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WORKING PAPER

# 21-10 The Political Economy of Pandemic Preparedness and Effectiveness

Cullen S. Hendrix

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**ABSTRACT**

The success of countries in the Organization for Economic Cooperation and Development (OECD) in controlling the COVID-19 pandemic has varied greatly. Explanations for the differences fall into four broad categories: political/economic, cultural/social, demographic/geographic, and policy-oriented. This paper uses Bayesian model averaging to assess the explanatory power of 21 potential covariates. It shows that standard political economy variables that predict greater investment in public health, such as GDP per capita and level of democracy; both general and pandemic-disease-specific measures of government effectiveness; and demographic factors that predict increased vulnerability, such as the share of population that is elderly or obese, do not explain the differences in outcomes. The key factors appear to have been interdictability (the ability to tightly control borders and effectively restrict or monitor entrants at a limited number of entry ports), the early adoption of stronger international travel restrictions, and a female head of government. A simple model including these three variables has an $R^2$ of 0.78 and is robust across estimators.

**Cullen S. Hendrix,** nonresident senior fellow at the Peterson Institute for International Economics, is professor at the Korbel School of International Studies, University of Denver.

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## 1. INTRODUCTION

The performance of countries in the Organization for Economic Cooperation and Development (OECD) in responding to the COVID-19 pandemic has varied greatly. As of May 28, 2021, Australia, Iceland, Finland, Japan, South Korea, New Zealand, and Norway had all managed to keep COVID-related mortality rates below 20 deaths per 100,000 inhabitants. In contrast, Belgium, the Czech Republic, Hungary, Italy, the Slovak Republic, and Slovenia all saw mortality rates above 200, and major economies like the United States and United Kingdom had rates above 180 (JHU 2021).

This working paper investigates both structural and policy-oriented potential explanations for the differing success OECD countries have had in preventing COVID-related mortality. Broadly, explanations fall into four main categories: political-economic, cultural/social, demographic/geographic, and policy-oriented. I use Bayesian model averaging to assess the explanatory power of these various potential covariates and find standard political economy variables that predict greater investment in public health, like GDP per capita and level of democracy (Pritchett and Summers 1996, Lake and Baum 2001, Acemoglu et al. 2019), do not help explain outcomes. Nor do measures of government effectiveness, both general and pandemic-disease-specific. Nor do demographic factors that predict increased vulnerability, like share of population that is elderly or obese or average life expectancy. These factors provide virtually no leverage on the question of which countries have performed best in minimizing mortality due to COVID-19. In the main, there appears to be no consistent political-economic explanation for COVID performance.

Rather, the key factors appear to have been *interdictability*, or the ability to tightly control borders and effectively monitor entrants at a limited number of entry ports, the early adoption of stronger international travel restrictions, and having female heads of government. A simple model including these three variables fits the data rather well ($R^2$ = 0.78) and is robust across estimators.

The paper proceeds as follows. Section 2 briefly summarizes the still-emerging literature on cross-national variation in COVID mortality. Section 3 proposes several potential explanations. Section 4 presents the results of a model selection exercise based on Bayesian modeling averaging and the results of regression analysis. Section 5 discusses the results and draws some conclusions.

## 2. LITERATURE REVIEW

The vast majority of studies addressing COVID mortality either take the infected individual as the unit of analysis (Imam et al. 2020, Sanyaolu et al. 2020) or address variation in COVID-related health performance over time within a country or jurisdiction (Baud et al. 2020, VoPham et al. 2020, Painter and Qiu 2021). Fewer studies have addressed cross-national variation in either COVID-related case fatality rates or total COVID-related mortality per capita.

Windsor et al. (2020) analyze a global sample of COVID-related mortality rates. They find that, contrary to conventional wisdom, countries led by female heads of state/government did not perform better than countries headed by men but that cultural values—in particular, the tendency toward individualism over collective identity—were consistently associated with higher mortality rates.

Brzezinski et al. (2020) also focus on cultural explanations. They analyze cell phone location data to assess compliance with lockdown policies. They find that countries with larger proportions of science skeptics (as proxied by skepticism about climate change) performed worse in complying with lockdown orders and other mobility restrictions designed to combat COVID-19. The researchers did not attempt to link compliance with mobility restrictions to mortality outcomes. In the popular press, the notion that Confucian-influenced countries place a high premium on social harmony, respect for authority, and individual duty and responsibility to society and have thus addressed COVID-19 more effectively has gained significant traction.[1]

Leffler et al. (2020) assess the effects of 19 variables—ranging from the extent of mask wearing to country size, GDP per capita, population size, and rates of obesity—on COVID mortality. They find many of these variables to be statistically significant. In particular, they find that wealthier, more urban, and more obese countries/populations experienced higher COVID mortality. However, their results are based on bivariate difference of means tests; there is thus no attempt to address potential confounding variables or to construct a metric for assessing relative explanatory power.

Karabulut et al. (2021) assess the role of regime type in explaining COVID-related outcomes. They theorize that democracy should have countervailing effects on COVID mortality: Democracies should invest more in public health systems (Lake and Baum 2001) and thus have better outcomes. However, democracies may also be more reticent to impose policies like social distancing, mask requirements, and stay-at-home orders that restrict individual freedoms and liberties. Empirically, Karabulut et al. find that on net, democracy is positively associated with COVID mortality.

The prevailing position is thus that GDP per capita, obesity, urbanization, culture, and regime type are useful for explaining COVID-related mortality. These studies have several limitations, however, because of the broadly cross-national nature of their design. First, the studies are based on comparisons across global samples of countries with vastly different capacities for identifying and reporting COVID-related mortality. Underreporting is significant in developing and middle-income countries, particularly in Africa and Asia (The Economist 2021, IHME 2021).[2] Second, most of these studies focus on a theoretical variable of interest rather than exploring a broader suite of potential explanatory variables.[3] This paper attempts to address these issues by focusing on a more similar set of cases—the advanced economies of the OECD—and addressing a more inclusive

1 Timothy W. Martin and Marcus Walker, "East vs. West: Coronavirus Fight Tests Divergent Strategies," *Wall Street Journal*, March 13, 2020, www.wsj.com/articles/east-vs-west-coronavirus-fight-tests-divergent-strategies-11584110308; Nancy S. Jecker, "Is the zero-Covid approach of China and Japan about saving face?" *South China Morning Post*, June 23, 2021, www.scmp.com/week-asia/opinion/article/3138356/zero-covid-approach-china-and-japan-about-saving-face; Ralph Jennings, "How Cultural Differences Help Asian Countries Beat COVID-19, While US Struggles," *Voice of America*, July 22, 2020, www.voanews.com/covid-19-pandemic/how-cultural-differences-help-asian-countries-beat-covid-19-while-us-struggles.

2 Windsor et al. (2020) address this issue by using nearest-neighbor matching of female-headed and male-headed governments. However, the heterogeneity in reporting effort is still unobserved. Moreover, the study focuses on gender results in some debatable matches: Bangladesh, a coastal country with a population of over 160 million, is matched with Bhutan, a landlocked, mountainous country with fewer than 1 million inhabitants. New Zealand, a country of fewer than 5 million people, whose nearest neighbor is about 1,000 miles away, is paired with the United Kingdom, a country of 67 million that lies less than 25 miles from continental Europe.

3 Karabulut et al. (2021) focus on the effect of democracy, for example, and Windsor et al. (2020) focus on the effect of the gender of the head of government/state.

set of potential explanatory factors and confounding variables that might lead to erroneous conclusions from bivariate relationships.

## 3. POTENTIAL EXPLANATORY FACTORS

In both the media and in the nascent scholarly literature, a variety of explanations has been offered for the relative success with which governments reduced pandemic-related mortality. Potential explanatory factors can be grouped into four broad categories: political/economic, cultural/social, demographic/geographic, and policy-based.[4]

Political/economic factors include the following:

- *GDP per capita*. Wealthier countries should have significant advantages over more resource-constrained countries in addressing threats to public health, including pandemic disease. The potential mechanisms include spending effects (greater investment in health systems) and the better general health that comes with higher incomes thanks to better health care, diet, and less exposure to communicable diseases (Pritchett and Summers 1996). However, the marginal impact of additional per capita output is attenuated among wealthier countries like those of the OECD (Deaton 2003).
- *Democracy*. For any level of income, democracies invest more in the provision of public goods and services, including investments in health, than their non- or less democratic counterparts (Lake and Baum 2001, Acemoglu et al. 2019).[5] Moreover, democratic leaders can be punished at the ballot box for poor pandemic response and thus have electoral incentives to enact effective pandemic response policies.
- *Government effectiveness*. More effective governments better translate available resources into policy outcomes. More effective governments should therefore be more successful in implementing the kinds of policies designed to reduce COVID-related mortality.
- *Federal structure*. The effects of federal political institutions are theoretically ambiguous. Federalism may prevent effective response because of widely different policy goals and implementation strategies at the state or province level (Gordon et al. 2020). Alternately, it may be beneficial, by allowing local officials to tailor responses to local demographic and social contexts and experiment with different approaches simultaneously in different jurisdictions (Gluck and Huberfeld 2018).

Cultural/social factors include the following:

- *Political culture: Traditional versus rational/secular values*. Political culture refers to the values and value orientations in a country that affect generally attitudes about authority, personal liberty and responsibility, and the nature of claims to knowledge that affect political life. One dimension of

4 All arguments are ceteris paribus. For an explanation of specific operationalizations and summary statistics, see the appendices.

5 In turn, this spending leads to higher growth rates, primarily through improved human capital stock (Baum and Lake 2003, Acemoglu et al. 2019).

political culture has been termed *traditional versus secular/rational values* (Inglehart 1990). This dimension refers to the extent to which cultural beliefs are informed by traditional sources of authority, including religion, the hierarchical family, and deference to traditional authority rather than by rational, scientifically informed worldviews. These values may be highly consequential for compliance with COVID-related public health interventions such as mask wearing and social distancing. In order to comply with these policies when the probability of official sanction is low, society members must believe there are both individual and collective benefits from doing so. More rational/secular values may promote individual-level adherence to best practices of mask wearing, compliance with lockdowns, and social distancing (Brzezinski et al. 2020).

- *Political culture: Survival versus self-expression values*. Another dimension of political culture is survival versus self-expression values. This dimension captures the degree to which values reflect primary concern for safety versus individual choice and self-expression. Because compliance with social distancing, mask wearing, and lockdown orders comes with costs (small and psychological but also economic, as a result of lost productive activity), effective pandemic response requires that large numbers of individuals sublimate their short-term desires and bear costs for the collective good. Countries with more self-expression-oriented political cultures may have lower levels of compliance with public health interventions that impose constraints on individual choice (Inglehart 1990, Windsor et al. 2020).
- *Female head of government/state*. One of the more powerful narratives to emerge during the pandemic has been the superior performance of countries with female heads of governments, purportedly because such governments were quicker to adopt restrictive mobility restrictions and because women are more likely to be heads of governments in countries with a sharper focus on social equity and public health and safety (Coscieme et al. 2020).

Demographic/geographic factors include the following:

- *Interdictability*. Of the five countries with the lowest COVID mortality, four are islands or chains of islands (New Zealand, Australia, Iceland, and Japan). One plausible reason for their superior performance is the degree to which being an island confers the ability to effectively monitor and control ingress and egress at a small number of ports of entry, which facilitates quarantine policies and contact tracing. Countries with long, permeable borders and more numerous ports of entry are likely to face greater challenges in enforcing these policies. The variable *interdictability* assimilates information from three variables that proxy the ability to tightly control borders and effectively monitor entrants at a limited number of entry ports: whether the country is an island state with no land borders, the (log of the) total length of a country's land borders, and the number of international airports. The variable *interdictability*, created using factor analysis, explains 91.4 percent of the common variance among the three variables (Eigenvalue = 1.84). Factor analysis determines whether the interrelationships between a set of manifest (i.e., observable and measurable) variables can be expressed by a smaller set of latent variables, or factors. Eigen decomposition yields orthogonal vectors (the latent variables) with corresponding eigenvalues quantifying the proportion of common variance in the correlation matrix explained by the factor (see Bollen 1989, 226–318); these latent variables can then be substituted into the regressions in place of the manifest variables. Using the inverse of the value renders interpretation more intuitive. These values range from –0.87 (the United States) to 2.65 (Iceland).

- *Experience with the Middle East Respiratory Syndrome (MERS) pandemic*. Experience dealing with previous pandemic outbreaks may have provided countries with learning opportunities that helped them refine and improve their pandemic response plans. MERS, a novel coronavirus that emerged in 2012, caused deadly outbreaks in 24 countries. South Korea was one of the countries hardest hit, with 186 confirmed cases and 38 deaths. The experience led the Korea Disease Control Prevention Agency (KDCA) to radically reform its policies regarding risk communication and contact tracing and to build forensic epidemiological capacity (Cho 2020). During the COVID-19 pandemic, Korea's response has been among the world's most effective, with COVID-related mortality kept to fewer than 4 deaths per 100,000 residents. The log of total MERS cases between 2012 and 2020 is used as a proxy for the MERS pandemic.
- *Percent elderly*. COVID-19 has had disproportional impacts on the elderly, with 78.2 percent of COVID-19 deaths in the United States occurring in people 65 and older. The heavy toll reflects both the general effects of aging and the higher likelihood of having other comorbidities, such as cardiovascular disease, diabetes, chronic respiratory disease, and hypertension (Gold et al. 2020).
- *Date of first case*. Several countries that were at the epicenter of the COVID-19 outbreak outside of China early on, including France, Italy, and Spain, were hit hard by the pandemic when understanding of its transmission vectors and treatment were embryonic. They did not have the chance to learn from other countries' responses to the virus. Countries in which the pandemic arrived later should have had better information with which to implement policies to reduce community spread and treat individual cases, both of which should have led to lower mortality.[6]
- *Early COVID-19 exposure*. In the same vein, countries with high levels of exposure in the early stages of the pandemic may experience systematically higher COVID mortality rates, because their populations fell ill before widespread testing was available and courses of treatment were better understood. Total new cases in the early stages of the global pandemic (March 1–14) per 100,000 residents is used as a proxy for early exposure.
- *Ethnic fractionalization*. Ethnic fractionalization—the degree of ethnic diversity in a society—may affect COVID-19 response via two channels. First, more ethnically diverse societies invest less in public goods and the provision of social services, a finding that emerges at a variety of levels of analysis, including cities and countries (Alesina, Baqir, and Easterly 1999; Habyarimana

6 The date of the first case is measured as the number of days between January 1, 2020 and the first confirmed case. Only China had confirmed cases as of December 31, 2019.

et al. 2007; Baldwin and Huber 2010). Second, greater ethnic diversity may undermine generalized trust—the belief that other individuals can be counted on to act in prosocial ways (Alesina and La Ferrara 2002, Nannestad 2008). For mask wearing and social distancing to be effective, individuals may need to believe that others will comply with these policies in order for it to be individually rational for them to do so. Where such trust is weak or absent, COVID mortality may be higher because of less compliance with public health measures.

- *Gini coefficient*. Greater economic inequality may increase COVID mortality through several channels, including underinvestment in public goods, higher comorbidities among a larger poor population with less access to health care, and greater pressure to avoid stay-at-home orders and work in at-risk environments in order to meet basic needs (Ahmed et al. 2020).
- *Obesity*. Higher levels of obesity may lead to higher COVID mortality, both because obesity itself is a comorbidity (Dietz and Santos-Burgoa 2020) and because obesity predisposes individuals to other comorbidities, including hypertension and cardiovascular disease (GBD 2015 Obesity Collaborators 2017).
- *Urbanization*. Theoretically, urbanization could be associated with higher or lower mortality from COVID-19. It could be associated with higher mortality because social distancing may be more difficult in denser environments and access to outdoor space is more limited. It could be associated with lower mortality because a larger share of the population lives near improved sanitation and health care infrastructure and is thus more likely to survive if infected (Vlahov and Galea 2002).
- *Population density*. At the subnational level, COVID-19 infection rates have been higher in more densely populated administrative districts because of higher contact rates between residents (Sy, White, and Nichols 2021; Bhadra, Mukherjee, and Sarkar 2021).
- *Population*. Some of the COVID-19 response success stories have been in less populous countries (New Zealand, Iceland, and Norway). This association comports with some studies of public health expenditures and life expectancy, which show that smaller states tend to be healthier (Easterly and Kraay 2000).

Several measures proxy ex ante pandemic preparedness and specific policy measures enacted to prevent COVID-19 spread. They include the following:

- *Pandemic preparedness*. Independent of the level of general government capacity, the ability of a public health systems to identify and respond to epidemic diseases and pandemic outbreaks varies. The Global Health Security Index uses 34 indicators and 85 sub-indicators to assess national capabilities to "address one of the world's most omnipresent risks: infectious disease outbreaks that can lead to international epidemics and pandemics" (JHU, NTI, and EIU 2019). Higher scores should be associated with lower COVID mortality.

- *Strength of early international travel restrictions*. Restrictions on international travel were significant determinants of early pandemic infection rates (Chinazzi et al. 2020); they are viewed as one of the key factors allowing New Zealand to maintain low COVID mortality despite lifting domestic mobility restrictions and having low vaccination levels. The initial decision to impose travel restrictions at the outset of the pandemic may have given countries more time during which to implement domestic responses.
- *Length and intensity of domestic mobility restrictions/enforced social distancing*. One of the more controversial responses to the pandemic has been the imposition of stay-at-home orders and curfews in order to reduce contact rates and slow community spread (Leffler et al. 2020). Enacted to slow community spread and ease stress on hospitals and healthcare providers, domestic mobility restrictions may suppress mortality.

## 4. MODEL SELECTION AND RESULTS

The outcome of interest is COVID mortality rates per 100,000 inhabitants as of May 28, 2021. Data are from the Johns Hopkins Coronavirus Research Center.[7] The mean for the OECD is 124.7, with a minimum value of 0.5 (New Zealand) and a maximum value of 303.5 (Hungary). Values are natural log transformed for analysis.[8]

When theoretical priors are weak, the number of potential covariates is large, and the number of observations is small ($n$ = 37), Bayesian model averaging (BMA) provides a framework for selecting a model (Raftery, Madigan, and Hoeting 1997). BMA estimates $2^k$ models, where $k$ is the number of potential covariates. In this case, 21 variables yield 2,097,152 unique combinations of covariates (table 1). The posterior inclusion probability (PIP) is the mean of all posterior probabilities for all specifications, including the particular variable. As a first approximation, it can be interpreted as the probability that the variable offers significant explanatory power and is robust to various model specifications. Conceptually, this approach is similar to other forms of sensitivity analysis (Sala-i-Martin 1997, Brock and Durlauf 2001, Steel and Ley 2007).[9]

7 See https://coronavirus.jhu.edu (accessed on May 28, 2021).

8 As a robustness check, I also analyzed COVID mortality data from the Institute for Health Metrics and Evaluation (IHME) (www.healthdata.org). The IHME corrects for potential underreporting by comparing the excess death rate during the pandemic week by week with what would have been expected based on past trends and seasonality. It also corrects for reductions in deaths thanks to lower mobility (which reduced the number of deaths from traffic accidents) in some countries and the lower incidence of other diseases, particularly influenza, thanks to mask wearing and social distancing. Results are similar to those reported here, with the exception of elderly as share of population, which emerges as potentially significant in the Bayesian model averaging. It was only marginally significant in the base regression model ($p$ < 0.1) and did not markedly improve model fit (see appendix C).

9 The least absolute shrinkage and selector operator (LASSO) regression was used as a robustness check to inform model selection. It returned eight potentially consequential (i.e., nonzero) coefficients: interdictability, the strength of early international travel restrictions, female head of government, the log of the number of MERS cases 2012–20, government effectiveness, the percent elderly in 2019, ethnic fractionalization, and additional deaths caused by obesity (see appendix table D.1). The LASSO model did not markedly improve model fit; of the additional variables, only the percent of elderly was statistically significant and associated with higher COVID mortality (see appendix table D.2).

Table 1
**Potential covariates of COVID mortality rates across the OECD: Results of Bayesian model averaging**

| *Variable* | *Coefficient* | *Standard error* | *t-score* | *Posterior inclusion probability* |
|---|---|---|---|---|
| Interdictability | -0.886 | 0.191 | -4.64 | 1.00 |
| Female head of government | -0.502 | 0.461 | -1.09 | 0.62 |
| Strength of international travel restrictions by February 15, 2020 | -0.154 | 0.159 | -0.97 | 0.56 |
| ln MERS cases, 2012–20 | -0.116 | 0.137 | -0.84 | 0.49 |
| Percent elderly, 2019 | 0.023 | 0.039 | 0.58 | 0.32 |
| Government effectiveness, 2019 | -0.198 | 0.409 | -0.48 | 0.26 |
| Ethnic fractionalization | 0.106 | 0.382 | 0.28 | 0.12 |
| ln GDP per capita, 2019 | 0.043 | 0.190 | 0.22 | 0.11 |
| Global Health Security Score | -0.002 | 0.007 | -0.22 | 0.10 |
| Additional deaths caused by obesity, 2017 | 0.001 | 0.003 | 0.24 | 0.09 |
| Date of first case | 0.000 | 0.004 | 0.09 | 0.08 |
| Total new cases as of March 1–15, 2000, per 100,000 residents | 0.000 | 0.001 | 0.19 | 0.08 |
| Survival versus self-expression values | 0.012 | 0.075 | 0.16 | 0.08 |
| ln population, 2019 | 0.004 | 0.037 | 0.11 | 0.07 |
| Liberal Democracy Score, 2019 | -0.029 | 0.392 | -0.07 | 0.07 |
| Length/intensity of domestic mobility restrictions | 0.020 | 0.125 | 0.16 | 0.07 |
| Gini coefficient, 2019 | -0.153 | 0.930 | -0.16 | 0.07 |
| Federal system | 0.015 | 0.098 | 0.15 | 0.07 |
| Urbanization, 2019 | -0.052 | 0.377 | -0.14 | 0.06 |
| Traditional versus rational/secular values | -0.004 | 0.055 | -0.08 | 0.06 |
| Population density, 2018 | 0.000 | 0.000 | 0.05 | 0.05 |

Note: The 21 variables yield 2,097,152 unique combinations of covariates.
*Source:* Author's calculations.

Applying BMA to 21 potential covariates, the analysis identifies 4 variables as more likely than not (PIP > 0.5) to be robust covariates of COVID mortality rates: interdictability, the strength of international travel restrictions enacted by February 15, 2020, female head of government, and experience with the MERS pandemic.[10] Variables intended to proxy government capacity, both generally and

10 ln MERS cases 2012–20 barely misses the 0.5 threshold (0.49) and is included.

specifically to address pandemic disease and public health crises; government effectiveness; and performance on the Global Health Security Index were not robust covariates of COVID mortality rates.

An ordinary least squares (OLS) regression including these four variables was run to estimate a model of COVID mortality across the OECD. Table 2 reports the results for OLS specifications with robust standard errors (model 1), robust regression (model 2), and models excluding New Zealand, a potentially highly influential case with COVID mortality an order of magnitude lower than the next best-performing country (models 3 and 4). Of the four variables, three perform consistently across specifications: interdictability, the strength of international travel restrictions, and female head of government. (Experience with the MERS pandemic attained only weak statistical significance in a single specification [model 1].) Moreover, these simple models fit the data well, with $R^2$ values ranging from 0.703 to 0.781.

Table 2
**Regression estimates of COVID mortality rates across the OECD**

| | **(1)** | **(2)** | **(3)** | **(4)** |
|---|---|---|---|---|
| ***Variable*** | ***Ordinary least squares (OLS) with robust standard errors*** | ***Robust regression*** | ***OLS with robust standard errors, excluding New Zealand*** | ***Robust regression, excluding New Zealand*** |
| Interdictability | -0.859*** | -0.850*** | -0.806*** | -0.811*** |
| | (0.163) | (0.133) | (0.165) | (0.119) |
| Strength of international travel restrictions by February 15, 2020 | -0.230* | -0.237** | -0.224* | -0.179** |
| | (0.122) | (0.095) | (0.124) | (0.080) |
| Female head of government | -0.854** | -0.672** | -0.785** | -0.434* |
| | (0.345) | (0.255) | (0.357) | (0.221) |
| ln MERS cases, 2012–20 | -0.200* | -0.121 | -0.193 | -0.086 |
| | (0.115) | (0.078) | (0.119) | (0.066) |
| Constant | 4.949*** | 4.901*** | 4.943*** | 4.856*** |
| | (0.106) | (0.148) | (0.108) | (0.125) |
| Observations | 37 | 37 | 36 | 36 |
| *R*-squared | 0.775 | 0.781 | 0.703 | 0.753 |

Note: Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
*Source:* Author's calculations.

The primacy of interdictability is striking. It is highly statistically significant across specifications and in the expected direction: Greater interdictability is associated with lower COVID mortality. Interdictability also explains the most variation in COVID mortality, with a simple bivariate regression model having an $R^2$ of 0.6. Holding other variables constant, moving from the lowest interdictability score (the United States) to the median value is associated with a 39 percent decrease in expected COVID mortality (177.2 versus 109.1, based on model 2).

Of the seven OECD countries that kept COVID-related mortality to fewer than 20 deaths per 100,000 inhabitants, four are islands (New Zealand, Australia, Japan, and Iceland).[11] A fifth, South Korea, might as well be: It is separated from the rest of Asia by North Korea, and the demilitarized zone between the two countries is the world's most heavily fortified and least traversed border. The other two countries, Finland and Norway, are the only countries with long land borders. But both are curious cases. The Finnish-Norwegian border is entirely above the Arctic Circle, and the Norwegian-Swedish border lies along the vast Scandes mountain range. These regions are incredibly sparsely populated, with population densities similar to Alaska's. Finland's border with Russia extends farther south into more populated areas, but border crossings can occur only at designated checkpoints and require visas under most circumstances.

In contrast to the results of Windsor et al. (2020), this paper finds that countries with female heads of government are associated with lower COVID mortality: Holding values for other variables constant at their means, female-headed countries experienced about half the mortality of male-headed countries (97.6 versus 49.9). At 140.5, the COVID mortality rate in Sweden—the only Nordic country with a male executive—is three times higher than that of the next-highest Nordic country (Denmark, at 43.2).

Why countries headed by women performed better is unclear. It could be that female leaders prioritize and act differently from male leaders. Harder and Harder (2020) find that OECD countries with female heads of government enacted maximum shutdown measures earlier than did countries led by men.

It could be also that women become heads of government in the types of countries that are more likely to follow best practices in COVID-19 containment. The OECD countries with female heads of government (Denmark, Finland, Germany, Iceland, Lithuania, New Zealand, Norway, and Switzerland[12]) are some of the most progressive countries in the world in terms of gender equality and human development, and they have some of the most secular-rational value systems. The worldviews of their populaces are more science based than those of other countries, which may promote individual-level adherence to best practices of mask wearing, compliance with lockdowns, and social distancing (Brzezinski et al. 2020). Windsor et al. (2020) find support for this cultural argument in a broader sample of countries and argue that the perceived effect of female heads of government reflects these values, not the presence of a female executive per se. However, cultural values did not emerge as highly consequential in the

11 This pattern is evident in US states as well: Hawaii has had the lowest COVID-related mortality of all 50 states and the District of Columbia, with a mortality rate roughly on par with that of Denmark (www.beckershospitalreview.com/public-health/us-coronavirus-deaths-by-state-july-1.html).

12 Switzerland had a female president, Simonetta Sommaruga, in 2020. A man, Guy Parmelin, assumed the presidency in January 2021. However, the Swiss presidency rotates among members of the Federal Council on a "first among equals" basis every year, and the Swiss president has no formal powers above and beyond those of the council itself.

model selection process: Neither survival versus self-expression values nor traditional versus rational/secular values emerged as potentially consequential in the BMA analysis.

The strength of early travel restrictions also emerges as statistically significant, although the effect is less robust across specifications. Nine countries—including New Zealand, South Korea, Japan, and Finland—imposed blanket bans on arrivals from certain regions, in particular China, by February 15, 2020, and had low mortality rates. However, the Czech Republic and Italy also imposed such restrictions, and both have had COVID mortality above 200 per 100,000 inhabitants. Still, the difference between no early restrictions and regional bans is significant (table 2, model 1), essentially halving COVID mortality (104.3 per 100,000 among countries with regional bans versus 51.3 per 100,000 inhabitants with no early restrictions).

The regression models actually underestimate the effect of interdictability, because interdictability is a significant determinant of whether international travel restrictions were adopted at an early stage. Table 3 presents logistic regression estimates of whether OECD countries had instituted international travel restrictions by February 15, 2020. Interdictability emerges as the most important variable, suggesting that the decision was in part related to feasibility. The probability of a country instituting international travel restrictions doubles for a country in the 75th percentile of interdictability (Denmark) relative to the 25th percentile (Turkey or Austria). The only other variables that consistently explain international travel restrictions are liberal democracy, which is associated with a lower likelihood of instituting bans, and previous deaths from MERS.

Table 3
**Logistic regression estimates of instituting international travel restrictions across the OECD by February 15, 2020**

| *Variable* | *Strength of international travel restrictions by February 15, 2020* |
|---|---|
| Liberal Democracy Score, 2019 | –5.961** (2.393) |
| Interdictability | 1.980*** (0.491) |
| ln MERS cases, 2010–20 | 1.217*** (0.406) |
| Constant | 2.551 (1.595) |
| Observations | 37 |

Note: Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
*Source:* Author's calculations.

## 5. DISCUSSION AND CONCLUSION

These results point to sobering conclusions. In a world of recurrent COVID-like pandemics, effective response will require enacting quick constraints on global human mobility. To date, the evidence on the effectiveness of travel restrictions has been highly heterogeneous, in part because travel bans were often implemented in concert with other public health interventions and because the timing of bans greatly affects their effectiveness (Movsisyan et al. 2021). Effectiveness appears to have been greatest when the restrictions were imposed during the early phase of the pandemic, before community spread had occurred (Movsisyan et al. 2021).

The results also suggest that geography is largely destiny: Countries with geographic advantages in interdiction that acted quickly to restrict border crossings were able to avoid mass COVID-related mortality. Implementing travel bans is amenable to policy adoption and learning; geography is not. In a pandemic with repeated waves, which test patience and individual willingness to bear the costs of isolation, governance capacity and wealth do not insulate populations from the effects of the disease.

Standard political, economic, and demographic factors do not appear to have affected the success of the COVID-19 response. There is relatively little correlation ($\rho$ = –0.30) between GDP per capita and COVID mortality rates. Wealthier countries have not been healthier countries with respect to COVID-19. Italy and its European neighbors were ground zero for the first wave of the epidemic in Europe, which caught public health systems off guard. But even countries that had much more time to plan a response, such as the United States, Mexico, and Chile, performed poorly.

The COVID-19 experience has put the lie to many beliefs about which countries would be best positioned to address a pandemic. Indeed, a 2019 expert assessment by Johns Hopkins, the Nuclear Threat Initiative, and the Economist Intelligence Unit ranked the United States and the United Kingdom—which have been among the poorest performers in saving lives—as best prepared to weather a pandemic.

Decisiveness—or lack thereof—seems to have been rewarded or punished electorally. Baccini, Brodeur, and Weymouth (2021) and Noland and Zhang (2021) find large effects of COVID-19 deaths on county-level changes in Donald Trump's vote share between 2016 to 2020. Baccini, Brodeur, and Weymouth estimate that Trump likely would have won reelection had COVID mortality been 5 percent lower. Noland and Zhang estimate that Trump would have won the Electoral College had COVID mortality been 30 percent lower. In New Zealand, Prime Minister Jacinda Ardern's Labour Party won in a landslide in October 2020, with her party receiving its largest vote share in 50 years. In South Korea, President Moon Jae-in's Democratic Party and its satellite parties outperformed pre-COVID-19 polling in the 2020 legislative election, winning an unexpectedly large majority. Given the clear advantage women-headed governments have had in pandemic response, it would not be surprising to see female political candidates begin actively campaigning around issues related to public health and pandemic response.

COVID-19 has been particularly unsparing to already marginalized populations: the elderly, people who are socially marginalized because of race and/or economic status and people with preexisting conditions (Imam et al.

2020, Sanyaolu et al. 2020). A pandemic with more dire consequences for otherwise healthy, working-age adults or children might be a catalyst for more decisive, sweeping policy responses.

The success of countries like South Korea and Japan has provided a playbook: Travel and mobility restrictions, contact tracing, and widespread mask wearing and social distancing worked. But that playbook has to be implemented, and not all countries are equally well-positioned or willing to do so.

Longitudinal work on case fatality rates and the effectiveness of mask wearing and other interventions suggests a playbook for dealing with future pandemics with similar vectors of transmission. However, it is disconcerting the degree to which geography matters and other standard political economy, demographic, and policy-based explanations do not.

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## APPENDIX A

This appendix provides descriptions of the data, data sources, and descriptive statistics.

Table A.1
**Variables included in the analysis**

| *Variable* | *Source* | *Mean* | *Standard deviation* | *Notes* |
|---|---|---|---|---|
| COVID mortality per 100,000 residents | JHU Coronavirus Resource Center | 124.7 | 79.6 | |
| ln COVID mortality per 100,000 residents | JHU Coronavirus Resource Center | 4.4 | 1.3 | |
| Adjusted COVID mortality per 100,000 residents | Institute for Health Metrics and Evaluation | 196.5 | 137.4 | |
| Interdictability | Author's calculations based on factor analysis in appendix B; data on international airports from Wikipedia; on land border from CIA World Factbook | 0.0 | 0.9 | |
| Female head of government | Author's coding | 0.2 | 0.4 | |
| Strength of international travel restrictions by February 15, 2020 | Oxford COVID-19 Government Response Tracker (OxCGRT) | 0.9 | 1.3 | 0 (no restrictions); 1 (screening of arrivals); 2 (quarantining of arrivals from some or all regions); 3 (ban on arrivals from some regions); 4 (ban on arrivals from all regions or total border closure). |
| ln MERS cases, 2012–20 | European Centre for Disease Prevention and Control (ECDC) | 0.9 | 1.4 | |
| Percent elderly, 2019 | World Bank | 17.6 | 4.2 | |
| Government effectiveness, 2019 | World Bank | 1.2 | 0.6 | |
| Date of first case | Author's calculations | 48.5 | 16.8 | Number of days between January 1, 2020 and first case. |
| Early new cases per 100,000 residents | Our World in Data, 2021 | 65.1 | 93.8 | |
| Ethnic fractionalization | Alesina et al. (2003) | 0.3 | 0.2 | |
| ln GDP per capita, 2019 | World Bank | 10.4 | 0.7 | |
| Global Health Security Score | JHU-NTI-EIU (2019) | 61.2 | 9.9 | |

| *Variable* | *Source* | *Mean* | *Standard deviation* | *Notes* |
|---|---|---|---|---|
| Additional deaths per 100,000 caused by obesity, 2017 | Global Health Data Exchange (GHDx) | 52.5 | 24.8 | |
| Survival versus self-expression values | Inglehart (1990) | 0.0 | 1.0 | |
| Federal system | Author's calculations | 0.14 | 0.07 | |
| Traditional versus rational/ secular values | Inglehart (1990) | 0.0 | 1.0 | |
| Gini coefficient, 2019 | Organization for Economic Cooperation and Development | 0.32 | 0.06 | |
| Liberal Democracy Score, 2019 | Varieties of Democracy (V-Dem) Project | 0.72 | 0.15 | |
| Length/intensity of domestic mobility restrictions | OxCGRT | 0.9 | 0.4 | 0 (no measures); 1 (recommend not leaving house); 2 (require not leaving house with exceptions for daily exercise, grocery shopping, and "essential" trips); 3 (require not leaving house with minimal exceptions [e.g., allowed to leave once a week or only one person can leave at a time]).<br>Value is daily average for the country February 15, 2020. |
| Urbanization, 2019 | World Bank | 0.8 | 0.1 | |
| ln population, 2019 | World Bank | 2.7 | 1.4 | |
| Population density, 2018 | World Bank | 139.0 | 140.8 | |

## APPENDIX B

This appendix reports the results of the factor analysis used to construct the interdictability variable used in the analysis. The variable corresponds to Factor 1, which explains 91 percent of the common variance among the three variables: whether the country is an island state with no land borders, the (log of the) length of a country's land borders, and the number of international airports.

Table B.1
**Factor analysis for creating interdictability variable**

| *Observations: 37*<br>*Retained Factors: 2* | | | | |
|---|---|---|---|---|
| ***Factor*** | ***Eigenvalue*** | ***Difference*** | ***Proportion*** | ***Cumulative*** |
| 1 | 1.84 | 1.57 | 0.91 | 0.91 |
| 2 | 0.27 | 0.36 | 0.13 | 1.05 |
| 3 | -0.09 | | -0.05 | 1.00 |
| Factor loadings and unique variances | | | | |
| ***Variable*** | ***Factor 1*** | ***Factor 2*** | ***Uniqueness*** | |
| Island state | -0.94 | 0.19 | 0.08 | |
| ln length of land borders | 0.96 | 0.09 | 0.07 | |
| International airports | 0.20 | 0.47 | 0.74 | |

Note: $Chi^2$: 76.83, Prob > $chi^2$ = 0.0000.
*Source:* Author's calculations.

## APPENDIX C

This appendix replicates the analysis presented in table 2, using COVID-19 mortality data from the Institute for Health Metrics and Evaluation (IHME) (http://www.healthdata.org). The IHME corrects for potential underreporting by comparing the excess death rate during the pandemic week by week with what would have been expected based on past trends and seasonality. It also corrects for reductions in deaths thanks to lower mobility (which reduced the number of deaths from traffic accidents) in some countries and the lower incidence of other diseases, particularly influenza, thanks to mask wearing and social distancing.

Table C.1
**Regression estimates of COVID mortality rates across the OECD using data from the Institute for Health Metrics and Evaluation (IHME)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| ***Variable*** | ***Ordinary least squares (OLS) with robust standard errors*** | ***Robust regression*** | ***OLS with robust standard errors excluding New Zealand*** | ***Robust regression, excluding New Zealand*** |
| Interdictability | -0.797*** | -0.952*** | -0.708*** | -0.624*** |
| | (0.226) | (0.167) | (0.234) | (0.171) |
| Strength of international travel restrictions February 15, 2020 | -0.274** | -0.295** | -0.264* | -0.234* |
| | (0.127) | (0.120) | (0.130) | (0.116) |
| Female head of government | -0.916** | -0.527 | -0.800* | -0.725** |
| | (0.426) | (0.320) | (0.416) | (0.319) |
| ln MERS cases, 2012–20 | -0.229* | -0.142 | -0.217 | -0.087 |
| | (0.133) | (0.098) | (0.139) | (0.095) |
| Constant | 5.434*** | 5.318*** | 5.425*** | 5.366*** |
| | (0.146) | (0.186) | (0.145) | (0.180) |
| Observations | 37 | 37 | 36 | 36 |
| $R$-squared | 0.692 | 0.736 | 0.598 | 0.560 |

Note: Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
*Source:* Author's calculations.

## APPENDIX D

This appendix presents the results of the robustness check, conducted using a least absolute shrinkage and selector operator (LASSO) regression as an alternative to Bayesian model averaging for informing the model selection. Of the 21 potential covariates, the LASSO model selected 8 for potential inclusion (table D.1).

Table D.1
**Least absolute shrinkage and selector operator (LASSO) regression estimates for COVID mortality rates**

| ***Variable*** | ***Coefficient*** |
|---|---|
| Interdictability | -0.764 |
| Strength of international travel restrictions by February 15, 2020 | -0.220 |
| Female head of government | -0.633 |
| ln MERS cases, 2012–20 | -0.138 |
| Government effectiveness, 2019 | -0.411 |
| Percent elderly, 2019 | 0.077 |
| Ethnic fractionalization | 0.876 |
| Additional deaths caused by obesity, 2017 | 0.001 |
| Constant | 3.687 |

*Source:* Author's calculations.

The LASSO-informed models do not markedly improve model fit ($R^2$ 0.822 vs. 0.775, comparing table D.2 model 1 and table 2 model 1), and the inclusion of the additional variables renders travel restrictions and female head of government only weakly significant (3 of 4 specifications). Of the additional included variables, only percent elderly emerges as potentially significant and in the expected direction, with older populations experiencing higher COVID-related mortality. The BMA-derived models are more parsimonious than the LASSO-derived models, and they are effectively equal in goodness of fit.

Table D.2
**Regression estimates of COVID mortality based on least absolute shrinkage and selector operator (LASSO) model**

| | **(1)** | **(2)** | **(3)** | **(4)** |
|---|---|---|---|---|
| ***Variable*** | ***Ordinary least squares (OLS) with robust standard errors*** | ***Robust regression*** | ***OLS with robust standard errors excluding New Zealand*** | ***OLS with robust standard errors excluding New Zealand*** |
| Interdictability | -0.764***<br>(0.187) | -0.850***<br>(0.147) | -0.673***<br>(0.188) | -0.919***<br>(0.123) |
| Strength of international travel restrictions by February 15, 2020 | -0.220*<br>(0.113) | -0.194*<br>(0.0993) | -0.213*<br>(0.114) | -0.0752<br>(0.0755) |
| Female head of government | -0.633**<br>(0.295) | -0.520*<br>(0.298) | -0.510*<br>(0.283) | -0.152<br>(0.237) |
| ln MERS cases, 2012–20 | -0.138<br>(0.110) | -0.0805<br>(0.0883) | -0.120<br>(0.113) | -0.110<br>(0.0678) |
| Government effectiveness, 2019 | -0.411<br>(0.253) | -0.339<br>(0.285) | -0.448*<br>(0.256) | -0.230<br>(0.217) |
| Percent elderly, 2019 | 0.077**<br>(0.029) | 0.054*<br>(0.030) | 0.077**<br>(0.03) | 0.045*<br>(0.023) |
| Ethnic fractionalization | 0.876<br>(0.575) | 0.255<br>(0.613) | 1.073*<br>(0.554) | 0.120<br>(0.478) |
| Additional deaths caused by obesity, 2017 | 0.001<br>(0.005) | -0.001<br>(0.006) | 0.001<br>(0.005) | -0.001<br>(0.004) |
| Constant | 3.687***<br>(0.779) | 4.240***<br>(0.705) | 3.644***<br>(0.775) | 4.241***<br>(0.535) |
| Observations | 37 | 37 | 36 | 36 |
| $R$-squared | 0.822 | 0.805 | 0.773 | 0.816 |

Note: Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
*Source:* Author's calculations.