2-22-2023

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Dan Chen
University of Richmond, dchen@richmond.edu

Yong Li

Jiebing Wu

Recommended Citation

Dan Chen, Yong Li & Jiebing Wu (2022) Policy Stringency, Political Conditions, and Public Performances of Pandemic Control: An International Comparison, *Public Performance & Management Review*, DOI: 10.1080/15309576.2022.2040548

Policy Stringency, Political Conditions, and Public Performances of Pandemic Control: An International Comparison†

Dan Chen
E-mail: dchen@richmond.edu
University of Richmond

Yong Li
E-mail: liyong@shmtu.edu.cn
Shanghai Maritime University

Jiebing Wu (corresponding author)
E-mail: wujb@zju.edu.cn
Telephone: 86-571-56662066
Zhejiang University
866 Yuhangtang Road, Xihu District, Hangzhou, Zhejiang, China, 310027

Abstract

What factors might explain the cross-country variations in COVID-19 public performances and what lessons can be drawn to be better-prepared for future pandemics? This study focuses on the effects of policy stringency on COVID-19 public health outcomes to gain insights into national-level state responses to COVID-19 and the conditions for their effectiveness. Using data from 136 countries comprising 91.4% of the global population, we find that more stringent policies lead to lower infection and death rates. More importantly, the negative effects of restrictive policies on infection and death rates are moderated by political trust and democracy levels, possibly through the mechanism of popular compliance with government policies. Under conditions of higher political trust and lower democracy levels, the policy effects on infection and death rates are greater. However, while the results suggest the importance of policy stringency and political trust, we should not draw the conclusion that authoritarian political systems are more conducive to policy effectiveness. When comparing the moderating effects of political trust and democracy, political trust is more important as a facilitating factor. Therefore, in addition to making scientifically-supported policies, fostering political trust should be an important goal for governments to be better prepared for future pandemics.

Keywords COVID-19 pandemic, policy stringency, political trust, democracy

† This paper has been published in *Public Performance & Management Review*, https://doi.org/10.1080/15309576.2022.2040548. This is an accepted author version.

Introduction

The COVID-19 pandemic has created health crises for countries all around the world (Hu et al., 2020). The severity of these crises, however, is uneven. Some nations have suffered from higher levels of death rates than others. For example, as of May 2021, the cumulative death rate varies from 5.66‰ in Peru, 1.81‰ in the United States, 1.62‰ in France, to only 0.04‰ in Ethiopia and South Korea. To control the spread of COVID-19, governments globally have implemented different policies. These variations in policy responses and COVID-19 death rates around the world provide a "natural experiment" for us to understand the policy effect and its political conditions, so that we can draw conclusions in order to be better-prepared for future pandemics and other crises.

Existing studies that focus on political and policy factors have explored how government policy responses, political regimes, state capacity, health expenditures, and other factors have affected public performances during the COVID-19 pandemic (Gaynor and Wilson, 2020; Greer et al., 2020; Harris, 2020; Hartley and Jarvis, 2020; Kavanagh and Singh, 2020; Maier and Brockmann, 2020; González-Bustamante, 2021). However, there remains a lack of empirical studies on the effects of pandemic control and prevention policies, and especially on the complex causal relationships between restrictive policies and public health outcomes. Furthermore, existing studies have reached inconsistent findings regarding policy effects on infection or death rates. For example, while some studies find that shelter-in-place policies can reduce negative public health outcomes, others find no evidence for this, necessitating further research in this area (Berry et al., 2021; Dave et al., 2021).

Moreover, political conditions for policy effect during the pandemic remain under-studied. For example, political trust has been found to positively affect public health outcomes during epidemics (Freimuth et al., 2014; Blair et al., 2017; Vinck et al., 2019; Mei, 2020). Since the outbreak of the COVID-19 pandemic, scholars have reflected on the advantages and disadvantages of democracy as a political system (Kavanagh and Singh, 2020). Empirically, however, some questions about whether and how political trust and democracy moderate public performances during the pandemic remains unanswered. In this study, we try to address the following research questions to help fill some of the research gaps: Do more stringent policies reduce COVID-19 infection and death rates, compared to less stringent policies? How do political trust and the nature of political systems moderate policy effects on COVID-19 infection and death rates?

We collect and analyze data on 136 countries comprising 91.4% of the global population, complementing existing studies that focus on a smaller number of countries (Gaynor and Wilson, 2020; Harris, 2020; Hartley and Jarvis, 2020; Hsiang et al., 2020; Maier and Brockmann, 2020; Berry et al., 2021; Dave et al., 2021; González-Bustamante, 2021). Our findings shed new light on the varying public performances during the pandemic and enrich the theoretical discussion on the political conditions for successful pandemic management. Specifically, this study makes three potential contributions to the existing literature: (1) We use two-stage least-squares regression to examine causal relationships between policy stringency and COVID-19 infection and death rates, while accounting for time lag effects in policy effectiveness. Our regression results also allow us to discern the exact causal impact of restrictive policies on COVID-19 outcomes, thus contributing to the cause-and-effect research on policy effects. We find a causal relationship between policies that are more stringent at limiting human contact and movement and lower COVID-19 infection and death rates, consistent with the epidemiological understanding of the novel coronavirus. As policy stringency increases by 1 unit (out of 100 possible units), the infection rate decreases by 0.1778 case per 1,000 population and the death rate decreases by 0.0043 death per 1,000 population, after a six-month lag. (2) The study also tests the moderating effects of political trust and democracy levels, revealing a possible mechanism of policy effectiveness against COVID-19. We find that under conditions of higher political trust and lower democracy levels, the policy effects on infection and death rates are stronger, which may expand our understanding of the cross-country variations in public performances of pandemic control. (3) The findings of this research have significant practical implications, suggesting the importance of policy stringency and political conditions in better handling of the pandemic. However, we should not draw the conclusion that authoritarian political systems are more conducive to policy effectiveness. Comparing the moderating effects of political trust and democracy, political trust is more important as a facilitating factor. Therefore, in addition to making scientifically-supported pandemic control and prevention policies, fostering political trust should be an important goal for governments to be better prepared for future pandemics.

Literature Review and Hypotheses

Policy effects on COVID-19 death rates

Government policy responses constitute important actions to control the spread of a pandemic and minimize pandemic-related deaths. However, due to the novel nature of COVID-19, what constitutes the most appropriate policy response is controversial and uncertain, unlike other natural disasters for which there are standard protocols and best practices developed from past experiences (Capano et al., 2020). During the initial phases of this pandemic, the lack of effective treatments and vaccines added further uncertainty and urgency. Against this background, governments adopted various policy measures intended to slow the spread of the virus by reducing human contact (Fang et al., 2020; Harris, 2020). Policy measures such as social distancing, mask wearing, limiting gatherings and travel, and closing businesses and schools, have strong epidemiological value in controlling the spread of the virus. Slowing down the spread can help “flatten the curve” of infected cases, so as to protect the integrity of the healthcare system and its capacity to treat patients. These effects would ultimately lead to a lower death rate, calculated as the percentage of COVID-19 deaths in the national population (Juvet et al., 2020; Maier and Brockmann, 2020). The example of India’s mounting cases and deaths in early 2021 illustrates this mechanism. Due to a huge spike in COVID-19 cases, many hospitals in India became overwhelmed and ran out of medical oxygen, leading to many deaths that could have been avoided (Yasir & Raj, 2021). Thus, an overwhelmed healthcare system can lead to a higher death rate. To avoid this scenario, many governments have adopted policy measures to limit human contact and slow the spread of the virus.

These policy measures, however, vary in their stringency levels and their degrees of limitations on human contact. For example, some governments adopted more stringent policy measures such as shutting down businesses and transportation completely, while other governments adopted less stringent policy measures such as suggesting mask wearing and allowing businesses to operate at a certain capacity. While all were intended to slow the spread of the virus, these policies may have different effectiveness on public performances during the pandemic across different countries.

Earlier in the pandemic, scholars used various methods to understand the effectiveness of policy measures as non-pharmaceutical interventions. Ferguson et al. (2020) used epidemiological modeling to predict how combinations of policies at different stringency levels might affect public performances related to the COVID-19 pandemic (Ferguson et al., 2020). While the results are instructive, we still need empirical studies to understand the actual effects of policy measures in different national contexts. Other studies have focused on particular policies to examine their effects on public performances. For example, Hsiang et al. (2020) and

Dave et al. (2020) found that shelter-in-place policies caused reductions in disease prevalence, while Berry et al. (2021) did not find detectable effects of shelter-in-place policies on disease spread or deaths. These studies used data from the United States (Berry et al., 2021; Dave et al., 2021), China, South Korea, Italy, Iran, and France (Hsiang et al., 2020), which may not have allowed a more comprehensive examination of policy effects in different national contexts. More importantly, the inconsistent findings necessitate further empirical research to discern the complex causal relationship between policy measures and public performance during the pandemic. We need to understand not only the public health effects of various policy measures, but also the political conditions that may facilitate or inhibit the intended policy effects.

Government policy responses to the COVID-19 pandemic exert impact primarily through changing individual behavior. This can be achieved through two mechanisms: (1) signaling government authority and capacity for enforcement (Kotowski et al., 2014) and (2) enforcement such as monitoring and punishment (Mookherjee and Png, 1994). Signaling government authority and capacity for enforcement may change individual behavior. During the pandemic, governments have become the main sources of information and the makers of rules. When a government announces policy measures that require the population to substantially change their life routines, such as closing businesses and schools, it is signaling its authority and capacity for enforcement because it has the power to make these drastic changes. Such signaling may compel parts of the population to change their behavior accordingly, possibly due to trust in political authority or the anticipation of punishment for violation. On the other hand, enforcement requires government personnel or technology on the ground to monitor the population and force them to comply with policies. For example, in Greece the police deployed drones to spot those who defied local safety protocols such as social distancing, curfews, and lockdowns (Carassava, 2021). In addition, there may be punishments for those who violate pandemic control and prevention policies. For example, the Norwegian prime minister was fined 20,000 Norwegian crowns ($2,352) by the police in April 2021 for violating COVID-19 social distancing rules (Solsvik & Fouche, 2021). An American college student was sentenced to two months in prison for violating coronavirus restriction in the Cayman Islands (Gross & Eligon, 2020). These punishments would compel or incentivize the change of individual behavior by increasing the cost of policy violation. When policies are more stringent, their restrictive effects are stronger, which would facilitate more uniform actions to stem the spread of the virus. Based on this discussion, we hypothesize the following:

Hypothesis 1: The more stringent a government's pandemic policy response is, the lower the COVID-19 infection and death rates are in that country.

Political trust and policy effects

While government policy responses are driven by epidemiology, their effects in the real world are conditioned by complex factors. To control the spread of the virus, government policy measures are designed to substantially change people's behavior and life routines. Such drastic limitations on human contact and movement are unprecedented for the vast majority of the world population, resulting in immense challenges to people's livelihoods and mental health (Brunetto et al., 2021). According to the International Labor Organization, 8.8% of global working hours were lost in 2020 relative to the fourth quarter of 2019, equivalent to 255 million full-time jobs and approximately four times greater than those lost during the global financial crisis in 2009 (International Labor Organization, 2021). A recent study reports a high global prevalence of both depression and anxiety during the COVID-19 pandemic and shows that the implementation of mitigation strategies including public transportation and school closures, and stay-at-home orders caused such disorders (Castaldelli-Maia et al., 2021). When pandemic control and prevention policies incur such a high cost to people's lives, hesitance and resistance naturally ensue, undermining popular compliance with government policies. Given the nature of infectious diseases, even when a small group of people disobey government policies, the collective efforts to tame the spread of the virus would be undercut. Indeed, noncompliance has undermined public performances in previous epidemics. For example, during the polio eradication campaign in Nigeria in 2003, refusal to take the polio vaccine due to mistrust between the state and citizens resulted in a spread of the polio epidemic (Obadare, 2005). During the Ebola crisis in West Africa from 2013 to 2016, violence against Red Cross volunteers broke out during safe burial procedures, leading to more Ebola infections (Belluck, 2015). During the COVID-19 pandemic, the unprecedented crisis situations that governments around the world face, and the sacrifices that populations in different societies are asked to make, created formidable obstacles to full compliance with restrictive policies.

The political environment in which restrictive policies are implemented may condition the degree of popular compliance. Because the government is the maker and implementer of restrictive policies, people's trust in the government may affect how likely they are to comply with government policies. Political trust is a "reserve" of political support (Li, 2004), indicating belief in the trusted entity's commitment to act in the interest of citizens and its ability to fulfill that commitment if left untended (Levi and Stoker, 2000). When citizens lack political trust, they are less inclined to comply with government-issued public health measures or protocols. Studies that examine previous epidemics find that political trust is an important factor that facilitates compliance with policy responses to public health challenges, including taking precautions against the infectious disease, abiding by government-mandated social distancing mechanisms, supporting contentious control policies such as "safe burial" of infected bodies, and adopting preventive behaviors such as accepting vaccines and seeking formal healthcare (Freimuth et al., 2014; Dhillon and Kelly, 2015; Blair et al., 2017; Vinck et al., 2019). Similarly, a study found that ethnic marginalization breeds political mistrust, which undermines compliance in public health emergencies (Arriola and Grossman, 2021). Furthermore, a lack of political trust has been linked to worse public health outcomes (Mesch and Schwirian, 2015; Alsan and Wanamaker, 2018).

In the context of the COVID-19 pandemic, popular compliance induced by political trust can facilitate policy measures to reduce the number of infected patients in a given time period (Maier and Brockmann, 2020) and lessen the possibility of an overwhelmed healthcare system, all of which would eventually lead to a lower death rate. For example, in analyzing the Chinese government's COVID-19 response, Mei (2020) points out the crucial factors of compliance in explaining China's success so far. For instance, strict lockdown measures are implemented more smoothly and effectively in China due to people's higher compliance (Mei, 2020). Hille and White (2020) describe such compliance as "people will do whatever the government told them to do" (Hille and White, 2020). During a pandemic, people need to trust governments to comply with restrictive policies to minimize infection (Cairney and Wellstead, 2021). Therefore, we expect the policy effects on COVID-19 infection and death rates to be moderated by political trust. Given this discussion, we hypothesize that:

Hypothesis 2: In countries with higher (lower) levels of political trust, the magnitude of the negative effects of policy stringency on COVID-19 infection and death rates is larger (smaller).

Democracy and policy effects

Besides political trust, the nature of a political system is another key factor that may moderate policy effects on pandemic outcomes. The nature of a political system refers to the degree of democracy and can be classified into democratic, hybrid, and authoritarian political systems (Ekman, 2009; Morgenbesser, 2014). The nature of a political system shapes the population's expectation of government responses and their tendency to comply with policy measures. In the unprecedented COVID-19 pandemic, the lack of prior experiences in dealing with a novel coronavirus on such a wide-ranging scale (Yang, 2020) has meant that existing notions about individual freedoms and the limits of state power may clash with restrictive policies intended to control the pandemic. In democratic societies where notions of individual freedoms are conceptualized as antithetical to government actions, the population have a lower likelihood of expecting stringent policies imposed by their governments that severely limit individual freedoms. As a result, governments face higher thresholds to justify restrictions, even when restrictions are supported by epidemiology (Toshkov et al., 2021). Moreover, limiting movements creates negative consequences for economic activities, resulting in loss of employment and income, as discussed earlier. People whose livelihood depends on jobs in "contact-intensive sectors," such as restaurants, shops, and public transport, also had strong reasons to disobey government measures to make ends meet, such as in Argentina, Chile, and Peru where tough lockdowns make much economic activity impossible (The Economist, 2021b). Facing the "double loss" of freedom and livelihood, many people, especially in democracies, took to the streets to protest against government policies intended to control the pandemic and defied policy measures such as wearing face masks and social distancing. When stringent measures were implemented in 2020 and early 2021, protests broke out to resist government policies in dozens of countries, including the United States, Canada, the United Kingdom, Germany, Spain, Colombia, and Lebanon (The Economist, 2021a, 2021b). Furthermore, an initial study shows that democracy is correlated with worse outbreaks and weaker policy effectiveness (Cepaluni et al., 2020).

On the other hand, in authoritarian political systems where restrictive policy measures have been more common, the population may experience less of a "shock" when the government announces policies to limit movement or shut down businesses. The anticipation of punishment for policy violation may also facilitate compliance with policy measures. From the government's perspective, the state apparatus used to enforce government policies in normal times can be easily mobilized to enforce pandemic restrictions. For example, in China the grassroots-level neighborhood committees—organizations that are supported and guided by the government—have played an indispensable role in implementing public education campaigns on pandemic control and prevention and enforcing contact tracing and quarantine (Zhang et al., 2020). In contrast, due to shorter time horizons, political leaders in democracies tend to have weaker incentives to invest in institutional infrastructures that are crucial in generating prompt and effective responses to crisis situations (Healy and Malhotra, 2009; Dionne, 2011). The enforcement capacity in authoritarian political systems may become an advantage during a pandemic for governments to quickly and effectively enforce restrictive measures, alleviating the tendency towards noncompliance discussed earlier. Therefore, we hypothesize the following:

Hypothesis 3: In more (less) democratic countries, the magnitude of the negative effects of policy stringency on COVID-19 infection and death rates is smaller (larger).

Data and Method

To compile a dataset that allows us to test our hypotheses, we use available data from public sources. For our dependent variables of COVID-19 infection and death rates, we use data on COVID-19 cases and deaths from the COVID-19 data repository at the Center for Systems Science and Engineering at Johns Hopkins University and population data from the World Bank to calculate infection and death rates (per 1,000 population).[1] For our independent variable of policy stringency, we use data from the Oxford COVID-19 Government Response Tracker.[2] Specifically, we use the stringency index as our independent variable and the containment and health index as an alternative measure for robustness checks. Both indices are calculated using the following indicators: school closure, workplace closure, cancelled public events, restrictions on gatherings, closed public transport, stay-at-home requirements, restrictions on internal movement, international travel controls, and public information campaigns. The containment and health index includes the following additional indicators: testing policy, contact tracing, facial covering, vaccination policy, and protection of elderly people, which also have implications for public health outcomes. It is important to acknowledge that, while shelter-in-place or stay-at-home requirements are among the most restrictive policies, we do not examine these policies separately. Instead, we examine a group of pandemic policies that are constructed into an index. This is mainly because most countries have multiple policies in place at the same time, making it difficult to separate the effects of specific policies. Our data cover the 16-month time period from February 2020 to May 2021, and our unit of analysis is country-month. Our policy stringency variables are monthly averages of the policy stringency index scores and the health and containment index scores. Our COVID-19 infection and death rates variables consist of newly added cases and deaths in each month as percentages of a country's population.

To examine the possible moderating effects of political trust and democracy, we use data from various barometer surveys (AfroBarometer, AmericasBarometer, ArabBarometer, AsianBarometer, EuroBarometer) and the seventh wave of the World Values Survey for political trust[3] and the Democracy Index 2019 produced by The Economist Intelligence Unit for democracy scores.[4] For political trust, we use the most recent available data. The descriptive statistics for all variables are summarized in Table 1.

(Table 1 about Here)

Our analysis strategy tries to address issues with causal inference and time-series effects. Most linear or generalized linear regression analyses can determine correlation but not causation. In particular, for variables that occur around the same time, there may be an endogeneity concern. In our study, the causal relationship between government policy interventions and COVID-19 public health outcomes is complex, so we use two-stage least-squares (2SLS) regression to empirically test the causal relationship between policy stringency and public health outcomes. This approach contributes cause-and-effect outcomes to the existing studies on pandemic policies and their effects. Specifically, we use an instrumental variable (IV) that is a good predictor of a country's policy stringency but does not affect that country's COVID-19 infection and death rates. The use of IV replaces the need for control variables, and this approach has been used in existing studies (Chen et al., 2021). We construct an IV based on the regional average of policy stringency score for each month excluding the country at hand, and we divide up the world into six regions: Asia, Oceania, Europe, Africa, North America, and South America. Theoretically speaking, other countries' policy stringency average should not affect a country's own COVID-19 infection and death rates in a given month. However, policy stringency of countries in the same region may influence a country's own policy decisions, as governments react to the same wave of infection that may easily spread in the region. For example, as the recent Omicron variant spreads in Europe, lockdowns and other pandemic restrictions were reimposed across various European countries, including the Netherlands, Denmark, France, Germany, Italy, and Ireland (Meyer, 2021). Using the IV we predict the values of policy stringency, which are then used to compute a linear regression model for our dependent variables of infection and death rates.

The 2SLS regression model that we developed to estimate the relationship between policy stringency index and COVID-19 public performances is shown in Equations (1) and (2):

$$Y_{it} = \alpha + \beta \hat{P}_{it} + u_i + \theta_t + \varepsilon_{it} \qquad (1)$$

$$P_{it} = \rho + \sigma Z_{it} + \mu_i + \vartheta_t + \epsilon_{it} \qquad (2)$$

Where, Y_{it} denotes infection and death rate in country i at month t. P_{it} represents policy stringency index in country i at month t. We instrument country's own policy stringency index by using the regional average of policy stringency score for each month excluding the country at hand, expressed by Z_{it}. Country fixed effects u_i and μ_i were included to account for unobserved time-invariant characteristics that was specific to country i, such as geographic features. Month fixed effects θ_t and ϑ_t were also included to control for any factors that affect all countries similarly in a given month. Lastly, ε_{it} and ϵ_{it} are the error terms. β is the parameter vector that gives the responses of COVID-19 public health outcomes to policy stringency index.

During a pandemic, the public performances take time to show up in data. According to epidemiologists, policy measures such as social distancing and stay-at-home requirements take a minimum of about two weeks to show effects on the number of new cases, due to the mean incubation period of the novel coronavirus (approximately five to six days before first symptoms) and the mean time required to develop symptoms severe enough that the patient will seek medical attention (approximately another six to seven days) (Vogel, 2020). More importantly, policy restrictions may not be closely followed on the ground, as discussed earlier, which would extend the time lag between policy announcements and the actual effects on public health outcomes. For example, according to the data from Oxford University shown in Figure 1, in China restrictive policies were implemented starting in February 2020, and the death rate starts to show a decline without fluctuation in mid-April 2020, resulting in a time lag of about two months. In the United States, restrictive policies were implemented starting in April 2020, and the death rate starts to show a decline without fluctuation in February 2021, resulting in a time lag of about 10 months. Taking an average of the two extreme cases, we decided to model six months lag between policy measures and their effects on infection and death rates.

(Figure 1 about Here)

Results and Discussion

Our regression analysis consists of several steps to examine the causal effects of policy stringency on COVID-19 infection and death rates, conduct robustness checks, and explore the moderating effects of political trust and democracy. To examine the causal effects of policy stringency on COVID-19 infection and death rates, we used two-stage least-squares regression to model the causal effects of policy stringency on COVID-19 infection and death rates. As mentioned earlier, policy stringency is measured by monthly averages of policy stringency index scores; the robustness checks use containment and health index as a measure for policy stringency.

Table 2 summarizes the two-stage least-squares regression models. Model (1) shows that in the first stage of regression, the IV of regional policy stringency average is positively correlated with a country's own policy stringency. The robustness check using an alternative measure of policy stringency (i.e., health and containment index) in Model (2) shows similar results. In the second stage of regression, using policy stringency index as the measure for our independent variable, Model (3) and Model (5) results show that policy stringency has a causal, negative effect on infection and death rates. As policy stringency increases by 1 unit (out of 100 possible units), the infection rate decreases by 0.1778 case per 1,000 population, and the death rate decreases by 0.0043 death per 1,000 population. As a robustness check, we used containment and health index as an alternative measure for our independent variable in Model (4) and Model (6). The results show similar causal, negative effects on infection and death rates, and the magnitude of these effects are slightly larger. Together, these results provide empirical support for our first hypothesis.

(Table 2 about Here)

To explore the moderating effects of political trust, we divided up our sample into two groups by the median political trust score: one group is higher than the median, and the other group is lower than the median. We then ran regression models using subsamples, and the results are summarized in Table 3. Model (7) and Model (8) show that, when political trust level is low, policy stringency has negative, causal effects on infection and death rates. As policy stringency increases by 1 unit, the infection rate decreases by 0.1729 case per 1,000 population, and the death rate decreases by 0.0039 death per 1,000 population. Model (9) and Model (10) show that, when political trust level is high, policy stringency also has negative, causal effects on infection and death rates. As policy stringency increases by 1 unit, the infection rate decreases by 0.1857 case per 1,000 population, and the death rate decreases by 0.0048 death per 1,000 population.

Comparing the magnitude of the effects, policy stringency has larger effects on infection and death rates when political trust is higher. The robustness check (results available in Appendix Table A1) shows similar results. At lower political trust levels, as health and containment index increases by 1 unit, the infection rate decreases by 0.2522 case per 1,000 population and the death rate decreases by 0.0056 case per 1,000 population. At higher political trust levels, as health and containment index increases by 1 unit, the infection rate decreases by 0.2698 case per 1,000 population and the death rate decreases by 0.0056 case per 1,000 population. Though the coefficients for death rate decrease under higher and lower political trust levels are similar, the magnitude of the policy effects on infection rate decrease is larger when political trust is higher. These results provide empirical support for our second hypothesis.

(Table 3 about Here)

To explore the moderating effect of democracy, we divide up our sample into two groups by the median democracy score: one group is higher than the median, and the other group is lower than the median. We then run regression models using subsamples, and the results are summarized in Table 4. Model (11) and Model (12) show that, when a country is less democratic, policy stringency has negative, causal effects on infection and death rates. As policy stringency increases by 1 unit, the infection rate decreases by 0.1791 case per 1,000 population, and the death rate decreases by 0.0044 death per 1,000 population. Model (13) and Model (14) show that, when a country is more democratic, policy stringency also has negative, causal effects on infection and death rates. As policy stringency increases by 1 unit, the infection rate decreases by 0.1732 case per 1,000 population, and the death rate decreases by 0.0042 death per 1,000 population. Comparing the magnitude of the effects, policy stringency has slightly larger effects on infection and death rates when a country is less democratic. The robustness check (results available in Appendix Table A2) shows similar results. At lower democracy levels, as health and containment index increases by 1 unit, the infection rate decreases by 0.2913 case per 1,000 population and the death rate decreases by 0.0068 case per 1,000 population. At higher democracy levels, as health and containment index increases by 1 unit, the infection rate decreases by 0.2174 case per 1,000 population and the death rate decreases by 0.0045 case per 1,000 population. The magnitude of policy effects is larger when democracy level is lower. These results provide empirical support for our third hypothesis.

The results seem to be consistent with the recent study by Berry et al. (2020) that did not find significant effects of shelter-in-place policies on COVID-19 public health outcomes in the United States. The authors provided a possible explanation that some people may not actually abide by the shelter-in-place policies, thus rendering the insignificant effect. This explanation is consistent with our theoretical expectation that people in democratic societies are less used to draconian policies that restrict individual freedom, which may have undermined policy compliance and policy effects on public health outcomes.

(Table 4 about Here)

So far, the results suggest that higher political trust and lower democracy scores provide conducive conditions for government policies to help reduce COVID-19 infection and death rates. While political trust is a public attitude that has many benefits to the operations of politics and governance, such as support for policies and compliance with taxpaying (Scholz and Lubell, 1998; Fried, 2006), we hesitate to suggest that, in order to successfully handle a pandemic, governments need to remove their democratic characteristics. Indeed, in producing prompt and effective pandemic responses, authoritarian governments often suffer from a lack of free information flow, which may result in coverups and delays in taking proper measures (Kavanagh and Singh, 2020). So the question becomes, empirically, is political trust more important than democracy for government policies to help reduce COVID-19 infection and death rates?

Comparing the magnitude of policy effects moderated by political trust and democracy, policy effects on infection and death rates under higher political trust are slightly larger than those under lower democracy scores. When political trust level is high, as policy stringency increases by 1 unit, the infection rate decreases by 0.1857 case per 1,000 population, and the death rate decreases by 0.0048 death per 1,000 population (see Table 3). When a country is less democratic, as policy stringency increases by 1 unit, the infection rate decreases by 0.1791 case per 1,000 population, and the death rate decreases by 0.0044 death per 1,000 population (see Table 4). These results suggest that political trust is a more important condition than democracy to facilitate government policies to improve public health outcomes. To foster people's trust in their governments, therefore, is crucial in a pandemic or other crisis situation for government policies to take intended effects. Especially when government policies are unusually restrictive, popular compliance can be induced when the trust in government is high.

Conclusions

The COVID-19 pandemic has posed many serious challenges to governments around the world, exposing weak links in some governments' crisis management and their capacity to quickly control the spread of the disease. Meanwhile, other governments have managed the crisis relatively successfully, with lower infection and death rates. Understanding the lessons of the pandemic has become an important research topic, so that we can be better prepared when future pandemics occur. In the areas of politics and policy, existing studies have reached inconsistent findings on the public health effects of policies designed with the guidance of epidemiology. While some studies find policies that restrict human movement reduce disease prevalence (Hsiang et al., 2020; Dave et al., 2021), other studies find none (Berry et al., 2021). These inconsistent findings highlight the importance of further research using more comprehensive data and the importance of understanding how political context may facilitate or inhibit scientifically designed policies intended to control the pandemic.

In this study, we examine the policy effects on COVID-19 infection and death rates and the political conditions. Based on the results, this study makes three potential contributions. First, using two-stage least-squares regression, we find a causal relationship between policies that are more stringent at limiting human contact and movement and lower COVID-19 infection and death rates, consistent with the epidemiological understanding of the novel coronavirus. Due to the complex causal relationships between policy interventions and public health outcomes, existing empirical studies have reached inconsistent findings. This research provides causal evidence showing that restrictive policies are effective at improving COVID-19 public performances and the exact causal impact, shedding new light on the varying policy effectiveness of pandemic control and enriching the theoretical discussion on successful pandemic management.

Second, we find that political trust and democracy moderate the policy effect on COVID-19 infection and death rates, possibly through the mechanism of popular compliance. When political trust is higher and democracy scores are lower, the policy effects on COVID-19 infection and death rates are larger. Our explanation is that higher political trust can induce popular compliance with government policies, consistent with what existing studies have found in relation to previous epidemics (Freimuth et al., 2014; Dhillon and Kelly, 2015; Blair et al., 2017; Vinck et al., 2019). Compared to democratic societies, people in authoritarian societies may be more inclined to comply with restrictive policies due to anticipation of punishment of violations; meanwhile, authoritarian governments may be better equipped with the capacity to enforce restrictive policies. However, the two factors are not equally important, and the results should not be interpreted as advocating that governments should remove their democratic characteristics in order to better handle pandemics. Compared to democracy, political trust is a more important condition that can facilitate larger effects of government policies on reducing COVID-19 infection and death rates. The results reveal a possible mechanism of policy effectiveness against COVID-19, which may expand our understanding of the cross-country variations in public performances of pandemic control. Although we do not directly measure popular compliance in this study, we believe popular compliance is an important variable for future research to consider. Popular compliance is a key factor to ensure policy implementation and effectiveness, which may help explain the variation in policy performance outcomes during public health crises. The methods of survey research and experiments and anonymized mobile geolocation data (Huang et al., 2021) can be used to measure how likely a country's population is to comply with government policies.

Third, this study has implications for the public administration literature, particularly the debate on the politics and administration dichotomy (Wilson, 1887; Goodnow, 1900). Many scholars point out that the absolute separation of politics and administration is ideal rather than real and that the boundary between politics and administration is fluid, indicating the empirical inadequacy of the dichotomy (Simon, 1946; Waldo, 1955; Alford et al., 2017; Young et al., 2020). In fact, the relationship between politics and administration may be described as interdependent and mutually influenced (Svara, 1999; Rosser and Mavrot, 2017). Our study adds further evidence to this long-standing debate. Our findings indicate that politics can moderate how administration shapes public performance during the COVID-19 pandemic. Implementing policies created under epidemiological guidance is essential to reducing infections and related deaths. However, political trust and the nature of a political system, two important political factors, can moderate public performance, amplifying or reducing the effects of scientifically-supported policies on COVID-19 infections and related-deaths. Therefore, we need to take into account the influence of politics on administration when understanding the varying levels of public performance during the COVID-19 pandemic.

Finally, the findings in this study have important practical implications. To control and prevent COVID-19 outbreaks, restrictive policies are important measures for governments to deploy in order to quickly and effectively control the pandemic. Furthermore, the long-term factor of political trust is indispensable for short-term restrictive policies to be successful. Indeed, in crisis situations such as the COVID-19 pandemic, governments' policy coordination and decision-making capacities are disrupted (Kapucu, 2009), which accentuates the importance of communication and trust, so as to maintain resilience and flexible policy decision-making and implementation (Comfort, 2007). Even when governments make scientifically-supported policies to control the spread of the disease, a lack of political trust would undermine the effects of these policies. However, unlike policymaking, political trust cannot be produced overnight; it has to be cultivated over a long period of time by consistent government performance, response, and legitimacy mechanisms. Therefore, fostering political trust should be an important goal for governments to be better prepared for future pandemics and other crises.

Notes

1. Confirmed COVID-19 cases and related deaths data come from the Coronavirus Resource Center at Johns Hopkins University, accessed 17 June 2021 (https://coronavirus.jhu.edu/). Population data from World Bank is used to calculate deaths per 1,000 population in each country, accessed 17 June 2021 (https://data.worldbank.org/indicator/SP.POP.TOTL).

2. Policy stringency index, and containment and health index data come from Coronavirus Government Response Tracker, developed by the Blavatnik School of Government at the University of Oxford, accessed 17 June 2021 (https://covidtracker.bsg.ox.ac.uk/).
3. Political trust data come from the most recent available datasets downloaded from the websites of AfroBarometer (https://afrobarometer.org/), AmericasBarometer (https://www.vanderbilt.edu/lapop/), ArabBarometer (https://www.arabbarometer.org/), AsianBarometer (http://www.asianbarometer.org/), and EuroBarometer (https://europa.eu/eurobarometer/screen/home) , accessed 17 June 2021; the years in which political trust data are collective include 2014, 2016, and 2018.
4. Democracy index data come from the Economist Intelligence Unit for democracy scores in 2019, accessed 17 June 2021 (https://www.eiu.com/n/campaigns/democracy-index-2019/).
5. The policy stringency index did not have data on Palestine in May 2021; therefore, N is 2175.
6. The health and containment index did not have data on Palestine and Tunisia in May 2021; therefore, N is 2174.
7. The cumulative data on COVID-19 deaths in August 2020 in Estonia and Kyrgyzstan show smaller numbers than those in the previous month, thus resulting in negative numbers of monthly death rates.

Acknowledgements
The authors wish to thank Dr. Shuai Chen, Dr. Biao Huang, Mingda Cheng, Dr. Hongli Pang for helpful comments and suggestions. The authors are grateful to Sha Wang and Kunyang Lin for their research assistance.

Declaration of interest statement
The authors declare no conflict of interest.

References

Alford, J., Hartley, J., Yates, S., & Hughes O. (2017). Into the Purple Zone: Deconstructing the Politics/Administration Distinction. *American Review of Public Administration*, *47*(7), 752-763.

Alford, J., Hartley, J., Yates, S., & Hughes, O. (2017). Into the purple zone: Deconstructing the politics/administration distinction. *The American Review of Public Administration*, *47*(7), 752-763.

Alsan, M., & Wanamaker, M. (2018). Tuskegee and the health of black men. *The quarterly journal of economics*, *133*(1), 407-455.

Arriola, L. R., & Grossman, A. N. (2021). Ethnic marginalization and (non) compliance in public health emergencies. *The Journal of Politics*, *83*(3), 000-000.

Belluck, P. (2015). *Red Cross Faces Attacks at Ebola Victims Funerals. New York Times, February 13*. Retrieved 17 June from https://www.nytimes.com/2015/02/13/world/africa/red-cross-faces-attacks-at-ebola-victims-funerals.html

Berry, C. R., Fowler, A., Glazer, T., Handel-Meyer, S., & MacMillen, A. (2021). Evaluating the effects of shelter-in-place policies during the COVID-19 pandemic. *Proceedings of the National Academy of Sciences*, *118*(15).

Blair, R. A., Morse, B. S., & Tsai, L. L. (2017). Public health and public trust: Survey evidence from the Ebola Virus Disease epidemic in Liberia. *Social Science & Medicine*, *172*, 89-97.

Brunetto, Y., Saheli, N., Dick, T., & Nelson, S. (2021). Psychosocial Safety Climate, Psychological Capital, Healthcare SLBs' Wellbeing and Innovative Behaviour During the COVID 19 Pandemic. *Public Performance & Management Review*, 1-22.

Cairney, P., & Wellstead, A. (2021). COVID-19: effective policymaking depends on trust in experts, politicians, and the public. *Policy Design and Practice*, *4*(1), 1-14.

Capano, G., Howlett, M., Jarvis, D. S., Ramesh, M., & Goyal, N. (2020). Mobilizing policy (in) capacity to fight COVID-19: Understanding variations in state responses. *Policy and Society*, *39*(3), 285-308.

Carassava, A. (2021). *Greece Deploys Drones to Stop Partygoers From Breaching COVID Rules*. Retrieved 17 June from https://www.voanews.com/europe/greece-deploys-drones-stop-partygoers-breaching-covid-rules

Castaldelli-Maia, J. M., Marziali, M. E., Lu, Z., & Martins, S. S. (2021). Investigating the effect of national government physical distancing measures on depression and anxiety during the COVID-19 pandemic through meta-analysis and meta-regression. *Psychological medicine*, *51*(6), 881-893.

Cepaluni, G., Dorsch, M., & Branyiczki, R. (2020). Political regimes and deaths in the early stages of the COVID-19 pandemic. *Available at SSRN 3586767*.

Chen, S., Chen, Y., Lei, Z., & Tan-Soo, J.-S. (2021). Chasing Clean Air: Pollution-Induced Travels in China. *Journal of the Association of Environmental and Resource Economists*, *8*(1), 59-89.

Comfort, L. K. (2007). *Shared risk: Complex systems in seismic response*. Emerald Group Publishing.

Dave, D., Friedson, A. I., Matsuzawa, K., & Sabia, J. J. (2021). When do shelter‐in‐place orders fight COVID‐19 best? Policy heterogeneity across states and adoption time. *Economic inquiry*, *59*(1), 29-52.

Dhillon, R. S., & Kelly, J. D. (2015). Community trust and the Ebola endgame. *New England Journal of Medicine*, *373*(9), 787-789.

Dionne, K. Y. (2011). The role of executive time horizons in state response to AIDS in Africa. *Comparative Political Studies*, *44*(1), 55-77.

Ekman, J. (2009). Political participation and regime stability: A framework for analyzing hybrid regimes. *International Political Science Review*, *30*(1), 7-31.

Fang, H., Wang, L., & Yang, Y. (2020). Human mobility restrictions and the spread of the novel coronavirus (2019-ncov) in china. *Journal of Public Economics*, *191*, 104272.
Ferguson, N., Laydon, D., Nedjati Gilani, G., Imai, N., Ainslie, K., Baguelin, M., Bhatia, S., Boonyasiri, A., Cucunuba Perez, Z., & Cuomo-Dannenburg, G. (2020). Report 9: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demand.
Freimuth, V. S., Musa, D., Hilyard, K., Quinn, S. C., & Kim, K. (2014). Trust during the early stages of the 2009 H1N1 pandemic. *Journal of health communication*, *19*(3), 321-339.
Fried, A. (2006). Why Trust Matters: Declining Political Trust and the Demise of American Liberalism. *Perspectives on Politics*, *4*(1), 186-187.
Gaynor, T. S., & Wilson, M. E. (2020). Social vulnerability and equity: The disproportionate impact of COVID‐19. *Public administration review*, *80*(5), 832-838.
González-Bustamante, B. (2021). Evolution and early government responses to COVID-19 in South America. *World development*, *137*, 105180.
Goodnow, F. J. (1900). *Politics and administration: A study in government*. Macmillan.
Greer, S. L., King, E. J., da Fonseca, E. M., & Peralta-Santos, A. (2020). The comparative politics of COVID-19: The need to understand government responses. *Global public health*, *15*(9), 1413-1416.
Gross & Eligon. (2020). *Sentence Is Cut for U.S. Student Who Broke Quarantine.* The New York Times, December 22. Retrieved 17 June from https://www.nytimes.com/2020/12/22/world/americas/skylar-mack-cayman-islands-covid.html
Harris, J. E. (2020). *The coronavirus epidemic curve is already flattening in New York City*.
Hartley, K., & Jarvis, D. S. (2020). Policymaking in a low-trust state: legitimacy, state capacity, and responses to COVID-19 in Hong Kong. *Policy and Society*, *39*(3), 403-423.
Healy, A., & Malhotra, N. (2009). Myopic voters and natural disaster policy. *American Political Science Review*, *103*(3), 387-406.
Hille, K., & White, E. (2020). Containing coronavirus: lessons from Asia. *Financial Times*, *16*.
Hsiang, S., Allen, D., Annan-Phan, S., Bell, K., Bolliger, I., Chong, T., Druckenmiller, H., Huang, L. Y., Hultgren, A., & Krasovich, E. (2020). The effect of large-scale anti-contagion policies on the COVID-19 pandemic. *Nature*, *584*(7820), 262-267.
Hu, Q., Zhang, H., Kapucu, N., & Chen, W. (2020). Hybrid Coordination for Coping with the Medical Surge from the COVID‐19 Pandemic: Paired Assistance Programs in China. *Public administration review*, *80*(5), 895-901.
Huang, B., Wang, J., Cai, J., Yao, S., Chan, P. K. S., Tam, T. H.-W., Hong, Y.-Y., Ruktanonchai, C. W., Carioli, A., & Floyd, J. R. (2021). Integrated vaccination and physical distancing interventions to prevent future COVID-19 waves in Chinese cities. *Nature Human Behaviour*, *5*(6), 695-705.
International Labor Organization. (2021). *ILO Monitor: COVID-19 and the world of work, seventh edition*. Retrieved 17 June from https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/briefingnote/wcms_767028.pdf
Juvet et al. (2020). *COVID-19: Case fatality rate and infection fatality rate for serious COVID-19, 1st update – a rapid review*. Norwegian Institute of Public Health. Retrieved 17 June from https://www.fhi.no/en/publ/2020/Case-fatality-rate-and-infection-fatality-rate-for-seroius-Covid-19/
Kapucu, N. (2009). Public administrators and cross‐Sector governance in response to and recovery from disasters. *Administration & Society*, *41*(7), 910-914.
Kavanagh, M. M., & Singh, R. (2020). Democracy, capacity, and coercion in pandemic response: COVID-19 in comparative political perspective. *Journal of Health Politics, Policy and Law*, *45*(6), 997-1012.
Kotowski, M. H., Weisbach, D. A., & Zeckhauser, R. J. (2014). Signaling with Audits: Mimicry, Wasteful Expenditures, and Non-Compliance in a Model of Tax Enforcement.

Levi, M., & Stoker, L. (2000). Political trust and trustworthiness. *Annual review of political science*, *3*(1), 475-507.

Li, L. (2004). Political trust in rural China. *Modern China*, *30*(2), 228-258.

Maier, B. F., & Brockmann, D. (2020). Effective containment explains subexponential growth in recent confirmed COVID-19 cases in China. *Science*, *368*(6492), 742-746.

Mei, C. (2020). Policy style, consistency and the effectiveness of the policy mix in China's fight against COVID-19. *Policy and Society*, *39*(3), 309-325.

Mesch, G. S., & Schwirian, K. P. (2015). Confidence in government and vaccination willingness in the USA. *Health promotion international*, *30*(2), 213-221.

Meyer, D. (2021). *Lockdowns spread across Europe in the face of Omicron's 'lightning' advance.* Fortune. Retrieved 22 December from https://fortune.com/2021/12/20/omicron-lockdown-netherlands-covid-europe-france-germany-italy-ireland/

Mookherjee, D., & Png, I. P. (1994). Marginal deterrence in enforcement of law. *Journal of Political Economy*, *102*(5), 1039-1066.

Morgenbesser, L. (2014). Elections in hybrid regimes: Conceptual stretching revived. *Political Studies*, *62*(1), 21-36.

Obadare, E. (2005). A crisis of trust: history, politics, religion and the polio controversy in Northern Nigeria. *Patterns of Prejudice*, *39*(3), 265-284.

Rosser, C., & Mavrot, C. (2017). Questioning the constitutional order: A comparison of the French and the US politics–administration dichotomy controversies after World War II. *The American Review of Public Administration*, *47*(7), 737-751.

Scholz, J. T., & Lubell, M. (1998). Trust and taxpaying: Testing the heuristic approach to collective action. *American Journal of Political Science*, 398-417.

Simon, H. A. (1946). The proverbs of administration. *Public administration review*, *6*(1), 53-67.

Solsvik & Fouche. (2021). *Norwegian PM fined by police over coronavirus rules violation. Reuters, April 9.* Retrieved 17 June from https://www.reuters.com/world/norway-prime-minister-fined-by-police-over-virus-rules-violation-2021-04-09/

Svara, J. H. (1999). Complementarity of politics and administration as a legitimate alternative to the dichotomy model. *Administration & Society*, *30*(6), 676-705.

The Economist. (2021a). *As the pandemic rages on, so do protests about it. The Economist, March 27.* Retrieved 17 June from https://www.economist.com/graphic-detail/2021/03/27/as-the-pandemic-rages-on-so-do-protests-about-it

The Economist. (2021b). *Why Latin America's economy has been so badly hurt by covid-19. The Economist, May 15.* Retrieved 17 June from https://www.economist.com/the-americas/2021/05/13/why-latin-americas-economy-has-been-so-badly-hurt-by-covid-19

Toshkov, D., Carroll, B., & Yesilkagit, K. (2021). Government capacity, societal trust or party preferences: what accounts for the variety of national policy responses to the COVID-19 pandemic in Europe? *Journal of European Public Policy*, 1-20.

Vinck, P., Pham, P. N., Bindu, K. K., Bedford, J., & Nilles, E. J. (2019). Institutional trust and misinformation in the response to the 2018–19 Ebola outbreak in North Kivu, DR Congo: a population-based survey. *The Lancet Infectious Diseases*, *19*(5), 529-536.

Vogel, L. (2020). How long will social distancing take to work? Experts weigh in on Canada's COVID-19 response.

Waldo, D. (1955). The Value Problem in Administrative Study. *The Study of Public Administra-tion, New York: Random House, Inc*, 60-66.

Wilson, W. (1887). The study of public administration. *Political Science Quarterly*, *2*(2), 197-222.

Yang, K. (2020). Unprecedented challenges, familiar paradoxes: COVID‐19 and governance in a new normal state of risks. *Public administration review*, *80*(4), 657-664.

Yasir & Raj. (2021). *Deaths Mount at an Indian Hospital After Oxygen Runs Out*. Retrieved 17 June from https://www.nytimes.com/2021/05/03/world/asia/India-coronavirus-deaths-oxygen.html

Young, S. L., Wiley, K. K., & Searing, E. A. (2020). “Squandered in real time”: How public management theory underestimated the public administration–politics dichotomy. *The American Review of Public Administration*, *50*(6-7), 480-488.

Zhang, N., Shi, T., Zhong, H., & Guo, Y. (2020). COVID-19 prevention and control public health strategies in shanghai, China. *Journal of Public Health Management and Practice*, *26*(4), 334-344.

Appendix. Additional Tables

Table A1. Effects of policy stringency on COVID-19 infection and death rates moderated by political trust (robustness check).

	Low Trust		High Trust	
	Model (A1) DV: Infection rate	Model (A2) DV: Death rate	Model (A3) DV: Infection rate	Model (A4) DV: Death rate
Health and containment index	-0.2522*** (0.0418)	-0.0056*** (0.0010)	-0.2698*** (0.0726)	-0.0056*** (0.0014)
Country fixed effects	Yes	Yes	Yes	Yes
Year-by-month fixed effects	Yes	Yes	Yes	Yes
Observations	690	690	670	670
KP F-statistics	57.12	57.12	51.34	51.34

Notes: Entries are unstandardized estimated coefficients of the second stage in two-stage least-squares regression models; standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A2. Effects of policy stringency on COVID-19 infection and death rates moderated by democracy (robustness check).

	Low Democracy		High Democracy	
	Model (A5) DV: Infection rate	Model (A6) DV: Death rate	Model (A7) DV: Infection rate	Model (A8) DV: Death rate
Health and containment index	-0.2913*** (0.0464)	-0.0068*** (0.0011)	-0.2174*** (0.0626)	-0.0045*** (0.0011)
Country fixed effects	Yes	Yes	Yes	Yes
Year-by-month fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	630	630
KP F-statistics	45.22	45.22	73.80	73.80

Notes: Entries are unstandardized estimated coefficients of the second stage in two-stage least-squares regression models; standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 1. Descriptive statistics.

Variable	Definition/Unit	Mean	SD	Min	Max	N
Policy stringency	Policy stringency index (0-100) monthly average	56.94	22.16	0	100	2175[5]
	Containment and health index (0-100) monthly average	53.96	18.82	0	89.02	2174[6]
Infection rate	New infections per month / national population (1,000 people)	2.13	4.10	0	38.10	2176
Death rate	New deaths per month / national population (1,000 people)	0.04	0.08	-0.05[7]	0.70	2176
Political trust	Measured on a 4-point scale	2.39	0.49	1.46	3.73	2176
Democracy	Measured on a 10-point scale	5.78	2.07	1.93	9.87	2080
Instrumental variable	Policy stringency index (0-100) monthly average – Asia	59.75	12.73	15.48	78.69	559
	Policy stringency index (0-100) monthly average – Europe	55.11	15.64	5.86	79.35	496
	Policy stringency index (0-100) monthly average – North America	59.51	17.14	5.77	86.47	288
	Policy stringency index (0-100) monthly average – South America	67.40	18.94	3.42	87.25	192
	Policy stringency index (0-100) monthly average – Africa	51.87	16.46	3.78	79.93	608
	Policy stringency index (0-100) monthly average – Oceania	46.57	20.85	19.15	95.13	32
	Containment and health	56.58	11.96	14.32	66.47	559

	index (0-100) monthly average – Asia					
	Containment and health index (0-100) monthly average – Europe	55.03	14.65	6.90	67.96	496
	Containment and health index (0-100) monthly average – North America	55.16	14.84	5.24	72.42	288
	Containment and health index (0-100) monthly average – South America	60.73	16.72	3.45	72.93	192
	Containment and health index (0-100) monthly average – Africa	48.33	14.16	3.03	63.67	607
	Containment and health index (0-100) monthly average – Oceania	47.05	15.99	12.97	79.88	32

Table 2. Effects of Policy Stringency on COVID-19 infection and death rates.

	Model (1)		Model (2)	
2SLS:	DV: Policy Stringency Index		DV: Health and Containment Index	
First-stage estimation:				
Policy stringency index (regional average)	0.7670*** (0.0649)			
Health and containment index (regional average)			0.7465*** (0.0705)	
Country fixed effects	Yes		Yes	
Year-by-month fixed effects	Yes		Yes	
Observations	1360		1360	
Second-stage estimation:	Model (3) DV: Infection Rate	Model (4) DV: Infection Rate	Model (5) DV: Death Rate	Model (6) DV: Death Rate
Policy stringency index	-0.1778*** (0.0251)		-0.0043*** (0.0005)	
Health and containment index		-0.2592*** (0.0379)		-0.0056*** (0.0008)
Country fixed effects	Yes	Yes	Yes	Yes
Year-by-month fixed effects	Yes	Yes	Yes	Yes
Observations	1360	1360	1360	1360
KP F-statistics	139.6	112.1	139.6	112.1

Notes. Entries are unstandardized estimated coefficients; standard errors are in parentheses. KP F-statistic is a new indicator of traditional first-stage F-statistic, with a critical value of 16.38 in the case of one IV to one endogenous variable (Kleibergen and Paap, 2006). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3. Effects of policy stringency on COVID-19 infection and death rates moderated by political trust.

	Low Trust		High Trust	
	Model (7) DV: Infection rate	Model (8) DV: Death rate	Model (9) DV: Infection rate	Model (10) DV: Death rate
Policy stringency index	-0.1729^{***} (0.0263)	-0.0039^{***} (0.0006)	-0.1857^{***} (0.0518)	-0.0048^{***} (0.0011)
Country fixed effects	Yes	Yes	Yes	Yes
Year-by-month fixed effects	Yes	Yes	Yes	Yes
Observations	690	690	670	670
KP F-statistics	76.40	76.40	56.00	56.00

Notes. Entries are unstandardized estimated coefficients of the second stage in two-stage least-squares regression models; standard errors are in parentheses. KP F-statistic is a new indicator of traditional first-stage F-statistic, with a critical value of 16.38 in the case of one IV to one endogenous variable (Kleibergen and Paap, 2006). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Effects of policy stringency on COVID-19 infection and death rates moderated by democracy.

	Low Democracy		High Democracy	
	Model (11) DV: Infection rate	Model (12) DV: Death rate	Model (13) DV: Infection rate	Model (14) DV: Death rate
Policy stringency index	-0.1791*** (0.0277)	-0.0044*** (0.0007)	-0.1732*** (0.0445)	-0.0042*** (0.0008)
Country fixed effects	Yes	Yes	Yes	Yes
Year-by-month fixed effects	Yes	Yes	Yes	Yes
Observations	670	670	630	630
KP F-statistics	63.65	63.65	82.17	82.17

Notes. Entries are unstandardized estimated coefficients of the second stage in two-stage least-squares regression models; standard errors are in parentheses. KP F-statistic is a new indicator of traditional first-stage F-statistic, with a critical value of 16.38 in the case of one IV to one endogenous variable (Kleibergen and Paap, 2006). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

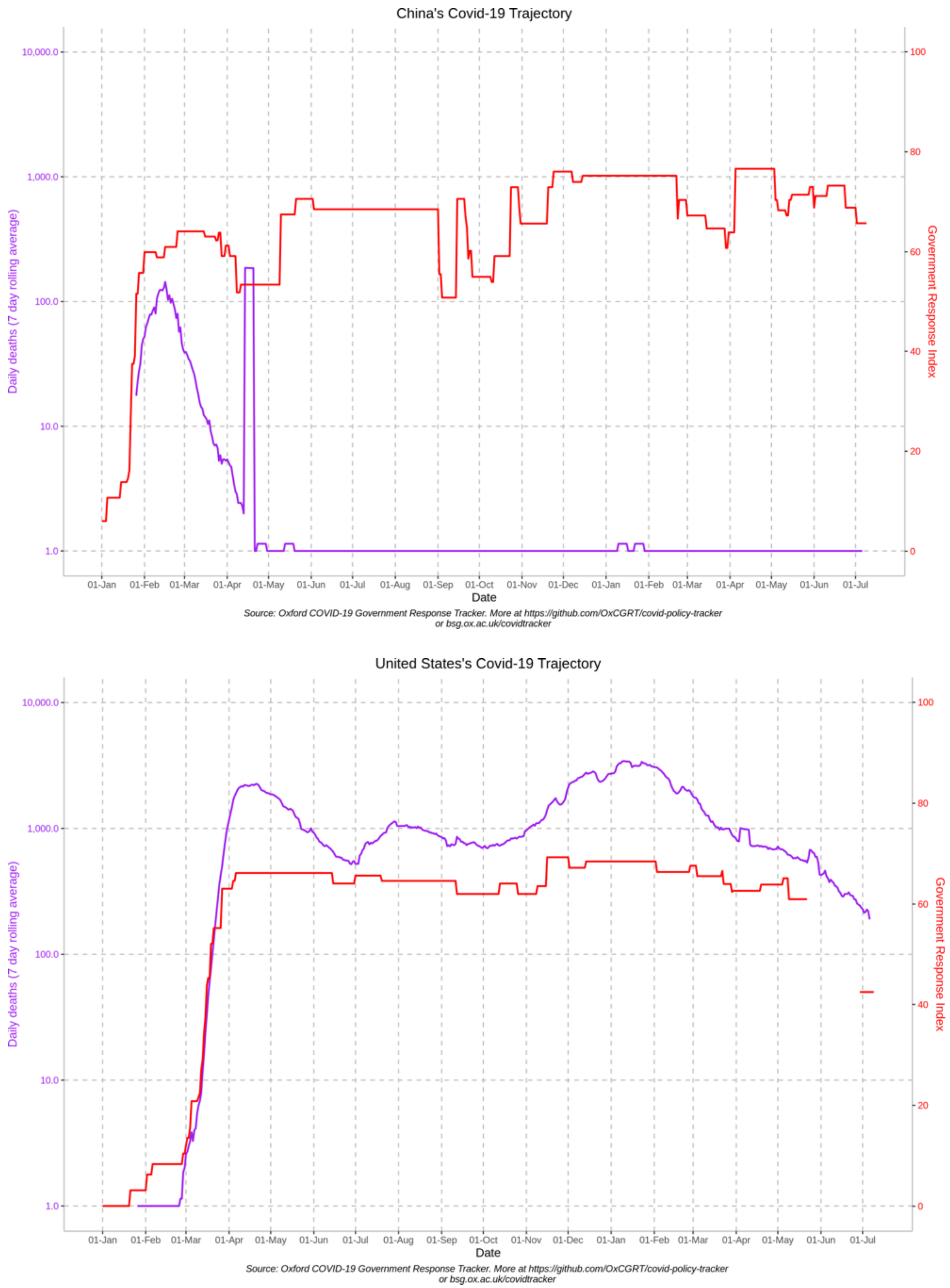

Figure 1. Policy stringency and death rates in China and the United States