1)                  |
| Free-market                          | −0.004**      | −0.004(5.9)   | −0.004(5.7)                 |
| Continents                           |               |               |                             |
| Asia                                 | 0.577**       | 0.571**       | 0.344**                     |
| Europe                               | −0.004(7.8)   | −0.004(5.9)   | −0.004(5.7)                 |
| North America                        | 4.594**(1.7)  | 4.594**(1.7)  | 4.594**(1.7)                |
| Oceania                              | 3.319(0.7)    | 3.319(0.7)    | 3.319(0.7)                  |
| South America                        | 14.938**(4.3) | 14.938**(4.3) | 14.938**(4.3)               |
| **Elderly Population**               | −0.860**(3.2) | −0.900(3.6)   | −0.762(2.7)                 |
| **Per Capita GDP**                   | −0.0001(2.2)  | −0.0001(2.4)  | −0.0001(1.5)                |
| Number of Countries                  | 158           | 160           | 154                         |
| Number of Observations               | 26,612        | 26,922        | 26,017                      |
| F-statistic                          | 25.23**       | 20.96         | 19.85                       |
| R-Square                             | 0.23          | 0.23          | 0.22                        |

Notes: All models are estimated via ordinary least squares and include continent fixed effects (Africa omitted continent). The numbers in parentheses are (absolute value) t-statistics based on country-level clustered standard errors.

* denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

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12 Original data set updated to 2014 is used in this paper. See https://sites.google.com/site/authoritarianregimedataset/home.
Table 3
COVID-19 Response: Culture and Other Considerations.

| Dependent Variable: Stringency Index | Model 3.1 | Model 3.2 | Model 3.3 | Model 3.4 |
|--------------------------------------|-----------|-----------|-----------|-----------|
| Individualism Index                  | −0.022(0.4)| −0.174(2.0)| −0.020(2.4)| 0.006(0.3) |
| Public Health                         |           |           |           |           |
| Public Health X Days since 50         | 0.773(6.0)| 0.546(6.7)| 0.599(6.9)| −0.773(0.3) |
| Date of First 50 Cases                |           |           |           |           |
| Island Nation                         |           |           |           |           |
| Days since 50                         | 0.005(4.7)| −0.004(5.7)| −0.004(6.0)| −0.004(6.2) |
| Days since 50 – Squared               |           |           |           |           |
| Continent                             |           |           |           |           |
| Asia                                  | 3.296(1.2)| 3.732(1.3)| 3.314(1.2)|           |
| Europe                                | 2.717(0.5)| 1.467(0.3)| 2.114(0.4)|           |
| North America                         | 10.173(2.5)| 8.377(1.5)| 9.377(1.8)|           |
| Oceania                               | −1.009(0.2)| −2.735(0.4)| 2.763(0.6)|           |
| South America                         | 9.526(2.2)| 14.275(4.2)| 14.217(4.3)|           |
| Elderly Population                    | −0.764(2.4)| −0.791(2.8)| −0.870(3.5)|           |
| Per Capita GDP                        | −0.0001(1.7)| −0.0001(2.0)| −0.0001(2.3)|           |
| Number of Observations                | 65        | 157       | 257       | 275       |
| F-statistic                           | 33.20**   | 19.74**   | 19.78**   | 20.00**   |
| R-Square                              | 0.35      | 0.22      | 0.22      | 0.21      |

Notes: All models are estimated via ordinary least squares regression and include continent fixed effects (Asia omitted continent in Model 3.1 as there are no African countries in the data set, Africa is the omitted in the other models). The numbers in parentheses are (absolute value) t-statistics based on country-level clustered standard errors. Daily data covering a period ending on August 18, 2020.

* denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Philippines and Hungarian Prime Minister Viktor Orban (Levitsky & Ziblatt, 2019; Diamond, 2020).

Table 1 summarizes how early pandemic responses varied by regime type, senior population size, continental location, and country income (GDP). Three different dates are considered: one, two, and three weeks after the first 50 COVID-19 cases were reported in each country. The results show that monarchies were more aggressive at the onset of the pandemic relative to other authoritarian regimes as well as nations categorized as democracies (omitted category in the table). Specifically, the Stringency Index in countries with monarch rule stood from 11 to 13 points higher relative to the other countries in the data set, although the evidence is not statistically strong at the one-week mark. (For reference, the mean value for that Index was 66, 75, and 78 at the one, two- and three-week mark, respectively, for the entire data set.) Geographically, the index was 13 to 15 points higher in South American countries relative to African countries (omitted category), perhaps reflecting the fact that the first wave of COVID-19 swept through these countries relatively later giving authorities the opportunity to learn from others where the pandemic appeared first.

As to the other control variables in the model, and contrary to expectations, regions, nations with relatively large senior populations (Elderly Population) tended to pursue less aggressive containment policies to combat the pandemic, other things equal. The results show that more economically affluent countries were also less aggressive early on in combatting the disease. For example, the parameter estimates on the Per Capita GDP variable suggest that a $5,000 increase in per capita income, other things equal, would lead to a lower Stringency Index value between 1 and 3 points.

Next, a form of equation (1) is estimated where a distinction is made between the timing and strength of the policy response of authoritarian and nonauthoritarian regimes over a longer period following the confirmation of the first 50 cases within each nation.15 To accomplish this, an interaction variable, (Days since 50) X (Authoritarian Regime), is added to the equation to see if there are systematic differences in the policy response between the two regimes as the pandemic unfolds in the first few months after its arrival in their country. A summary of the results is presented as Model 2.1 in Table 2.

The results confirm the quadratic relationship expectation with stronger containment and related measures put in place early on and then relaxed over the weeks that followed. There is some evidence – although not statistically strong – that authoritarian responses were somewhat weaker from their democratic counterparts at the beginning of the pandemic. However, the positive and statistically significant parameter estimate on the interaction variable (Authoritarian Regime X Days since 50) points to a stronger policy response by authoritarian regimes as the pandemic evolved. Specifically, the interaction variable provides information on how the effect of the Authoritarian variable on the Stringency Index changes relative to their non-authoritarian counterparts as time elapses after the first 50 confirmed COVID cases reached their country. For example, the parameter estimates on the authoritarian regime variables in Model 2.1 indicate that such regimes start out with an Index approximately 6 points lower (~5.839), other things equal, relative to democratic regimes, but that gap closes by value 0.142 points for each day since 50 COVID cases were confirmed in their country.16

The results for the continent and GDP variables are qualitatively similar to what was reported in Table 1. A notable exception is that the response of the North American nations is now shown to be more aggressive relative to other countries, in contrast to the earlier findings. Further, the senior population variable (Elderly Population) becomes statistically significant. The parameter estimate on that variable (~0.800) suggests that if a nation’s senior

15 For the purposes of this analysis the countries classified as authoritarian are taken from Frey (2020) and include the following: Afghanistan, Algeria, Angola, Azerbaijan, Bahrain, Brunei, Burundi, Cameroon, Chad, China, Cuba, Democratic Republic of Congo, Ethiopia, Gabon, Hong Kong, Iran, Iraq, Kazakhstan, Laos, Libya, Macao, Mauritania, Nicaragua, Oman, Qatar, Russia, Rwanda, Saudi Arabia, South Sudan, Sudan, Syria, Thailand, Turkey, Uganda, United Arab Emirates, Uzbekistan, Venezuela, and Vietnam.

16 A referee points out that during the pandemic crisis some democratic countries followed an autocratic strategy by adopting special laws and emergency decrees that gave full authority to their leaders whereas in the control and containment measures to address the disease. This could potentially bias the results by classifying such countries as democratic rather than authoritarian in the analysis. Countries in this category include Canada, France, India, Hungary, Tunisia, and the United Kingdom (Thomson & Ip, 2020). To address this concern, Model 2.1 was re-estimated with these countries excluded from the data set. The results (available upon request) are virtually unchanged from what is reported above. I am thankful to the referee for bringing this issue to my attention.
population were to grow by one standard deviation of all countries considered in the data set, such an increase would result in a drop in the Stringency Index by about 5 points, other things equal.\textsuperscript{17}

Panel A in Fig. 1 depicts the relationship described above visually. For democratic regimes model estimates suggest that the policy response reached a peak at about 10 weeks after the onset on disease with a Stringency Index of about 70.\textsuperscript{18} Authoritarian regimes tended to stay aggressive longer relative to their democratic counterparts, reaching an index of near 80 at about 13 weeks. Further, reflecting the positive parameter estimate on the interaction variable, the while authoritarian regimes tend to start out with lower index values, the gap closes as time evolves and eventually (at about ten weeks) these regimes begin to have relatively higher index values as further time elapses.

4.1.2. Federalist versus unitary states

Next, a comparison is made between federalist and unitary states response to the pandemic. A key difference between the two regimes is that in federalist states government authority is constitutionally split in some manner between the central government and subnational jurisdictions (e.g., states, provinces). In unitary forms of government, all government power rests with the central government although it can delegate (and revoke) responsibilities to local units of government.

Potential problems associated with the responses to a national health care crisis in a federalist state can be illustrated using the United States as an example. In the U.S., a federalist regime, individual states have constitutional authority to regulate health policy. Regarding the COVID-19 response, the federal government issued guidelines through the Center for Disease Control and other organizations for dealing with the crisis and offered financial resources in support of state initiatives, but in the end state governors were charged with the policy response in their state. The record has shown that containment polices have varied widely across the 50 states for a disease that has no political boundaries. This has led some to conclude that while a number of states have pursued aggressive policies to combat the pandemic and coordinated plans with neighboring states in loosening containment policies over the summer months, “[s]uch efforts are necessary but not a sufficient replacement for a nationally coordinated effort. When our collective fate relies on speed, efficiency, and unity, federalist ideals fall flat. Divided governance creates unnecessary challenges for residents of states that are slow to act or to take up federal policies” (Gordon, et al., 2020).\textsuperscript{19}

Model 2.2, summarized in Table 2, presents the results when equation (1) is estimated using a dummy variable “Federalist Regime” as the regime characteristic indicator.\textsuperscript{20} The findings indicate that, other thing being equal, the Stringency Index started out over 10 points lower in federalist regimes but strengthened relatively in the following weeks. This is also depicted in Panel B of Fig. 1, where the path is presented visually based on Model 2.2 estimates and assuming mean values for the other variables in the model. In weeks 10 – 12 following 50 confirmed cases within a nation, the policy response was approximately the same for both types of regimes. Following that, unitary regimes appeared to have loosened up restrictions sooner than their federalist counterparts. Whether or not this was the result of the containment policies being more successful in unitary countries or authorities bowed to political pressures, of course, cannot be answered by this analysis. Regarding the other variables in the model, the results are qualitatively similar to what was reported in Model 2.1.

4.1.3. Political rights and civil liberties

The closure and containment policy response to the pandemic all involve some form of government intervention in the economy by placing restrictions on business activity and personal decision making. Yet political institutions of nations vary widely with respect to the degree that its citizens enjoy political rights and civil liberties and freedom, broadly defined. In societies that have been traditionally afforded a great deal of individual freedom policy makers may face additional hurdles when it comes to imposing “emergency” restrictions designed to combat the pandemic.

To address this, a nation’s Freedom Score is used as another way to characterize the political institutions of a country. According to Freedom House, the producer of this index, it is intended to “assesses the real-world rights and freedoms enjoyed by individuals.”\textsuperscript{21} This index on political rights and civil liberties is organized on a 100-point scale where higher values imply greater freedom. The findings, summarized as Model 2.3 in Table 2, indicate the nations with a higher freedom score began with less aggressive strategies to combat the pandemic but that they catch up in the following weeks. Both the Freedom Score variable and its interaction with Days Since 50 are statistically significant at the 5 percent level or better. All other variables in the model have similar results to the earlier analysis.

The estimated relationship between Freedom Scores and policy responses to coronavirus is depicted visually in Panel C of Fig. 1. Freedom House classifies countries as “Free”, “Partially Free”, or “Not Free” based on where they fall with respect to their Freedom Score. The calculations presented in Panel C are based on Freedom Scores of 85 (Free), 50 (Partially Free), and 15 (Not Free). These scores were selected for the purposes of this exercise as they lie in the approximate middle of the range Freedom House uses to assign countries into one of these freedom categories.\textsuperscript{22} Examining the results presented in the graph, the “Not Free” countries start out with a Stringency Index approximately 30 points higher than “Free” countries, with “Partially Free” countries lying approximately in the middle, all other factors equal. By around the twelfth week all countries in all three freedom categories begin to converge.

4.2. Cultural factors and other considerations

In this section attention is given to cultural and other factors that may have played a role in formation of a nation’s policy responses to the pandemic.

4.2.1. Individualism versus collectivism

The ease that COVID-19 can be spread among humans calls for a collective action on containment policies (e.g., facemasks, social distancing, travel restrictions, contact tracing) that protect third parties from those who already have the virus. Resistance to government-imposed containment strategies to “flatten the curve” has been well documented and the strength of this resistance has varied greatly around the globe (Leicester, 2020). Some of this

\textsuperscript{17} An alternative model was also estimated that included an interaction term between the age demographic variable and the amount of time that elapsed since the first 50 confirmed cases of the virus was reported. That variable was not statistically significant. Further, changing to age demographic to the percentage of the population.

\textsuperscript{18} Calculations assume mean values for the other variables in the model.

\textsuperscript{19} The impact of decentralization on various socio-economic issues has been widely studied in both the economics and political science literature. For a recent survey, see Martinez-Vazquez, et al. (2017).

\textsuperscript{20} Source of federalist classifications: Elazar, D. J., ed. Federal systems of the world: a handbook of federal, confederal and autonomy arrangements. Longman Current Affairs, 1994. Data from this source were downloaded from Daniel Treisman, Decentralization Database, 2008 (http://www.sscnet.ucla.edu/polisci/faculty/treisman/) and updated to 2020.

\textsuperscript{21} For further details, see https://freedomhouse.org.

\textsuperscript{22} Specifically, scores in the approximate range between 70 and 100 are considered “Free” by Freedom House, those between 69 and 30 are classified as “Partially Free”, while the remainder are considered “Not Free”.
resistance stems from skepticism on the need for or the effectiveness of the containment strategies put in place by government authorities. Others see these strategies as a violation of their civil liberties and therefore not a proper role for government to play in the economy.

To assess the importance of the latter in formulating public policies to combat the pandemic the analysis borrows from the literature that has studied the cultural differences between individualistic and collective societies (Hofstede (2001), Gorodnichenko and Roland (2017)). Broadly speaking, in individualist societies citizens see themselves as independent and not so much as members of a larger group. In such societies, people give priority to personal freedom and caring for their immediate family; ties with others and the broader society are loose. In contrast, “collectivism stands for a society in which people from birth onwards are integrated into strong, cohesive in-groups, which continue to protect them throughout their lifetime in exchange for unquestioning loyalty” (Hofstede, 2001, p. 225). Collectivist societies might therefore be expected to put more of a premium on avoiding negative externalities and taking steps to protect the group from things like pandemics.

To operationalize this for present purposes, the well-known Individualism Index developed by Hofstede (2001). Hofstede (2011) is added to Equation (1) as a National Characteristic variable.23 The index is based on factor analysis of the results from a survey developed the purpose of establishing cultural values of similar respondents across countries. The most recent version of the data set includes approximately 80 countries collected at various points in time up to the year 2013.24 Individualism Index values are organized on a 100-point scale with higher numbers implying more individual cultural values. The U.S., Australia, and Great Britain rank at the top of this Index while citizens living in Panama, Ecuador, and Guatemala are considered to have the most collectivist attitudes.

Constraints on available data reduces the sample size by more than one-half over what is used elsewhere in this paper and there are no countries from the African continent. The results are presented as Model 3.1 in Table 3. While the negative parameter estimate on the Individualism Index variable conforms with expectations (suggesting a modest 0.5-point reduction in the Stringency Index resulting from a one standard deviation increase in the individualism measure), the variable is not statistically significant at conventional levels.25

4.2.2. Public health

Is the pandemic policy response different among nations depending on the priority they give to public health? To address this, the variable Public Health is substituted in equation (1) as an alternative indicator of Regime Characteristics. The health care pri-

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23 For a recent use of the index in understanding economic growth among nations, see Gorodnichenko and Roland (2017).
24 For further details, see https://geerthofstede.com/research-and-vsm/dimension-data-matrix.
25 Further, adding a variable interacting Days since 50 with the Individualism Index also proved to be statistically insignificant.
ority of a government is proxied by domestic general government health expenditure (% of GDP). Nations placing higher priority on public health might be expected to be more aggressive in their policy strategy to deal with the pandemic. Alternatively, it could be argued that such nations already have policies in place to manage pandemics in general and thus mitigating the need for further policy actions directed at the COVID-19 event.

The findings are summarized as Model 3.2 in Table 3. Results point to nations that spend relatively larger amounts on public health began with less aggressive policies after the virus spread to their state but strengthened relative to other nations in the following weeks and months. This is demonstrated visually in Panel D of Fig. 1. In the graph, low priority is defined as government health spending share of GDP equal to 1.28%, or one standard deviation below the sample mean (2.29%) for all nations in the data set. Medium priority is defined as sample mean spending and high priority is set at spending one deviation above the sample mean or at 5.86%. Using these criteria, high priority nations begin with a Stringency Index about 10 points below that of low health care priority nations. However, all three groups of nations are near convergence by the 12-week mark. The results for the remainder of the variables in the model mirror what was found earlier.

4.2.3. Learning from others

The novelty of the virus posed a challenge to policy makers and health care professionals in formulating a strategy to combat this disease and to educate the public appropriately about its potential impact on public health. Further, the disease spread around the globe in wavelike fashion, with its first known appearance in China in late December 2019 followed by arriving in Singapore in mid-February of the following year. The last country to reach 50 confirmed cases in the data set used in the analysis was Seychelles and that occurred on July 7, 2020. This time lag held the potential opportunity for countries that were impacted later in the wave to learn from the experiences of countries impacted earlier thereby allowing them an opportunity to formulate their own strategies more proactively.

To see if all this had an impact on the timing and aggressiveness of the strategy to combat the epidemic a variable noting the date that the first 50 confirmed cases in a nation (Date of First 50 Cases) was added to equation (1). The results are presented as Model 3.3 in Table 3. As can be seen, the positive parameter on the Date of First 50 Cases was not statistically significant at conventional levels suggesting nations experiencing the pandemic later in the wave were not more aggressive in their response, other things being equal. The findings for the rest of the model remain essentially unchanged from what is reported above.

4.2.4. Island nations

Island nations have natural barriers that may limit the opportunities for the transmission of COVID-19 from other countries relative to nations sharing a common border with others. This may lead to containment and other policies in island nations that are more focused on border closure and other strong restrictions on international movement, allowing them to employ less aggressive policies in areas that primarily affect domestic activities. As a result, their overall record of containment policies might be expected to be less strong relative to non-island nations. To address this possibility, an Island Nation dummy variable is added to equation (1) with the expectation of a negative value for the parameter estimate for this variable.

The results, reported as Model 3.4 in Table 3, confirm that expectation – approximately 1-point lower Stringency Index for island nations, other things equal – but the finding does not pass the usual threshold for statistical significance. Correlation with some of the continental fixed effects indicator may have contributed to this finding (e.g., the correlation between Island Nations and Oceania is 0.31), however, dropping the continental fixed-effects variables does not change the statistical significance of the Island variable.

4.2.5. Gender considerations

Finally, it has been widely observed that some female heads of state have had strong records early on in combating the spread of COVID-19 in their countries (Taub, 2020). New Zealand, for example, led by Prime Minister Jacinda Ardern, imposed a stringent county-wide lockdown early and this virtually eliminated new caseload by mid-August. The record in Angela Merkel's Germany on disease containment had been substantially better than that of neighboring European countries with male heads of state. In the present analysis, this is looked at more generally in the context of the timing and aggressiveness of pandemic response in women-led countries.

Generally, women are considered to be more risk averse than men (Croson & Gneezy, 2009; Charness & Gneezy, 2012) and this may lead them to advocate for more aggressive strategies to mitigate adverse impacts of such things as a global health pandemic. Carikpati and Kambhampati (2020) find some support for this proposition in the case of COVID-19, although their focus is the timing and effectiveness of lockdowns (not strategies more generally) and over an earlier stage of the outbreak (through mid-May) than is considered here.

As of mid-year 2020 there were 21 nations with female heads of state of government. Using a gender variable (Woman Head of State) in equation (1) along with a timing interaction term (Woman Head of State X Days since 50) results indicate that there have been no significant differences in the timing and overall aggressiveness of the policy response between the two genders more generally. It is important to keep in mind, however, that these results do not necessarily imply anything about policy outcomes. It could still be that women have been more effective at executing policy in this area relative to men, something that may have been the case in nations like New Zealand and Germany.

5. Robustness exercises

In this section the analysis is extended to consider several robustness checks of the conclusions drawn above.

Both the academic literature and popular media accounts have emphasized that policy makers in many island nations aggressively closed their borders out concern that their health care systems would be unable to handle a COVID-19 outbreak brought about by the transmission of the disease by foreigners (e.g., Craig, et al. (2020); Westerman (2020)).

See Council of Foreign Relations, https://www.cfr.org/article/womens-power-index#chapter-title-0-2.

Complete model results are not reported here to conserve space but are available upon request.
5.1. Updating policy to reflect trends in case history

It may be reasonable to expect that governments adjust their policies over the six-month time horizon considered in this analysis based on the success or lack thereof of the current policies in place. To address this, Recent Trend in Case History is included as an additional explanatory variable to equation (1). This variable is defined as the average number of new covid-19 cases per million reported in a country over the preceding seven days. For all models presented in Tables 2 and 3 with statistically significant results for the key variables of interest (Models 2.1–2.3 and Model 3.2) the case history variable is added to the regression setup and the models are re-estimated. The results are reported in Table 4 as Models 4.1–4.4.

As expected, the parameter estimate on the Recent Trend variable is positive and statistically significant in all models estimated, indicating that nations tend to adopt more stringent policies in the face of an increase in average new caseload in the preceding week. Regarding the other variables in the model, including the Regime/ National Characteristic variables, the results are substantively similar to findings reported above for each model.

5.2. Constrained values of stringency index

Given that the dependent variable is continuous, but lies within the [0, 1] interval (when rescaled by dividing the Index by 100) using an OLS estimation strategy may suffer from problems similar to linear probability models and binary response dependent variables. As is well known the predicted probabilities of such models can lie outside the [0, 1] interval when linear relationships of the dependent variable(s) with the independent variables in the model are assumed. To address this, Papke and Wooldridge (1996) and Wooldridge (2010) propose response regression techniques to fit such models using quasi-likelihood estimators under the assumption that the distribution of the conditional mean of the response variable follows a logistic functional form.33 The results using this estimation strategy, not reported but available upon request, reveal substantively similar results to what is reported for all models above.

5.3. Correlation between regime variables and cross-sectional error term

Standard fixed-effect models using equation (1) could not be estimated because the key regime/nation characteristics variables are time-invariant. A random-effects model assumes exogeneity of the regressors. To address the possibility that the regime and health care policy variables are correlated with the cross-sectional errors Models 2.1 – 2.3 and 3.2 were re-estimated using the Hausman and Taylor (1981) estimation strategy. Here the random-effects model is adjusted to deal with possibility of endogeneity of the regressors and this technique yields unbiased estimation of parameters of the time-invariant variables in the model. For this exercise, the authoritarian and federalist regime characteristics, health care, and economic freedom variables were specified as endogenous in their respective models and then estimated using the Hausman-Taylor procedure. The findings from this alternative estimation approach – available upon request – remain qualitatively similar to what was reported in the tables above.

6. Summary models

To complete the analysis, two “summary” models are estimated using in the same model the political institutional and health care variables that were shown to be statistically significant when they were considered sequentially above. Other factors, including the individualism culture, learning from others, gender, and island nations are excluded since they lacked statistical significance in the earlier analysis. Two versions of this more general model are estimated, one the excludes recent COVID-19 case history trends as an additional regressor and one that does not. Together, these are referenced as Model 5.1 and 5.2, respectively, and the results are reported in Table 5.

For the most part, the conclusions drawn earlier still hold in terms of the sign and magnitude of the parameter estimate on each key variable, and with respect to its statistical significance. Notable exceptions are (1) the is stronger evidence that authoritarian regimes (all categories) have a significantly lower Stringency Index relative to their democratic counterparts at the beginning of the pandemic, and (2) that the nations with a higher freedom score began with less aggressive strategies early on to combat the pandemic is statistically weaker.

7. Conclusions

We’ve had nine pandemics or close calls in the past 20 years [SARS COV-1 and avian flu twice each, MERS, swine flu, Ebola, Zika and SARS COV-2 once each]. We’ll have another nine in the next 20 years.34

- Sir John Bell, regius professor of medicine at Oxford University

The goal of this paper was to understand better what factors drove the timing and aggressiveness of government responses to COVID-19. Understanding what drives the timing of early interventions is important because epidemiological evidence points to early intervention leading to better outcomes and that knowledge should prove useful when confronting future pandemics that will inevitably arise. Beyond early intervention, the aggressiveness of policy intervention that transpired over the first six months after the virus first arrived in a country was analyzed.

Using the Oxford COVID-19 Government Response Tracker, Stringency Index, to measure the policy response that governments had taken to combat the COVID-19 outbreak during the first six months of the pandemic the major takeaways from this analysis are as follows:

- Generally, nations increased the aggressiveness of their policies during the first two to three months after the pandemic hit and then began to ease those restrictions after that.
- Monarchies stood out relative to other authoritarian and democratic regimes as having a stronger policy response in the first three weeks following the first 50 confirmed COVID-19 case mark reaching their country.
- Authoritarian regimes, viewed more broadly, pursued more aggressive policies relative to their democratic counterparts over the latter part of the six-month period analyzed.
- Unitary regimes tended to have stronger policy measures in place early on relative to federalist states but relaxed these restrictions sooner.
- Nations in which citizens enjoyed greater freedom in terms of political rights and civil liberties pursued less aggressive policies during the initial stages of the pandemic but had records similar to other nations after three months.

33 Estimation is carried out using the STATA command fracreg. A beta distribution is inappropriate as there are cases (Stringency Index) in the dataset with endpoint values of the [0, 1] interval.

34 As quoted in https://www.economist.com/britain/2020/08/22/britains-govern-ment-axes-public-health-england?utm_campaign=coronavirus-special-edition&utm_medium=newsletter&utm_source=salesforce-marketing-cloud&utm_term=2020–08-22&utm_content=article-link-5&etear=nl_special_5
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* denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Notes: All models are estimated via ordinary least squares and with continent fixed effects (omitted to conserve space). The numbers in parentheses are (absolute value) t-statistics based on country-level clustered standard errors. Daily data covering a period ending on August 18, 2020.

| Dependent Variable: Stringency Index | Model | 4.1 | 4.2 | 4.3 | 4.4 |
|--------------------------------------|-------|-----|-----|-----|-----|
| Recent Trend in Case History         |       | 0.102**(4.5) | 0.106**(5.4) | 0.107**(4.9) | 0.109**(5.0) |
| Authoritarian Regime                 |       | -6.735(1.3)  |                |                |                |
| Authoritarian Regime X Days since 50 |       | 0.145**(2.7) |                |                |                |
| Federalist Regime                    |       |                | -10.568**(3.0) |                |                |
| Federalist Regime X Days since 50    |       |                | 0.187**(4.8)   |                |                |
| Freedom Score                        |       | -0.466**(2.3) |                |                |                |
| Freedom Score X Days since 50        |       | 0.005**(2.3)  |                |                |                |
| Public Health                        |       | -2.315**(2.6) |                | 0.025**(2.7)   | 0.398**(4.8)   |
| Public Health X Days since 50        |       |                |                | 0.025**(2.7)   | 0.398**(4.8)   |
| Days since 50                        |       | 0.442**(5.8)  | 0.434**(5.1)   | 0.174**(1.3)   |                |
| Days since 50 - Squared              |       | -0.003**(6.6) | -0.003**(4.9)  | -0.004**(4.8)  | -0.003**(4.8)  |
| Elderly Population                   |       | -0.339**(2.1) | -0.611**(2.4)  | -0.484**(1.6)  | -0.338**(1.1)  |
| Per Capita GDP                       |       | -0.0002**(4.1)| -0.0002**(4.5) | -0.0002**(3.6) | -0.0002**(3.6) |
| Number of Countries                  |       | 158            | 160            | 154            | 157            |
| Number of Observations                |       | 25,069         | 25,338         | 24,505         | 24,930         |
| F-statistic                          |       | 23.41**        | 20.95**        | 18.26**        | 19.19**        |
| R-Square                             |       | 0.24           | 0.25           | 0.24           | 0.24           |

Notes: All models are estimated via ordinary least squares and with continent fixed effects (omitted to conserve space). The numbers in parentheses are (absolute value) t-statistics based on country-level clustered standard errors. Daily data covering a period ending on August 18, 2020.

* denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

COVID-19 responses vary significantly across countries, with more authoritarian regimes generally implementing more stringent measures early in the pandemic. The results suggest that nations (1) with a government structure that is more centralized, (2) where the decision-making process by government officials is more streamlined, (3) where the political rights and civil liberties are given less priority, and (4) with a weaker public health system tended to put in place more aggressive policy responses relative to others over the first few months after pandemic hit their county. States not so characterized generally caught up with others in terms of their policy response during the later months of the time period analyzed, with democratic states actually adopting stronger policies by that point.

It is important to recognize that the conclusions drawn above are general in nature, and that exceptions stand out, reflecting idiosyncratic characteristics within any given county that are not addressed in the models presented above. Canada, for example, a democratic nation with a strong federal form of government, is widely cited as a top performer in terms of its policies to confront the pandemic. Some authoritarian nations such as Iran have fared very poorly. Nevertheless, while such cases are important to consider when it comes to formulating policies to confront future pandemics, they are still anecdotal in nature. The contribution of the present analysis is to bring more systematic evidence to bear on how political systems, culture, and other factors may affect the ability of policy makers to implement and execute a timely strategy to confront similar public health crises down the line.

At a minimum, the results suggest the federalist states and nations where citizens enjoy more personal freedom may want to re-assess the institutions and strategies that they already have in place along with the priorities they have given to recognize and address pandemic threats early. This strategy going forward should be comprehensive in nature, nationwide in scope, and involve public health authorities, relevant agencies within the government, and be put in place before a similar health care crisis.

- Countries spending larger amounts on public health began with less aggressive policies but caught up with other countries within three to four months.
- There is little evidence that nations impacted by the pandemic relatively late in the time period analyzed put in place more aggressive policies early relative to other nations. Nor is there any evidence that island nations pursued different policies than other countries.
- There is no evidence that women leaders, viewed as a whole, put in place more aggressive policies in their country at the beginning of the pandemic relative to their male counterparts.
- Overall, economically prosperous nations pursued less aggressive containment and control policy responses over the period analyzed relative to others. Nor did states characterized by an older population demographic, considered to be most vulnerable to COVID-19, pursue more stringent measures, other things being equal. Instead, the analysis shows that nations (1) with a government structure that is more centralized, (2) where the decision-making process by government officials is more streamlined, (3) where the political rights and civil liberties are given less priority, and (4) with a weaker public health system tended to put in place more aggressive policy responses relative to others over the first few months after pandemic hit their county. States not so characterized generally caught up with others in terms of their policy response during the later months of the time period analyzed, with democratic states actually adopting stronger policies by that point.

Notes: All models are estimated via ordinary least squares and with continent fixed effects (omitted to conserve space). The numbers in parentheses are (absolute value) t-statistics based on country-level clustered standard errors. Daily data covering a period ending on August 18, 2020.

* denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Table 4 COVID-19 Response: Factoring in Trends in Case History.

| Dependent Variable: Stringency Index | Model | 5.1 | 5.2 |
|--------------------------------------|-------|-----|-----|
| Recent Trend in Case History         |       | 0.102**(4.2) |       |
| Authoritarian Regime                 |       | -11.884**(2.4) | -13.409**(2.6) |
| Authoritarian Regime X Days since 50 |       | 0.220**(3.8)  | 0.230**(3.8)  |
| Federalist Regime                    |       | -9.532**(2.6) | -9.495**(2.5) |
| Federalist Regime X Days since 50    |       | 0.164**(3.8)  | 0.169**(4.2)  |
| Freedom Score                        |       | -0.322**(1.6) | -0.318**(1.5) |
| Freedom Score X Days since 50        |       | 0.004**(1.7)  | 0.004**(1.7)  |
| Public Health                        |       | -1.846**(2.0) | -2.470**(2.5) |
| Public Health X Days since 50        |       | 0.021**(2.3)  | 0.024**(2.6)  |
| Days since 50                        |       | 0.271**(1.8)  | 0.111**(0.8)  |
| Days since 50 - Squared              |       | -0.005**(7.7) | -0.004**(6.7) |
| Elderly Population                   |       | -0.620**(2.0) | -0.270**(0.8) |
| Per Capita GDP                       |       | -0.0001**(1.2)| -0.0001**(3.0) |
| Number of Countries                  |       | 154            | 154            |
| Number of Observations                |       | 26,017         | 24,505         |
| F-statistic                          |       | 25.88**        | 23.16**        |
| R-Square                             |       | 0.26           | 0.29           |

Notes: All models are estimated via ordinary least squares and with continent fixed effects (omitted to conserve space). The numbers in parentheses are (absolute value) t-statistics based on country-level clustered standard errors. Daily data covering a period ending on August 18, 2020.

* denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Table 5 COVID-19 Response: Summary Models.
strikes. In federalist systems of government, it is important that the plan also be vertically coordinated between the federal level with their state and local counterparts. Importantly, sufficient resources need to be allocated to relevant institutions to ensure that the plan can be credibly executed at all stages. The need to do all this has already been recognized by multi-national institutions such as the Organisation for Economic Cooperation and Development (OECD, 2020) along with nonpartisan institutes such as the Council on Foreign Relations (2020). The results of the present study documents why this is important to do so.

In closing, it is also important to acknowledge that this analysis was not able to determine if states that relaxed their policy response earlier than others did so because the strategies they put in place were more effective at thwarting the virus or the result of political pressure being placed on authorities to open back up their economies. Authoritarian and federalist regimes states tended to be slow to put in place containment strategies and stayed more aggressive longer over the six-month period analyzed relative to their counterparts. Was that because policy outcomes were less successful in these regimes and therefore these policies had to stay in place longer? Or were authorities less prepared to confront the crisis and that led to loss of life that may have been avoidable? Questions like this still need to be answered as nations reassert their strategies to deal with future pandemics.

Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

I am grateful to two anonymous referees for their thoughtful comments and suggestions for improvement on an earlier version of this paper. All remaining errors are mine.

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