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JEL Classification: N/A

Keywords: N/A

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Timothy Besley[†] Sacha Dray[‡]

March 21, 2022

Abstract

This paper studies the role of free media in the responsiveness of governments and the public during the COVID-19 pandemic. Using a panel data of daily COVID-19 deaths, mobility and lockdown decisions for all countries, we show that, as the initial number of deaths increased, governments were more likely to impose a lockdown and citizens reduced their mobility. To account for inaccuracies in death reporting, we simulate deaths from a calibrated SEIR model as an instrument for reported deaths. Using this approach, we find that responsiveness to deaths was limited to governments and citizens in free-media countries, and responsiveness account for 40% of the difference in lockdown decision and mobility between free-media and censored-media countries. In support of the role of free media, we show that differences in responsiveness are not explained by a range of other country characteristics such as the level of income, education or democracy. We also find evidence that citizens with access to free media were better informed about the pandemic and had more responsive levels of online searches about COVID-19.

Keywords: COVID-19, lockdown, media freedom, responsiveness
JEL Codes: D72, D78, L82

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Introduction

The COVID-19 pandemic has highlighted the importance of responsiveness and access to truthful information during a public health crisis. Timely responses have been crucial to halt the spread of the virus by limiting community transmission and avoiding health system saturation. At the same time, knowledge of local peaks in infections was central to tailor responses to changes in circumstances such as the emergence of new variants. Non-pharmaceutical interventions, and in particular lockdowns, are dependent on responsiveness and access to trustworthy information for their effectiveness as they require widespread compliance.

This paper studies the role of free media in affecting lockdown decisions and social distancing during the early phase of the pandemic. We provide a conceptual framework and supporting evidence to motivate why free media increases responsiveness. Conceptually, free media makes citizens better informed about the severity of the pandemic, which can affect their compliance and the decision by governments to impose lockdowns.

We use a panel data of daily reported deaths, lockdown decisions and mobility trends during the initial phase of the pandemic (December 1 - May 1, 2020) in all countries affected by COVID-19. We measure government responsiveness as changes in the decision to impose a lockdown in response to an increase in COVID-19 deaths. Citizen responsiveness is measured as reduced mobility during lockdowns when COVID-19 deaths increase.[1]

Although deaths statistics are not the only trigger that could motivate governments and citizens to act, they were a salient indicator of the severity of the outbreak, especially in the early period with shortages of testing. That said, there are reasons to think that they are somewhat imprecise reflecting the competence of government and any incentive to misreport deaths for political reasons. Given the role of the media in reporting on COVID-

[1] Responsiveness to a crisis is characterized by the speed and magnitude of the economic policy response, uncertainty about the nature of the threat and the importance of individual compliance. See Besley (2020) for a general discussion of government responsiveness and preparedness.

19 and avoiding misinformation[2], we expect both death reporting and responsiveness to the pandemic to vary depending on whether countries have free or censored media.

We begin by documenting responsiveness to COVID-19 deaths. We show that a doubling of deaths early in the pandemic was associated with a 15.5 percentage points (p.p.) increase in the likelihood of imposing a lockdown by governments, as well as a 6 p.p reduction in time spent outside and a 2.8 p.p. increase in time at home during lockdowns by citizens. We find a similarly large level of responsiveness across all types of mobility, for alternative definitions of media freedom and death statistics, and when looking at responsiveness to cases instead of deaths.

To address concerns about misreporting of deaths, we develop an IV approach using simulated deaths from a calibrated Susceptible-Exposed-Infected-Recovered (SEIR) model as an instrument for reported death. To do so, we use a popular epidemiological model developed by Noll et al. (2020) and widely used at the time.[3] This model includes with age-specific parameters and several categories of infectious severity. The model has a range of inputs including population and age distribution, estimates of the spread and intensity of the disease from Noll et al. (2020), as well as country-level calibrated parameters of the initial time of the outbreak, basic reproduction number R_0, and healthcare capacity.[4]

We provide evidence that simulated deaths from the SEIR model are a good benchmark for the evolution of mortality in the initial phase of the pandemic, and serve as a valid instrument for reported deaths. The identification strategy requires that simulated deaths are exogenous to media freedom and lockdown decisions. In support of these assumptions, we show that the inputs used in the SEIR model are unrelated to the me-

[2]See e.g. Mian and Khan (2020) and Brennan et al. (2020). Fetzer et al. (2020) report that the majority of respondents find factual information provided by their government on COVID-19 to be untruthful based on an international survey of 73 countries conducted between March 29 and April 7, 2020.

[3]The website used to generate simulations from their model had on average 8 thousand page loads per day between March and May 2020 (Noll et al. (2020).)

[4]We take calibrated parameters from epidemiological simulations by Noll et al. (2020) and Walker et al. (2020). See full details on the SEIR model in Appendix Section D.

dia status of a country and that, as expected by construction[5], death simulations are not affected by actual decisions in response to the pandemic.

The IV results show that *only* free-media countries are responsive to COVID-19 deaths. Specifically, citizens in free-media countries tend to reduce their time outside and increase time at home after COVID-19 death spikes, while we find no significant relationship between deaths and mobility in censored-media countries. We also find that governments in free-media countries are more likely to impose a lockdown following an increase in COVID-19, although the difference is not statistically significant. As a robustness test, we obtain similar results using excess mortality as an indicator of the true death toll of COVID-19 for a subset of 39 countries. Using a decomposition exercise to attribute differences in lockdown decisions and mobility between free- and censored-media countries, we find that responsiveness to deaths accounts for more than 40% of the difference in mobility and lockdown, and was quantitatively more important than the number of deaths in explaining mobility differences between free- and censored-media countries.

We then provide evidence that free media was an important mechanism behind higher responsiveness through the provision of information. First, we show that differences in responsiveness cannot be explained by other country characteristics such as income, education or democracy using a similar empirical strategy as described above. Second, we provide evidence from online searches that citizens in free-media countries were both better informed about the pandemic and more responsive in their COVID-19 online searches (they tended to increase their online searches for COVID-19 as deaths increased). This is consistent with responsiveness caused by being better informed about changes in health risks.

Although the context is specific, this paper relates to several existing strands of related literature. First, this paper contributes to a studies that explore drivers of government effectiveness. Authors such as Acemoglu and Robinson (2012) have emphasised differ-

[5] Our simulations do not take as input actual mitigation strategies by countries.

ences in institutions, while Glaeser et al. (2007) focus on the importance of education. It is well known that there are large differences in observable measures of government quality across the world (La Porta et al. (1999)). Besley and Persson (2011) draws attention to how this reflects incentives to invest in state capacities, including public health systems. Related to this, is a large body of literature that has studied how political institutions shape policy incentives (e.g., Persson and Tabellini (2002)), in particular how health outcome are impacted by political institutions (Besley and Kudamatsu (2006); Kudamatsu (2012)) as well as a wider range of societal, political and economic factors as argued by Case and Deaton (2020) in the case of the United States.[6]

Second, the paper contributes to the growing literature on media and politics as reviewed, for example, by Coyne and Leeson (2009), Prat and Strömberg (2013), and Strömberg (2015). It is increasingly recognised that democratic accountability is enhanced when citizens have better information (e.g., Maskin and Tirole (2004); Besley (2006); Ferraz and Finan (2011); Snyder Jr and Strömberg (2010)). Within this line of work, our findings are most closely related to Besley and Burgess (2002) and Eisensee and Strömberg (2007) who focus on how media make governments more responsive to shocks which ties in with debates about how democracy and free media have reduced the incidence of famine in India (Sen (1981)).

Third, the paper is linked to work on censorship and media bias. The fact that media freedom is sometimes censored is not an accident since, as discussed in, for example, Besley and Prat (2006), there are incentives for governments to silence the media in order to retain power. Such activities have been linked to media ownership patterns by Djankov et al. (2003). There are also reasons to believe that citizens sometimes receive biased and distorted views from media coverage (Mullainathan and Shleifer (2005); Gentzkow and Shapiro (2006); DellaVigna and Kaplan (2007)), including in the case of COVID-19 (see Bursztyn et al. (2020)) and attention has recently switched to role of social media in prop-

[6] Bosancianu et al. (2020) finds that governments with high levels of state capacity and responsiveness report the greatest death burdens from COVID-19, consistent with our findings on death reporting.

agating and perpetuating misinformation (Allcott et al. (2019); Enikolopov et al. (2011)).

Finally, we contribute to three recent developments in the emerging literature on the economic analysis of COVID-19 pandemic. First, several studies have documented the importance of social norms and trust in compliance with social distancing (Bargain and Aminjonov (2020); Barrios et al. (2021); Bazzi et al. (2021); Besley and Dray (2021); Campos-Mercade et al. (2021); Durante et al. (2021); Hensel et al. (2022)). For instance, Bargain and Aminjonov (2020) show that high-trust countries had higher levels of compliance with social distancing, and more efficiency of policy stringency. We contribute to this line of inquiry by highlighting the independent role of access to free media in increasing compliance with social distancing in response to higher COVID-19 mortality. Second, we contribute to documenting the role of (mis)information during the COVID-19 pandemic (Bursztyn et al. (2020); Mian and Khan (2020)). Our study is consistent with the idea that access to free media improved awareness of COVID-19 risks and increased public responsiveness during a public health crisis. Third, we contribute to the overall economic analysis of government responses to COVID-19. Early contributions by Acemoglu et al. (2020), Alvarez et al. (2020), Besley (2020) and Kaplan et al. (2020) integrate insights from economic and epidemiological models to study lockdowns. The economic cost of lockdowns has been studied using high-frequency financial market data in Carvalho et al. (2020) and Surico and Galeotti (2020), and consumption data in Coibion et al. (2020), while Brodeur et al. (2021a) uses internet searches to measure the impact of lockdowns on well-being.[7] We contribute by highlighting the importance of responsiveness by both governments and citizens on the dynamics of the pandemic.

The remainder of the paper is organised as follows. Section 1 presents the data and some core facts. Section 2 presents evidence on responsiveness to deaths in free-media and censored-media countries. Section 3 describes additional results and empirical support for the role of free media to inform citizens about the spread of COVID-19. Section

[7] Brodeur et al. (2021b) provides an early review on the economic consequences of COVID-19.

4 concludes. We describe additional results and provide a theoretical framework to motivate the empirical findings in the Appendix.

1 Data

This section presents the data used in the empirical analysis regarding reported and simulated COVID-19 deaths, lockdown decisions, mobility and search trends, and media characteristics.

Death statistics and lockdown Data on COVID-19 deaths come from the European Centre for Disease Prevention and Control (ECDC) and are based on national reports, mainly from health authorities. The ECDC collects and harmonises these reports on a daily basis worldwide. We focus on deaths as this is the most comparable statistics across countries. Data on lockdown decisions by countries comes from Lejeune (2020). We consider that a country is under a lockdown when national measures restricting movements are in place at a national level for at least part of the day.

Simulated SEIR Deaths We simulate daily COVID-19 deaths for each country using a SEIR model developed by Noll et al. (2020). Compared to the "standard" SIR model, our simulation includes a category for the exposed and allows for differences in healthcare availability and vulnerability of countries. Specifically, it takes as parameters the number of available hospital and beds and intensive care units (ICUs), has additional categories of infectious individuals for those that are infectious but not hospitalised, hospitalised and hospitalised in critical care, and allows for age-specific transition rates. The inputs into the model include epidemiological parameters that are common across countries, hypothetical mitigation dates calibrated by income group, and epidemiological estimates to predict the initial onset of outbreaks and basic reproduction number in each country.[8]

[8] We use epidemiological parameters for the length of infectious period, length of hospital stay, length of ICU stay and severity of ICU overflow, and country-specific estimates of reproduction R_0, as well as

Further details on the calibration of the SEIR model can be found in Appendix Section D.

The SEIR model allows us to generate a simulated death toll due to the spread of COVID-19 infections in each country over time. We use this measure as an instrument for the evolution of mortality for reported mortality and may help to deal with concerns that death rates are inaccurate due either to incompetent or deliberately misleading reporting.

Mobility trends Data on mobility trends comes from Google Community Mobility reports.[9] Mobility trends refer to changes in visits and length of stay at different places after lockdown compared to a median value, for the corresponding day of the week, during the 5-week period from January 3rd to February 6th, 2020. We normalise baseline mobility to be 0, so that a value indicates a percentage change in mobility compared to baseline. We focus on mobility trends after governments implemented a lockdown to capture compliance with lockdown measures.

Media freedom Media freedom is measured using data from the Varieties of Democracy project[10], which calculates a freedom of expression and alternative sources of information index which comprises: (i) the extent to which a government respects press and media freedom,(ii) the freedom ordinary people to discuss political matters at home and in the public sphere, and, (iii) the freedom of academic and cultural expression. It is based on indicators for media censorship effort, harassment of journalists, media bias, media self-censorship, print/broadcast media critical and print/broadcast media perspectives, freedom of discussion for men/women, and freedom of academic and cultural expression. We classify a country as having free media if it has a score above the median score

estimated initial size and date of the outbreak from Noll et al. (2020). The number of hospital beds and intensive care units (ICUs) is estimated by Walker et al. (2020) which uses data from the World Bank and a systematic review. We account for mitigation interventions by governments using the average lockdown date by income group as the starting date and hypothesize that these measures reduce social contact rates by 60% following enhanced social distancing scenarios discussed by Ferguson et al. (2020) and Walker et al. (2020).

[9] www.google.com/covid19/mobility/

[10] From www.v-dem.net.

of 0.7 out of 1. See Figure A3 for a list of countries according to their media freedom status. Free-media and censored-media countries differed in when they decided to impose lockdowns, and in the date of initial outbreak.[11]

As a robustness check, we also use the Media Freedom index from Freedom House[12] In addition, we use the World Press Freedom index.[13] We classify a country as having free media or free press if it has a score above or equal to 50 out of 100 on the corresponding index. These robustness results are discussed in Appendix Section E.

Search trends We measure trends in internet searches about COVID-19 using Google search trends. Search trends indicate the share of Google searches including one of the following terms: "covid", "coronavirus", "covid19", "COVID-19", "covid 19", "ncov" , or "nCoV2019". Daily national search trends are normalised to be relative to the COVID-19 search share in the United States on January 30, 2020.[14] Any value therefore indicates the percentage change in search share compared to that baseline.

2 Evidence of Responsiveness and Role of Free Media

The core results on responsiveness focus on governments' decision to impose a lockdown in response to an increase in reported deaths along with citizens' compliance with such

[11] Table A1 presents summary statistics for free-media and censored-media countries using a balanced panel of all countries with reported deaths statistics from COVID-19 between December 1st, 2019 and May 1st, 2020. We report average country characteristics, COVID-19 infections and mortality, lockdown and mobility changes by media freedom status.

[12] From www.freedomhouse.org. The score is from index D1 which assesses the extent to which there are free and independent media. Media in this case refers to all relevant sources of news and commentary—including formal print, broadcast, and online news outlets, as well as social media and communication applications when they are used to gather or disseminate news and commentary for the general public.

[13] From www.rsf.org. This scores the degree of freedom available to journalists in 180 countries using both the survey responses of experts and quantitative data on abuses and acts of violence against journalists during the period evaluated. The criteria evaluated in the questionnaire are pluralism, media independence, media environment and self- censorship, legislative framework, transparency, and the quality of the infrastructure that supports the production of news and information.

[14] On January 30, 2020, the WHO announced that COVID-19 was a Public Health Emergency of International Concern.

lockdowns.[15] We think of publicly available data on COVID-19 deaths as informing beliefs about the severity of the outbreak. And we look at how citizens comply with lockdown measures using data on daily mobility trends. We expect countries with free media to be be more responsive to deaths than censored-media countries.[16] All specifications will include country fixed effects, outbreak $\times$ time fixed effects and the global number of COVID-19 deaths.

2.1 OLS results

The empirical analysis aims to capture the determinants of the lockdown decision, as well as private compliance with lockdowns. We first report estimates of responsiveness using the following OLS specification:

$$Y_{it} = \alpha_i + \delta_{tM} + \beta D_{it} + \gamma D_{it} \times M_i + \varepsilon_{it} \tag{1}$$

The outcome of interest Y is either the government decision to impose a lockdown or mobility changes during periods of lockdown. M_i indicates whether a country enjoys media freedom. We denote α as country fixed effects, and δ are media-specific outbreak time fixed effects that are dummies for each day since a country reached a total of 10 deaths to pick up a typical progression of the disease across free-media and censored-media countries.[17] Further, The coefficient β estimates the magnitude of government and citizens responsiveness to deaths. Given our theoretical framework, we also expect responsiveness to be heterogeneous across free-media and censored-media countries, which is captured by γ. We also include country fixed effects, and outbreak time fixed effects which is the

[15]Appendix B presents a conceptual framework on lockdown decisions and compliance that formalizes the idea that free media provides information on health risks.

[16]This argument is formalized in the model presented in Appendix B

[17]Given significant differences in the timing of outbreaks between free- and censored-media countries, we allow these indicators to vary by media status.This allows us to capture the fact that outbreaks occurred at significantly later dates in censored-media countries (close to 13 days later, see Table A1). We report results without these flexible fixed effects in Appendix E

time since the first 10 cumulative deaths.

Table 1 reports our main estimates of responsiveness using the above OLS specification. We find evidence of responsiveness to COVID-19 deaths by both governments and citizens. As show in Column 1, a doubling of COVID-19 deaths is associated with a 15.5 percentage points increase in the likelihood of imposing a lockdown, which is statistically significant. Columns 2 to 8 provide evidence of responsiveness of citizens. We find that an increase is deaths is associated with significantly more reductions in mobility outside across all types of outside places, and more time spent at home (shown by an increase in time spent in residential areas). For both governments and citizens, we find no evidence of differences in responsiveness between free-media and censored-media countries using OLS results. This is shown by the absence of statistical significance for the point estimate of the interaction between log deaths and a country media freedom status.

2.2 IV results

We now explore an IV approach to deal with concerns about potential misreporting of deaths due to either differences in competence or government incentives to accurately report deaths. We use country-specific simulated deaths from a SEIR model as instrument for reported deaths; we first discuss the results and then provide evidence of the validity of the instrument.

Simulated deaths using SEIR model The OLS gives an unbiased estimate of the impact of reported deaths on government and citizen responsiveness if D_{it} is uncorrelated with the error term ε_{it}. There are two natural concerns with this assumption: measurement error and endogenous reporting of deaths by governments. Measurement error could come from the misattribution of the cause of death, a common problem while pandemics are ongoing, and would lead to an attenuation bias towards zero. In the case of endogenous death reporting, the direction of bias is not as clear *a priori*. If governments face political costs from reporting higher death rates, this will tend to reduce responsiveness to deaths. But deaths themselves will also not be reported to justify a lockdown. Either way, this might induce a correlation between D_{it} and ε_{it}. Moreover, there are good reasons to think that the bias due to any strategic death reporting can vary depending on whether media is censored or free and lead to an overestimation of responsiveness for censored-media countries.

Our IV approach uses the simulated death rate from the SEIR model as an instrument for D_{it}. As discussed above, these simulations rely on a minimal set of country specific parameters, none of which are directly related to observed policy choices. Model parameters are R_0, the initial date of the outbreak, country population and age distribution, health-care capacity and the average mitigation start and efficiency from a country's income group.[18] Additionally, we expect that the first stage relationship between SEIR-simulated deaths and reported deaths will be heterogeneous for free-media and censored-media countries.

Empirical Specification The second stage equation is

$$Y_{it} = \alpha_i + \delta_{tM} + \beta\widehat{D}_{it} + \gamma\widehat{D_{it} \times M_i} + \varepsilon_{it} \tag{2}$$

Compared to the OLS specification, we simultaneously instrument in the first stage for D_{it} (log deaths) and $D_{it} \times M_i$ (log deaths x media freedom status) using E_{it} (log SEIR deaths) and $E_{it} \times M_i$ (log SEIR deaths x media freedom status). $\widehat{D}_{it}$ and $\widehat{D_{it} \times M_i}$ are the fitted values from the first stage regressions.

[18] In particular, we do not use any observed measure of responsiveness for predicting the trajectory of deaths in a country. Instead, we impute a *hypothetical* date for severe mitigation measures in each country measured as the average time of implementing a lockdown relative to the start of the outbreak by country income group. We rely on epidemiological parameters and the estimated date of first case used in the epidemiological modelling by Noll et al. (2020). See details on the SEIR model in Appendix Section D.

Results Table 2 reports the main responsiveness results using the IV approach detailed above. Column 1 estimates the responsiveness of governments to COVID-19 deaths. We find no evidence that censored-media countries were responsive to deaths when deciding to impose a lockdown. A doubling of total deaths during the Great Lockdown led to only a 3 percentage points increase in the likelihood of imposing a lockdown, which is not statistically significant. For free-media countries, the responsiveness is 23 percentage points (as given by the sum of point estimates for both log deaths and its interaction with the media freedom indicator). On average, we estimate larger responsiveness for free-media countries but the difference with censored-media countries is not statistically significant at the 5% level.

Columns 2 to 8 focus on private compliance with lockdown, using mobility changes during lockdowns as outcomes. Citizens in censored-media countries are found to not be responsive to deaths when reducing their social contacts: an increase in deaths is not estimated to lead to more reduction in time outside or increase in time indoor (the point estimate are of reverse sign compared to the OLS results and not statistically significant). On the contrary, citizens in free-media countries are found to be highly responsive. An increase in deaths leads to less social contacts across all outside categories and more time at home.

Figure 2 illustrates the heterogeneity in mobility response to deaths between free-media and censored-media countries, giving the 90 percent and 95 percent confidence intervals for the two subsamples. The estimated elasticity response of mobility appears to be different in free-media and censored-media countries, and their associated confidence intervals barely overlap.

Taken together, these results suggest that only countries with free media have taken lockdown measures that are responsive to the severity of the outbreak.[19]

[19] We find corroborating evidence looking at responsiveness to simulated deaths as reported in Table A4, when instrumenting for COVID-19 cases or recent deaths instead of total deaths as reported in Tables D2 and D3. We also find similar results using excess mortality as an indicator of the true death toll in a subset of 39 countries as reported in C.2.

Validity of the Instrument We now provide evidence in support of the exclusion restriction needed for the IV results to be valid. First, we show that that model parameters used to predict deaths using the SEIR model are uncorrelated with media freedom in a country. Second, we show that, holding all other country parameters equal, having free media is *not* associated with significantly different *simulated* deaths.

Table 3 shows the correlation between media freedom and the seven country-specific parameters that enter the SEIR simulation: R_0, the simulated start date of the outbreak in the country, the simulated date of the first mitigation measure, number of hospital beds, number of ICU beds, log population and share of elderly population. We find no statistically significant correlations between the media freedom status of a country and any of these parameters, with the exception of R_0 with a difference significant at the 10% level and small in magnitude (0.46 i.e. 0.38 SD, see Table C1). Further, we also construct a SEIR death index that captures any country-specific differences in simulated deaths over time by regressing SEIR deaths per million on country fixed effects, after controlling for date, outbreak time and income groups. We then regress these country fixed effects coefficients on media freedom status. This aims to capture any residual differences in SEIR deaths attributable to country characteristics. Reassuringly, we find no significant correlation between SEIR death index and media freedom status as shown in column 8.

These results provide evidence that the instrument based on using the simulations from the SEIR model is not biased towards predicting more or fewer deaths in free- versus censored-media countries. What Table 3 indicates is that none of the parameters that enter the simulation differ significantly by media status, therefore any difference in simulated deaths reflects differential parameter values (such as a larger share of vulnerable population) but not differences in the media status of the country. [20]

Figure 1 visually confirms that the distribution of country-specific epidemiological parameters used to simulate COVID-19 deaths do not differ by media freedom status. For

[20]Censored-media countries have, in fact, reported fewer deaths than free-media countries, and this is also a feature of the simulations from the SEIR model as shown in Figure A1.

each of the parameters and for the SEIR death index, there is common support and limited differences between the distribution of parameters for free-media and censored-media countries. Reassuringly, there is little difference in the distribution of R_0. As detailed in section D, parameters for the mitigation trigger and healthcare capacity (subpanels 6-8) are calibrated by income group following Walker et al. (2020).[21]

2.3 Mobility Decomposition

We now decompose differences in mobility in response to death between free- and censored-media countries into what is attributable to differences in responsiveness and what can be attributed to other factors. To do so, we us a standard Oaxaca-Blinder decomposition approach traditionally used in labor economics (see Fortin et al. (2011)). To this end, we use a subsample analysis as:

$$m_{ist}^{M} = \alpha^{M} \hat{D}_{ist}^{M} + \sum_{k} \beta_{k}^{M} X_{kist}^{M} + \epsilon_{ist}^{M} \tag{3}$$

where M denotes whether a country has free media (F) or censored media (C), m indicates lockdown mobility outcomes, $\hat{D}$ is the simulated death toll per million from the first stage of the IV approach and X captures all other covariates from equation (2).

The mean mobility difference is $\Delta \equiv \bar{m}^{F} - \bar{m}^{C}$ and can be written as:

$$\hat{\Delta} = \underbrace{(\hat{\alpha}^{F} - \hat{\alpha}^{C})\bar{\hat{D}}^{F}}_{\text{Responsiveness effect}} + \underbrace{\hat{\alpha}^{C}(\bar{\hat{D}}^{F} - \bar{\hat{D}}^{C})}_{\text{Death toll effect}} + \underbrace{\sum_{k}(\hat{\beta}_{k}^{F}\bar{X}_{kist}^{F} - \hat{\beta}_{k}^{C}\bar{X}_{kist}^{C})}_{\text{Other factors}} \tag{4}$$

The first term on the right-hand side represents average differences in responsiveness to death between free-media and censored-media countries. It refers to the "unexplained effect" in the language of the decomposition literature (difference in the responsiveness coefficients). The second term captures the average effect of differences in death toll that

[21] This calibration choice is due to the lack of country-level data and to avoid any potential endogeneity between the instrument that would arise if we used actual dates of lockdown measures.

affect mobility (differences in values of $\hat{D}$ or "explained effect"). The last term represents the overall effect of other covariates, namely outbreak time dummies, country dummies and the log global death toll. Provided that the responsiveness effects are correctly identified by the IV approach (as argued above), our decomposition should be viewed as causal rather than pure correlations.

Table 4 presents results of the decomposition for both the decision to lockdown and mobility trends following lockdowns. The first part of the Table shows the average overall difference in outcomes by media freedom, while the second part decomposes these differences following Equation (4). Overall, free-media countries are on average more likely to lock down by 2 percentage points, while also more effectively reducing time outside (-1.75 percentage point). Turning to the decomposition, we see across all outcomes that differences in responsiveness are large and account for about 40% of the absolute decomposed difference. Differences attributed to responsiveness are much larger than the observed overall difference in mobility by an order of magnitude. This is due to other effects such as time and country differences reducing observed differences in mobility (e.g. censored-media countries having outbreaks at a later date). Interestingly, the number of fatalities alone explains very little in observed mobility differences between free-media and censored-media countries. In other words, responsiveness to deaths rather than the number of deaths explain more of the difference in lockdown behaviour between free-media and censored-media countries. As a result, controlling for other factors, censored media could have further reduced outdoor mobility by 15 percentage points had they been as responsive as free-media countries.

3 Additional Results

3.1 Evidence of Information Mechanism from Internet Searches

We now explore the information mechanism through which the presence of free media can influence government and public decisions on lockdowns. We look at how media freedom affects the magnitude of COVID-19 internet searches following spikes in COVID-19 reported deaths. We hypothesise that seeing more reporting in the media might lead citizens to search more intensively online for information on COVID-19. As such, free media would increases citizens' awareness of the severity of COVID-19, driving higher responsiveness from citizens and governments according to our model.

Our core specification to investigate this is:

$$S_{it} = \alpha_i + \delta_t + +\eta D_{it} + \phi \left(D_{it} \times M_i \right) + \varepsilon_{it} \tag{5}$$

This regresses daily Google searches for COVID-19 on log deaths in free-media and censored-media countries, including country and outbreak time fixed effects. We also include day fixed effects to capture differences in aggregate daily patterns in searches as the pandemic unfolded. We interact media freedom with log deaths instead of simulated deaths to capture whether citizens in free-media countries are differently aware of deaths spikes. Our framework would lead us to expect individuals to react more strongly to a public signal on the severity of the disease such as death reporting.

Table 7 reports the results and shows in Columns 1-3 that countries with free media experience more online searches about coronavirus and see a larger increase in COVID-19 searches in response to higher reported deaths compared to censored-media countries. In column 4, we include country fixed effects, and also find that citizens are more inclined to search online about COVID-19 follow death spikes in free-media countries. These findings suggest that, apart from the direct impact of media freedom, citizens may choose to find additional ways of becoming informed. This reinforces the channel posited in the model linking media freedom to better informed citizens.

3.2 Subsample analysis

We now show that the core findings are robust to a different choice of specification that separately estimates responsiveness for free-media countries and censored-media countries as follows:

$$Y_{it}^{M} = \alpha_i^{M} + \delta_t^{M} + \gamma^{M} D_{it}^{M} + \varepsilon_{it}^{M} \tag{6}$$

This more flexible specification allows fixed effect and first-stage estimates to vary by media freedom status. Estimating the first stage separately on free-media and censored-media countries, also mitigates concerns about the IV estimator being biased in the presence of parameter heterogeneity.

Table 5 reports both OLS and IV results using the specification above. Columns 1-8 shows the main OLS results when dividing the sample between free-media and censored-media countries. Similar to previous findings, we report evidence of responsiveness by governments and citizens. As reported in column 1, a doubling of deaths leads to a 12.2 percentage points increase in the likelihood of imposing a lockdown in free-media countries, compared to 15.9 percentage point increase in censored-media countries. While the responsiveness is statistically significant in both samples, we cannot reject that the difference in point estimate is different from 0 at the 5% level. As shown in columns 2 to 8, we find strong evidence of responsiveness in both samples of countries. An increase in deaths is associated with a significant reduction in time spent outside – and also specifically at retails shops, public transportation, workplaces, groceries or parks – and an increase in time at home. Here again, we find evidence of responsiveness for citizens in both samples and we reject the null hypothesis that private responsiveness differs by media status.

Columns 9-16 of Table 5 report IV results from the subsample analysis. We replicate our previous results and find that, when accounting for misreporting, only governments and citizens of free-media countries are responsive to COVID-19 deaths. A doubling of deaths leads to a 23 percentage points increase in the likelihood to impose a lockdown in free-media countries but has no effect in censored-media countries (although we cannot reject the null of equality of these two coefficients at the 5% level). Second, we find robust evidence of citizens in free-media countries being responsive to COVID-19 when complying with lockdowns, and no similar evidence in censored-media countries. This result is found across all the range of outcomes in Columns 10-16 that capture both time indoor (Residentials) and outdoor. Overall, we find similar results using a subsample analysis or our baseline IV specification in Section 2.2

3.3 Media Freedom versus Other Country Characteristics

One possibility is that media freedom is picking up other sources of heterogeneity across countreis givig a false impression of what drives differential responsiveness. One way to address this is to explore a wide range of ways to cut the data to see if we get similar results. Hence we employ a whole array of subsamples using:

$$Y^C_{it} = \alpha^C_i + \delta^C_t + \gamma^C D^C_{it} + \varepsilon^C_{it} \tag{7}$$

where C indicates a specific country characteristic. In each case, we split the data into into two sub-samples based on different characteristics, including democratic institutions, executive constraints, an index of general preparedness for a pandemic, measures of trust, the presence of social protection systems, economic conditions, age composition and income distribution.[22] Table 6 reports the p-value when we test the hypothesis that the responsiveness coefficients in each sub-sample created are equal. It is striking that we find no evidence of heterogeneity in responsiveness to deaths between countries other

[22]See a full list of these characteristics and data construction in Appendix F

than that from media freedom documented above.[23] This is illustrated graphically in Figure 3 for the case of high- and low-income countries. A notable finding is that responsiveness is very similar for high- and low-income countries, and that the confidence intervals for these coefficients largely overlap.

While this approach does not *prove* that it is differences in media freedom that are driving the differences in responsiveness, it does add credence to this view given that there would be plausible reasons to believe that there would be heterogeneous responsiveness across different levels of development and political configuration.

4 Concluding Comments

This paper has explored the role of free media in the responsiveness of governments and the public to the COVID-19 pandemic. As the death toll from COVID-19 escalated, governments in free-media countries were more likely to impose a lockdown and their citizens were more responsive to the death toll when reducing their mobility. We find limited evidence of a similar pattern of responsiveness in countries with censored media. We interpret this as being due to free media serving to align beliefs by citizens and governments about the severity of the outbreak and hence coordinate actions.[24] We also show corroborating evidence that citizens in free-media countries are more aware of COVID-19 deaths.

We draw some general lessons from the evidence presented here. First, access to timely and trustworthy sources of information is likely to play a role during public health crises. Our results point to the potential importance of free media in ensuring early responses by governments and greater mobility restrictions in response to death spikes.

[23]We find some evidence of differences in responsiveness based on the holding of elections in 2020, and whether a country enjoys free and fair elections, as discussed in Appendix C. These results are in line with several studies highlighting the role of electoral concerns in lockdown decisions by governments (Gonzalez-Eiras and Niepelt (2022); Fernandez-Navia et al. (2021); Pulejo and Querubín (2021))

[24]This argument is developed formally in Appendix B

This highlights the value of access to information, however imperfect, to respond to new and emerging threats.[25] Second, the correlation between free media and responsiveness suggests that trusted institutions can foster cooperation and increase compliance. This has proved crucial for lockdown measures in which widespread support is critical. Relatedly, the nature of behavioral changes needed for social distancing underscores the voluntary nature of non-pharmaceutical interventions. Governments can act in conventional ways by imposing penalties and regulating, but there is an increasing role for public acceptance of costly measures that are taken in situations of emergencies. More generally, our results suggest that "quasi-voluntary compliance" (Levi (1988)), where compliance depends on both the enforcement regime and beliefs about the legitimacy of government interventions, are likely to be of first-order importance in public health crises.

Future work could look at how media freedom is related to other dimensions of policy responsiveness such as fiscal support to encourage staying at home and/or testing for infection. It would also be interesting to look at responsiveness in different phases of the pandemic following the initial lockdown period studied here. There was an interesting learning process as new variants and views about the efficacy of different mitigation responses have emerged. Another area which merits further investigation relates to interdependent policy making due to learning across countries/jurisdictions. This raises the possibility of that there was a process of yardstick competition as suggested, for example, in Besley and Case (1995), and Salmon (2019). By increasing information flows, free media can play a role in intensifying such competition.

This paper addresses long-standing themes in political economy, emphasising the role of media freedom in affecting policy and behavior. While it is too early to provide a proper assessment of the costs and benefits of the wide-ranging responses taken across different phases of the pandemic, the early period when the pandemic was emerging constitutes an interesting period to investigate the role of free media on policy since commu-

[25] Das et al. (2021) made a similar point.

nication was key in fashioning a response. Our findings reinforce the message that free media can be important in shaping how societies respond to emerging policy challenges.

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Tables and Figures

Table 1: Responsiveness and Media Freedom: OLS results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Log deaths	0.155***	-6.951**	-7.213*	-5.621**	-4.207**	-6.022**	2.846**	-6.009**
	(0.0538)	(3.362)	(3.680)	(2.740)	(2.003)	(2.589)	(1.267)	(2.839)
Log deaths × Media Freedom	-0.0328	-4.333	-3.406	-3.665	-2.197	-1.851	1.071	-2.987
	(0.0612)	(3.965)	(4.230)	(3.228)	(2.480)	(3.425)	(1.503)	(3.318)
Observations	23,549	22,874	22,874	22,876	22,874	22,876	22,872	22,953
Country FE	X	X	X	X	X	X	X	X
Outbreak time FE	X	X	X	X	X	X	X	X

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Each regression includes as covariate the log number of global COVID-19 deaths. Log deaths indicates the log cumulative deaths. Each regression includes country fixed effects and outbreak time fixed effects (time since first 10 cumulative deaths) that is allowed to vary by media status given differences in timing and evolution of outbreaks. Media freedom indicates a country with a value above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020. Column 8 is the unweighted average of mobility change in outside categories.

Table 2: Responsiveness and Media Freedom: IV results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
$\widehat{\text{Log deaths}}$	0.0303	2.496	2.566	1.343	1.139	2.330	-1.685	1.979
	(0.121)	(7.406)	(7.614)	(5.879)	(4.155)	(5.679)	(2.710)	(6.056)
$\widehat{\text{Log deaths} \times \text{Media Freedom}}$	0.200	-21.57**	-21.45**	-16.99**	-13.50**	-18.89***	8.860***	-18.39**
	(0.132)	(8.385)	(8.710)	(6.851)	(5.210)	(7.002)	(3.185)	(7.053)
Observations	21,708	21,183	21,183	21,185	21,183	21,185	21,181	21,262
F-stat First Stage	17.30	13.98	13.98	13.97	13.98	13.97	13.98	13.98
F-statistic death	35.82	29.19	29.19	29.19	29.19	29.19	29.19	29.20
F-statistic death x Media Freedom	67.40	61.52	61.52	61.52	61.52	61.52	61.55	63.15
Country FE	X	X	X	X	X	X	X	X
Outbreak time FE	X	X	X	X	X	X	X	X

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Each regression includes as covariate the log number of global COVID-19 deaths. $\widehat{\text{Log deaths}}$ indicates the log cumulative deaths from a first stage regression of log deaths using as instruments log simulated deaths and log simulated deaths × media freedom status. Media freedom indicates a country with a value above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. Simulated deaths are based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. Each regression includes country fixed effects and outbreak time fixed effects (time since first 10 cumulative deaths). We allow the outbreak time fixed effects to vary by media status given the difference in timing and evolution of outbreaks. F-stat First stage indicates the Kleibergen-Paap rk Wald F statistic of the excluded instrument in the first stage. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020. Column 8 is the unweighted average of mobility change in outside categories.

Table 3: Correlations between Media Freedom and SEIR parameters for Simulated Deaths Instrument

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	R_0	Outbreak Start	Mitigation Trigger	Hospital Beds	ICU Beds	Log Population	Share 70+	SEIR death index
Media Freedom	0.464*	-4.616	3.690	0.842	0.364	-0.498	3.576	0.0421
	(0.174)	(2.866)	(2.065)	(0.515)	(0.261)	(0.239)	(3.020)	(0.119)
Observations	158	158	174	174	174	174	158	144
R^2	0.034	0.013	0.11	0.10	0.063	0.022	0.13	0.00088

Notes: Significance levels: * 10%, ** 5%, *** 1%. Media freedom indicates a country with a value above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. See Appendix Section D for full details on the calibration of the SEIR model.

Table 4: Decomposition of Responsiveness by Media Freedom

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Overall								
Free media	0.17	-9.90	-9.75	-8.10	-5.96	-6.33	3.80	-8.07
Censored media	0.15	-7.69	-7.86	-6.08	-4.60	-5.37	2.74	-6.32
Difference	0.02	-2.21	-1.88	-2.02	-1.37	-0.97	1.06	-1.75
Decomposition								
Responsiveness to death	0.17	-17.13	-17.13	-13.46	-10.71	-15.17	6.89	-14.86
Number of fatalities	0.04	-3.32	-3.17	-2.84	-2.21	-2.69	1.29	-2.95
Other covariates	-0.19	18.24	18.42	14.27	11.55	16.90	-7.12	16.07
Observations	21,708	21,183	21,183	21,185	21,183	21,185	21,181	21,262

Notes: This table show the Oaxaca-Blinder decomposition based on Equation (4). The measure of COVID-19 deaths is the instrumented log number of deaths from the first stage regression in Table A3. Other covariates include outbreak time dummies , country dummies, and the log number of global deaths each day. Media freedom indicates a country with a value above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

TABLE 5: RESPONSIVENESS AND MEDIA FREEDOM: SUBSAMPLE ANALYSIS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
	OLS estimates							
Panel A: Free-media countries								
Log deaths	0.122***	-11.29***	-10.62***	-9.287***	-6.405***	-7.874***	3.918***	-8.997***
	(0.0291)	(2.108)	(2.092)	(1.713)	(1.467)	(2.249)	(0.811)	(1.722)
Observations	11,822	11,547	11,547	11,547	11,547	11,547	11,545	11,624
Panel B: Censored-media countries								
Log deaths	0.155***	-6.930**	-7.190*	-5.601**	-4.188**	-6.006**	2.838**	-5.991**
	(0.0541)	(3.378)	(3.698)	(2.754)	(2.015)	(2.603)	(1.274)	(2.854)
Observations	11,727	11,327	11,327	11,329	11,327	11,329	11,327	11,329
Country fixed effect	X	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X	X
H_0: Equality of coefficients (*p-value*)	0.73	0.13	0.24	0.11	0.20	0.37	0.27	0.19

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
	2SLS estimates							
Panel A: Free-media countries								
$\widehat{\text{Log deaths}}$	0.230***	-19.02***	-18.83***	-15.59***	-12.31***	-16.52***	7.150***	-16.37***
	(0.0540)	(3.929)	(4.225)	(3.515)	(3.140)	(4.093)	(1.670)	(3.613)
Observations	11,363	11,115	11,115	11,115	11,115	11,115	11,113	11,192
F-stat First Stage	33.27	34.22	34.22	34.22	34.22	34.22	34.25	35.89
Panel B: Censored-media countries								
$\widehat{\text{Log deaths}}$	0.0306	2.481	2.549	1.330	1.126	2.318	-1.678	1.965
	(0.122)	(7.443)	(7.653)	(5.910)	(4.177)	(5.706)	(2.722)	(6.088)
Observations	10,345	10,068	10,068	10,070	10,068	10,070	10,068	10,070
F-stat First Stage	34.47	27.83	27.83	27.82	27.83	27.82	27.83	27.82
Country fixed effect	X	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X	X
H_0: Equality of coefficients (*p-value*)	0.10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Each regression includes as covariate the log number of global COVID-19 deaths. $\widehat{Logdeaths}$ indicates the value of log deaths from a first stage regression of log reported deaths using as instrument log simulated deaths based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. F-stat First stage indicates the Kleibergen-Paap rk Wald F statistic of the excluded instrument in the first stage. Media freedom indicates a country with a value above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

Table 6: Drivers of Responsiveness using Alternative Subsample Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Media Freedom	[0.10]	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]
Free and fair elections	[0.42]	[0.03]	[0.07]	[0.05]	[0.07]	[0.03]	[0.03]	[0.04]
Election in 2020	[0.27]	[0.03]	[0.10]	[0.04]	[0.10]	[0.01]	[0.08]	[0.05]
Most people can be trusted	[0.39]	[0.26]	[0.27]	[0.24]	[0.24]	[0.54]	[0.32]	[0.28]
Confidence in government	[0.81]	[0.60]	[0.56]	[0.73]	[0.88]	[0.40]	[0.61]	[0.59]
Confidence in the press	[0.89]	[0.46]	[0.44]	[0.50]	[0.52]	[0.38]	[0.50]	[0.43]
Satisfaction with democracy	[0.36]	[0.22]	[0.43]	[0.23]	[0.58]	[0.29]	[0.29]	[0.27]
Willingness to fight for country	[0.42]	[0.11]	[0.17]	[0.10]	[0.14]	[0.11]	[0.13]	[0.11]
Democracy	[0.75]	[0.30]	[0.39]	[0.36]	[0.48]	[0.23]	[0.34]	[0.32]
Executive constraints	[0.57]	[0.95]	[0.96]	[0.94]	[0.83]	[1.00]	[0.74]	[0.95]
Log GDP per capita > median	[0.93]	[0.63]	[0.96]	[0.56]	[0.99]	[0.90]	[0.95]	[0.82]
Education > median	[0.59]	[0.89]	[0.86]	[0.95]	[0.57]	[0.69]	[0.76]	[0.85]
Global Health Security index	[0.20]	[0.48]	[0.34]	[0.47]	[0.23]	[0.37]	[0.22]	[0.34]
Tax revenue > median	[0.29]	[0.37]	[0.57]	[0.46]	[0.98]	[0.71]	[0.38]	[0.60]
Access to handwashing facilities	[0.78]	[0.62]	[0.82]	[0.50]	[0.75]	[0.46]	[0.72]	[0.63]
Income inequality	[0.40]	[0.23]	[0.34]	[0.20]	[0.58]	[0.97]	[0.23]	[0.40]
Social protection	[0.57]	[0.60]	[0.50]	[0.72]	[0.56]	[0.52]	[0.68]	[0.57]

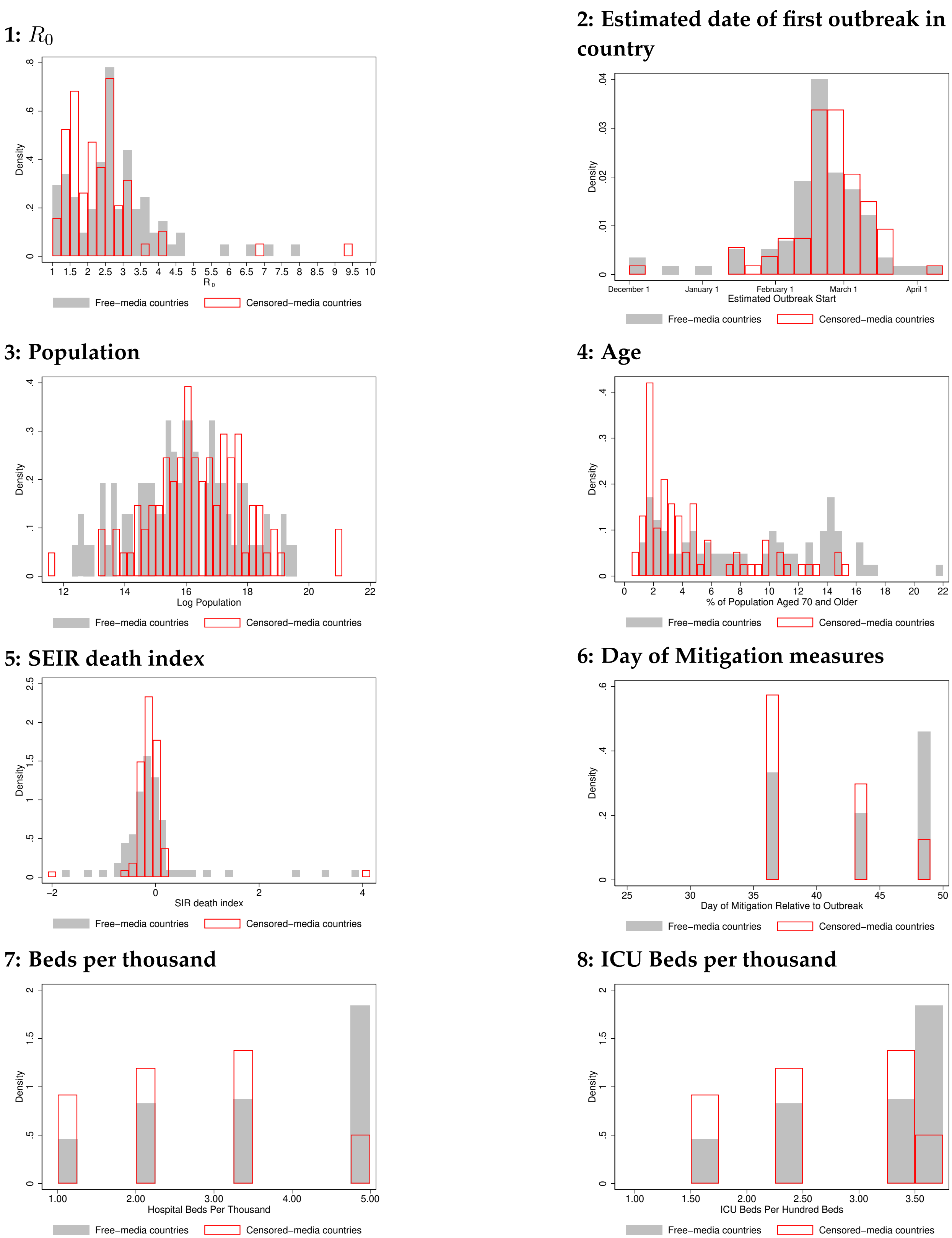
Notes: Each cell is the p-value from a separate IV regression based on Equation (2). The p-value tests the null hypothesis of equality of the responsiveness to death coefficient for two subsamples based on the category mentioned in the row. See Appendix Section F for definition of subsamples.

Table 7: COVID-19 Deaths, Online Searches and Media Freedom

	(1)	(2)	(3)	(4)
	Dependent Variable: COVID-19 Online Searches			
Media Freedom	61.73***	54.25***	37.03**	
	(20.20)	(18.66)	(17.04)	
Log deaths	47.03***	40.40**	19.89	5.504
	(5.095)	(16.42)	(16.75)	(14.53)
Media Freedom × Log deaths			21.60**	17.85**
			(8.656)	(8.080)
Country fixed effect				X
Outbreak time fixed effect		X	X	X
Day fixed effect		X	X	X
Basic controls	X	X	X	
Observations	19,932	19,444	19,444	23,715
R^2	0.16	0.58	0.58	0.69

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Columns 1-3 control for the share of internet users, years or education and log GDP per capita in a country (denoted basic controls). Covid search indicates the normalised share of Google searches including the word "COVID-19" or similar terms compared to the United States in January 30, 2020. Reported deaths are measured per million. Outbreak time indicates the days since a country reported its first 10 COVID-19 deaths. Simulated deaths represent simulated fatalities based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group.

FIGURE 1: PARAMETERS FOR SEIR DEATHS BY MEDIA FREEDOM STATUS



Notes: Day of mitigation measures relative to outbreak, beds and ICU beds are calibrated by income group following Walker et al. (2020). Country SEIR death index is obtained using the standardized country fixed effects when regressing SEIR deaths per million on country, date, outbreak time and income group fixed effects.

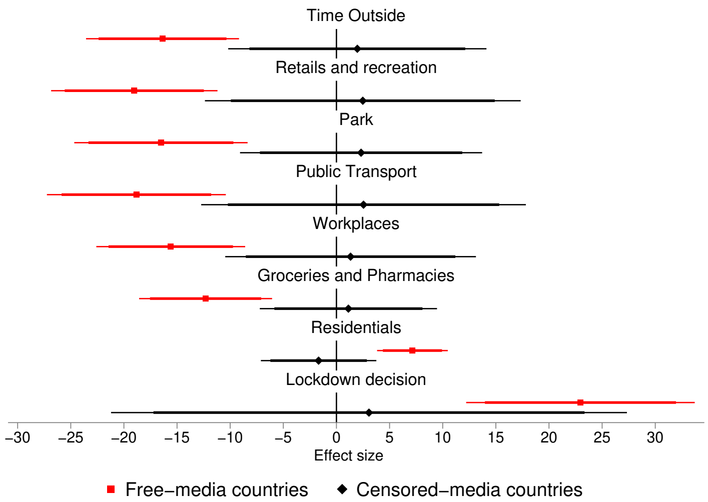


Figure 2: Responsiveness of Lockdown Mobility by Media Freedom

Notes: This figure shows the coefficients of deaths on mobility from Table 5. A thick line indicate a 90% confidence interval, a thin line indicates a 95% confidence interval. A free-media country has a score above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. Each panel indicates percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

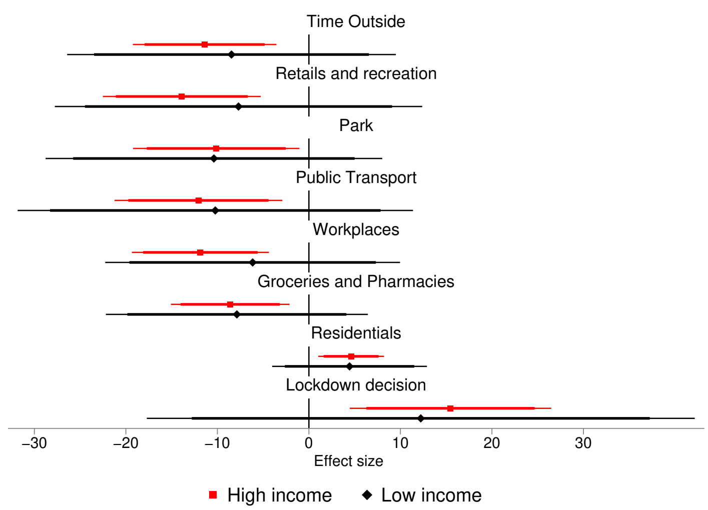


Figure 3: Responsiveness of Lockdown Mobility by Income

Notes: This figure shows the coefficients of responsiveness on mobility from Equation (2). High income indicates countries with GDP per capita above the median value. A thick line indicate a 90% confidence interval, a thin line indicates a 95% confidence interval. Each panel indicates percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

Appendix (For Online Publication)

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A Appendix Tables and Figures

TABLE A1: SUMMARY STATISTICS

	All			Free media			Censored media			Difference	
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	P-value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Country characteristics											
Media Freedom	0.69	0.74	(0.25)	0.88	0.88	(0.06)	0.49	0.59	(0.22)	0.39	[0.00]
GDP per capita	14,908	5,791	(20,686)	22,334	11,503	(24,809)	7,577	3,590	(11,780)	14,757	[0.00]
Years of education	8.00	8.03	(3.14)	8.85	9.07	(3.28)	6.97	6.77	(2.65)	1.88	[0.00]
Share of population 60 or older	0.14	0.11	(0.09)	0.17	0.16	(0.09)	0.11	0.07	(0.08)	0.06	[0.00]
Free and fair elections	0.53	1.00	(0.50)	0.82	1.00	(0.39)	0.24	0.00	(0.43)	0.57	[0.00]
Democracy	0.62	1.00	(0.49)	0.92	1.00	(0.27)	0.32	0.00	(0.47)	0.60	[0.00]
Trust in people	0.45	0.00	(0.50)	0.51	1.00	(0.50)	0.40	0.00	(0.49)	0.11	[0.26]
Access to handwashing facilities	0.40	0.00	(0.49)	0.52	1.00	(0.51)	0.32	0.00	(0.47)	0.20	[0.13]
Global Health Security index	43.30	41.30	(14.44)	49.08	47.90	(15.06)	37.43	35.95	(11.12)	11.65	[0.00]
COVID-19 Online Searches	60	-65	(259)	79	-55	(270)	42	-74	(247)	37	[0.03]
B. COVID-19 death toll											
First case	03/03	03/06	(20.04)	02/28	03/03	(19.23)	03/06	03/08	(20.44)	-6.41	[0.05]
First 10 deaths	04/24	04/10	(41.25)	04/18	04/04	(39.49)	04/30	04/20	(42.22)	-12.73	[0.05]
Deaths per million as of 05/01	34.04	3.42	(96.72)	61.99	5.72	(131.31)	6.46	1.75	(11.80)	55.53	[0.00]
Simulated deaths per million as of 05/01	360.27	7.87	(1,138)	614.52	33.54	(1,462)	83.59	2.30	(498)	530.93	[0.01]
C. Lockdown											
Date of lockdown	03/26	03/25	(8.07)	03/24	03/24	(6.76)	03/27	03/25	(8.97)	-3.52	[0.03]
Deaths per million at time of lockdown	0.83	0.06	(2.13)	1.32	0.06	(2.82)	0.32	0.06	(0.78)	1.00	[0.02]
Mobility Change (%): Retails and recreation	-63.71	-67.00	(18.37)	-66.30	-73.00	(20.23)	-60.52	-61.00	(15.19)	-5.78	[0.11]
Mobility Change (%): Groceries and pharmacies	-38.56	-37.00	(20.97)	-39.95	-38.00	(22.50)	-36.85	-36.00	(18.77)	-3.10	[0.37]
Mobility Change (%): Parks	-42.00	-45.00	(27.11)	-42.63	-48.00	(31.68)	-41.22	-44.00	(20.10)	-1.41	[0.79]
Mobility Change (%): Public transport	-64.00	-67.00	(16.07)	-65.16	-69.00	(16.54)	-62.55	-64.00	(15.37)	-2.61	[0.43]
Mobility Change (%): Workplaces	-51.19	-54.00	(18.64)	-53.95	-57.00	(20.20)	-47.81	-50.00	(15.90)	-6.14	[0.06]
Mobility Change (%): Residential	24.06	23.00	(8.42)	25.68	26.00	(8.90)	22.08	21.00	(7.33)	3.60	[0.02]
Number of countries		155			77			78			
Observations		23,715			11,781			11,934			

Notes: The sample includes all countries with reported COVID-19 cases between December 1, 2019 and May 1st, 2020. Media freedom indicates a country with a value above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. See Appendix Section F for definition of subsamples. Mobility indicates percentage changes in visits and length of stay at different places after lockdown compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020 using Google mobility trends data. Covid search indicates the share of Google searches featuring the term "COVID-19" or similar terms. Search trends are normalised to be percentage changes relative to the COVID-19 search share in the United States on January 30, 2020.

TABLE A2: RESPONSIVENESS AND MEDIA FREEDOM: REDUCED FORM AND FIRST STAGE

	(1)	(2)	(3)
	Time Outside	Log deaths	Log deaths × Media Freedom
Log SEIR deaths	0.584	0.296***	0.0000943
	(1.742)	(0.0559)	(0.000258)
Log SEIR deaths × Media Freedom	-6.251***	0.0499	0.345***
	(2.109)	(0.0803)	(0.0576)
Observations	21,262	21,262	21,262
F-stat First Stage		13.98	13.98
F-statistic death		29.20	
F-statistic death × Media Freedom			63.15
Country FE	X	X	X
Outbreak time FE	X	X	X
Outbreak time fixed effect × Media Freedom FE	X	X	X

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Reported and simulated deaths in log. Outbreak time indicates the days since a country reported its first 10 COVID-19 deaths. Simulated deaths represent simulated fatalities based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group.

TABLE A3: RESPONSIVENESS AND MEDIA FREEDOM: FIRST STAGE, SUBSAMPLE ANALYSIS

	(1)	(2)
	Free media	Censored media
Log SEIR deaths	0.346***	0.296***
	(0.0577)	(0.0561)
Country fixed effect	X	X
Outbreak time fixed effect	X	X
Kleibergen-Paap Wald rk F statistic	35.89	27.82
Observations	11,192	10,070

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Reported and simulated deaths in log. Outbreak time indicates the days since a country reported its first 10 COVID-19 deaths. Simulated deaths represent simulated fatalities based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group.

Table A4: Responsiveness and Media Freedom: Reduced Form, Subsample analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Panel A: Free-media countries								
Log SEIR deaths	0.0800***	-6.509***	-6.442***	-5.335***	-4.213***	-5.651***	2.447***	-5.658***
	(0.0165)	(1.370)	(1.318)	(1.221)	(0.961)	(1.364)	(0.507)	(1.196)
Observations	11,363	11,115	11,115	11,115	11,115	11,115	11,113	11,192
Panel B: Censored-media countries								
Log SEIR deaths	0.00952	0.734	0.754	0.393	0.333	0.686	-0.497	0.582
	(0.0385)	(2.141)	(2.201)	(1.714)	(1.212)	(1.624)	(0.760)	(1.751)
Observations	10,345	10,068	10,068	10,070	10,068	10,070	10,068	10,070
Country fixed effect	X	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X	X
H_0: Equality of coefficients (*p-value*)	0.08	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Each regression includes as covariate the log number of global COVID-19 deaths. Simulated deaths is the log number of fatalities based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

Table A5: COVID-19 Online Searches and Lockdown Mobility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Lockdown	-28.28***	-22.15***	-28.30***	-27.27***	-23.81***	9.614***	-25.95***
	(3.503)	(3.171)	(5.447)	(3.766)	(3.326)	(1.347)	(3.176)
COVID-19 searches × Lockdown	-0.0219***	-0.0239***	-0.0309***	-0.0234***	-0.0191***	0.0149***	-0.0238***
	(0.00667)	(0.00628)	(0.00910)	(0.00622)	(0.00642)	(0.00238)	(0.00583)
Country fixed effect	X	X	X	X	X	X	X
Day fixed effect	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X
Mean Outcome ∣ Lockdown=1	-64.12	-38.90	-42.55	-64.77	-51.96	24.26	-52.45
Mean Covid search ∣ Lockdown=1	298.78	298.78	298.85	298.78	298.85	298.41	298.85
SE Covid search ∣ Lockdown=1	(249.54)	(249.54)	(249.49)	(249.54)	(249.49)	(249.69)	(249.49)
Observations	9,289	9,257	9,271	9,238	9,315	9,217	9,315

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Covid search measure the share of internet searches including one of the following terms: “covid”, “coronavirus”, “covid19”, “covid-19”, “covid 19”, “ncov” , “nCoV2019”. These national search trends are normalised to be relative to the COVID-19 search share in the United States on January 30, which takes a value of 0. Outbreak time indicates the days since a country reported its first 10 COVID-19 deaths. Columns 1 to 6 indicate changes in visits and length of stay at different places after lockdown compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020, which takes a value of 0.

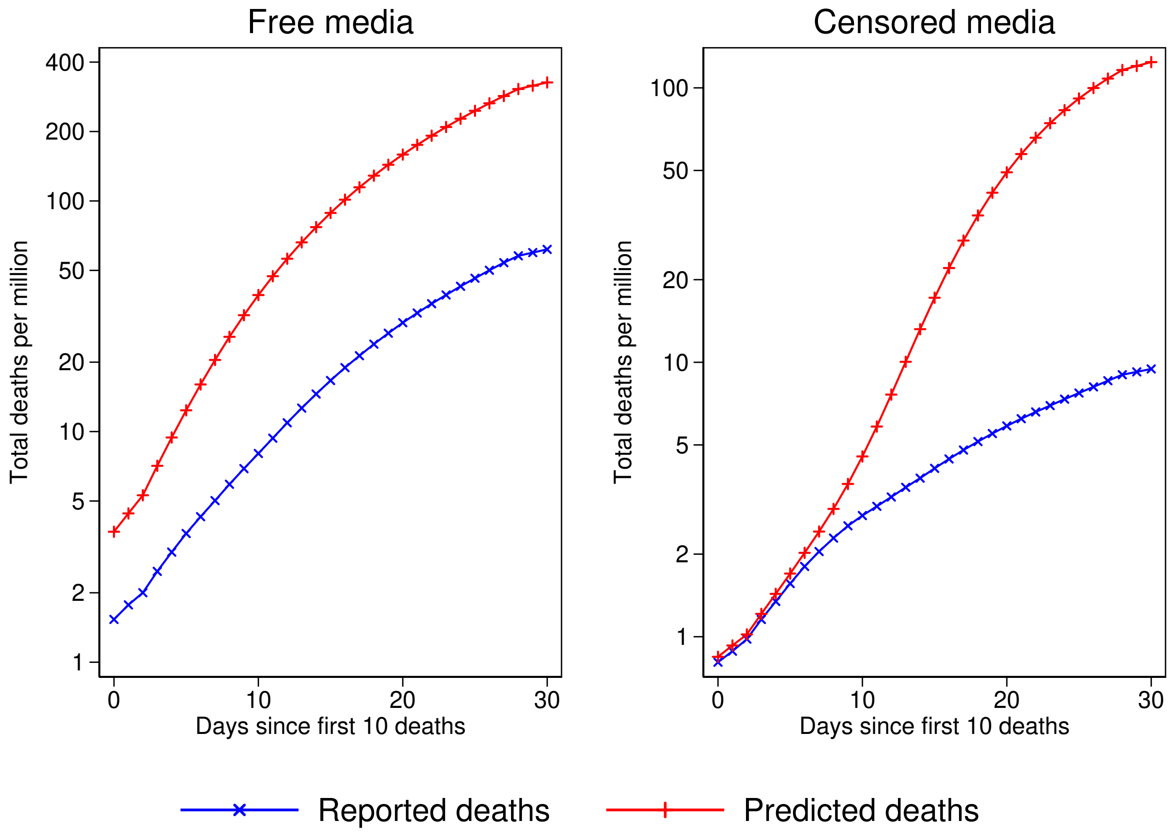
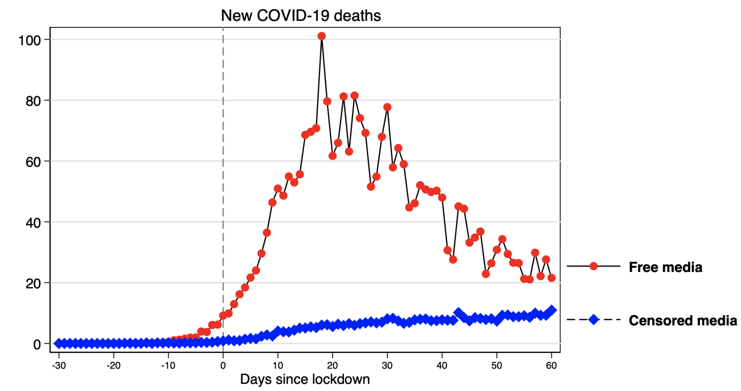


FIGURE A1: REPORTED VS SIMULATED DEATHS

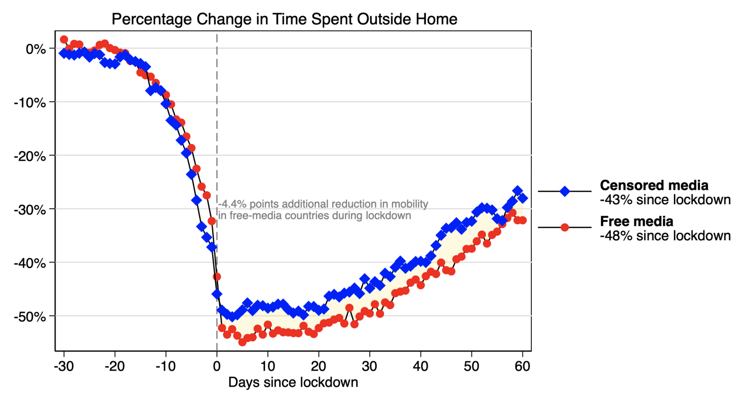
Notes: Simulated deaths is based on a SEIR model described in Section 1 with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. Media freedom indicates a country with a value above the median value 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. Both series report average cumulative death based on a balanced panel of countries who reported COVID-19 deaths for at least 30 days after their first 10 reported COVID-19 deaths. Values shown as 5-day moving averages using a log scale.

FIGURE A2: DESCRIPTIVE TRENDS IN COVID-19 MORTALITY, SEARCHES AND MOBILITY

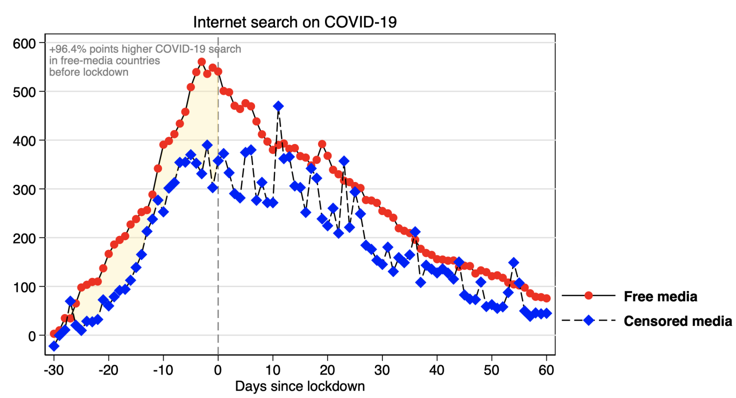
A. Evolution of COVID-19 mortality in free-media and censored-media countries



B. Evolution of mobility reduction in free-media and censored-media countries



C. Evolution of COVID-19 online searches in free-media and censored-media countries



Notes: Figure A shows the average number of new COVID-19 deaths. Figure B shows the average mobility change in time spent outside home compared to January 2020 using the google mobility data. Time outside home is the average of mobility changes across outdoor categories. Figure C displays the number of online searches about COVID-19 relative to the COVID-19 search share in the United States on January 30, 2020 (baseline of 100). All figures use a balanced sample of free- and censored-media countries that have imposed a lockdown for at least 60 days as of May 1, 2020. Free-media status is determined using the V-Dem Freedom of Expression and Alternative Source of Information index.

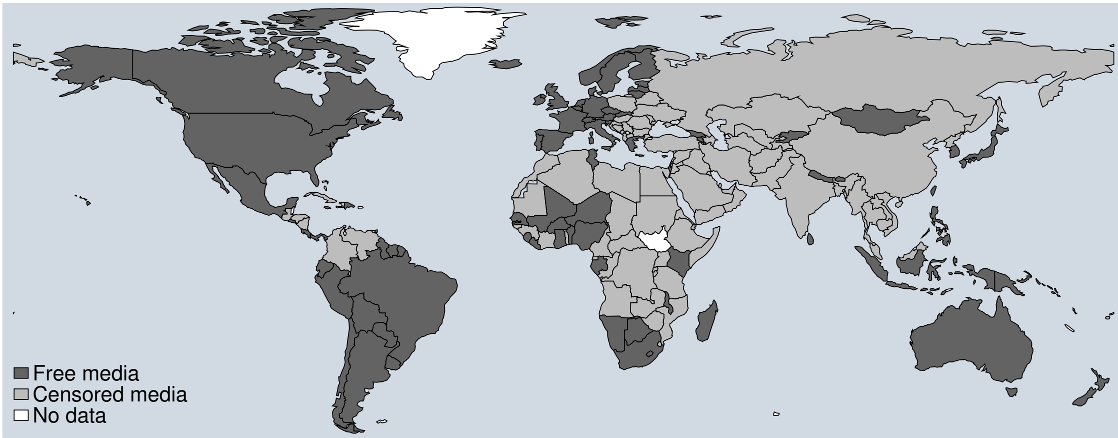


FIGURE A3: FREE-MEDIA AND CENSORED-MEDIA COUNTRIES

Notes: Free media indicates a country with a value above the median value 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. **Free-media countries**: Argentina Armenia Australia Austria Belgium Benin Bolivia Brazil Burkina Faso Canada Cape Verde Chile Costa Rica Cyprus Czech Republic Denmark Dominican Republic Ecuador El Salvador Estonia Finland France Gabon Gambia Georgia Germany Ghana Greece Guyana Iceland Indonesia Ireland Israel Italy Jamaica Japan Kenya Kyrgyzstan Latvia Liberia Lithuania Luxembourg Madagascar Malawi Mali Malta Mauritius Mexico Namibia Nepal Netherlands New Zealand Niger Nigeria Norway Panama Paraguay Peru Philippines Portugal Sao Tome and Principe Senegal Sierra Leone Slovakia Slovenia South Africa South Korea Spain Sri Lanka Suriname Sweden Switzerland Trinidad and Tobago Tunisia United Kingdom United States Uruguay. **Censored-media countries**: Afghanistan Albania Algeria Angola Azerbaijan Bahrain Bangladesh Belarus Bosnia and Herzegovina Bulgaria Cameroon Central African Republic Chad China Colombia Congo Croatia Cuba Côte d'Ivoire DRC Djibouti Egypt Equatorial Guinea Ethiopia Guatemala Guinea Guinea-Bissau Haiti Honduras Hungary India Iran Iraq Jordan Kazakhstan Kosovo Kuwait Lebanon Lesotho Libya Macedonia Malaysia Maldives Mauritania Moldova Montenegro Morocco Mozambique Nicaragua Oman Pakistan Palestine Poland Qatar Romania Russia Rwanda Saudi Arabia Serbia Singapore Somalia Sudan Swaziland Syria Tajikistan Tanzania Thailand Togo Turkey Uganda Ukraine United Arab Emirates Uzbekistan Venezuela Vietnam Yemen Zambia Zimbabwe. Countries not in sample are those with less than 10 reported COVID-19 deaths or not included in the V-Dem media freedom index.

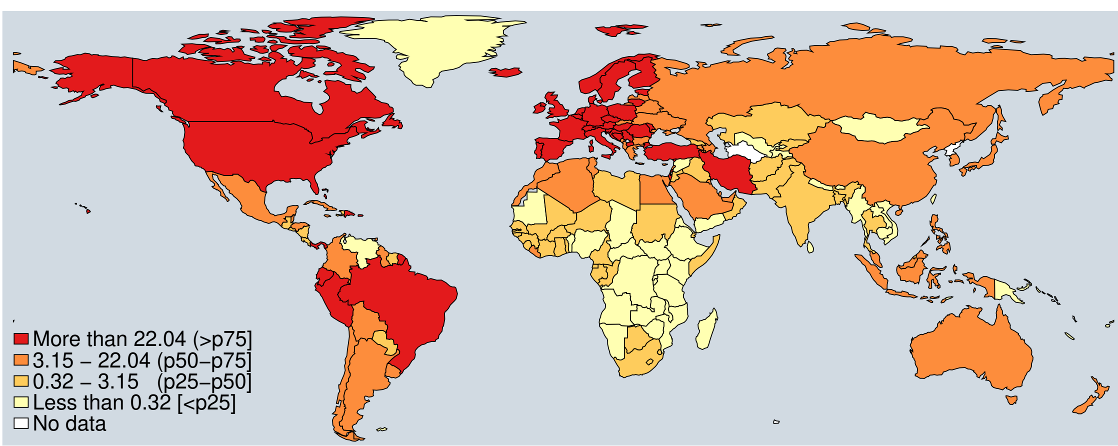


FIGURE A4: TOTAL REPORTED DEATHS PER MILLION AS OF MAY 1, 2020

Notes: Categories of countries constructed using as cutoff the 25^{th}, 50^{th} and 75^{th} percentile of total reported deaths per million as of May 1, 2020. *Source:* ECDC.

B Conceptual Framework

Basics

We build a simple model where the government is choosing whether to lockdown the economy and citizens choose whether to take costly actions, such as social distancing, working from home or wearing face coverings that are intended to reduce the spread of a disease, in our case COVID-19. Whether or not such actions are needed depends on the state of the world, $\sigma \in \{0, 1\}$. The social benefit from fighting the threat in state σ is $\rho\Delta(\sigma)$ with $\Delta(1) > 0 > \Delta(0)$ where ρ is the proportion of the population who decide to mitigate the threat. This formulation implies that fighting the pandemic with lockdowns and social distancing is beneficial only if $\sigma = 1$.

Let π denote a common prior that $\sigma = 1$. This reflects the genuine uncertainty in the pandemic about whether lockdown and private mitigation measures were really necessary. Then the expected social benefit from fighting the pandemic is

$$\rho\hat{\Delta}(\pi) = \rho\left[\pi\Delta(1) + (1-\pi)\Delta(0)\right].$$

Define $\bar{\pi} = -\Delta(0) / [\Delta(1) - \Delta(0)]$. Then $\hat{\Delta}(\pi) > 0$ for all $\pi > \bar{\pi}$.

Citizens

There is a continuum of citizens indexed by $i \in [0, 1]$ and their social distancing decisions are denoted by $\delta(i) \in \{0, 1\}$ where $\delta(i) = 1$ denotes social distancing. The fraction of citizens who mitigate is therefore $\rho = \int_0^1 \delta(i)\, di$. Citizens face a private cost of social distancing denoted by $\varepsilon(i)$ which is uniformly distributed on $[0, E]$. The government can enact a lockdown $\lambda \in \{0, 1\}$ with a fine Φ for non-compliance. Citizens can be pro-socially motivated agents and care about the social costs and benefits as in Besley and Ghatak (2005). We assume that $\Phi / [E - \Delta(1)] < 1$ which implies that there there will always be limited compliance with a lockdown.

Putting these elements together the payoff of citizen i is

$$\delta(i)\left[\rho\hat{\Delta}(\pi) - \varepsilon(i)\right] - (1-\delta(i))\lambda\Phi \tag{8}$$

where Φ is the expected penalty from breaking a lockdown. We will look for a Nash equilibrium in social distancing decisions where:

$$\hat{\delta}(i, \rho, \pi) = \arg \max_{\delta \in \{0,1\}} \left\{ \delta \left[\rho \hat{\Delta}(\pi) + \lambda \Phi - \varepsilon(i) \right] \right\}. \tag{9}$$

The equilibrium level of social distancing is given by

$$\hat{\rho}(\pi, \lambda) = \frac{\lambda \Phi}{E - \hat{\Delta}(\pi)}. \tag{10}$$

This is determined by whether there is a lockdown, $\lambda\Phi$. There is also a social multiplier in the denominator of (10) which is increasing in π. This reflects the positive complementarity in the citizens' compliance decisions. There is more social distancing when there is a stronger belief that there are social benefits from doing so. Note that $\rho(\pi, 0) = 0$ so there will not be any private response to the pandemic unless there is a lockdown.[26]

Government

Government must decide whether to impose a lockdown. We assume that, just as with citizens, it has mixed motives. So, given a belief π, its objective function is

$$\rho \hat{\Delta}(\pi) + \lambda r \tag{11}$$

where $r \in \left[0, \frac{1}{\theta}\right]$ is a political cost from implementing a lockdown. Assume that $\theta \Delta(1) < 1$. This implies that the probability of a lockdown is

$$\Lambda = \begin{cases} \theta \rho \hat{\Delta}(\pi) & \text{if } \hat{\Delta}(\pi) > 0 \\ 0 & \text{otherwise.} \end{cases} \tag{12}$$

This gives a complementarity between compliance and the likelihood of observing a lockdown; more compliance encourages implementing a lockdown when $\hat{\Delta}(\pi) > 0$.

We assume that the government receives a signal about the severity of the disease, denoted by d, and that it updates its belief that $\sigma = 1$ to $\hat{\pi}(d) = \pi + \beta \left(d - \hat{d}\right)$.[27] This says that there is a threshold level, $\hat{d}$, such that for $d > \hat{d}$, the government will believe it more likely that $\sigma = 1$. We will be focusing the case which we believe is more relevant in our empirical example which is where $d > \hat{d}$ so that there is a strengthening belief that $\sigma = 1$.

[26] We make this assumption for expositional simplicity. It would be straightforward to have private responses directly dependent on the severity of the threat, π.

[27] This could be derived from a standard Bayesian model but we do not need to be specific about this.

Media

Suppose that the media determines whether the citizens are informed about d. Let $\alpha \in [0,1]$ be the probability that they observe d. If they do not observe d, then we suppose that their beliefs are

$$\Pi(\lambda) = \begin{cases} \bar{\pi} & \text{if } \lambda = 1 \\ \underline{\pi} < \bar{\pi} & \text{if } \lambda = 0. \end{cases}$$

These are rational beliefs given the observed government action. This implies that the fraction of citizens who comply as a function of λ and α is:

$$\bar{\rho}(\lambda) = \begin{cases} \frac{\lambda\Phi}{E-\hat{\Delta}(\hat{\pi}(d))} & \text{with probability } \alpha \\ \frac{\lambda\Phi}{E-\hat{\Delta}(\Pi(\lambda))} & \text{with probability } 1-\alpha \end{cases}$$

As long as $\pi > \bar{\pi}$, then having more informed citizens increases compliance with the lockdown. This is driven by the social multiplier as the social benefits from the lockdown are now perceived to be higher.

Equilibrium

We now consider the equilibrium where citizens are choosing whether or not they will be comply with a lockdown alongside a decision of whether to lockdown. The timing that we consider is as follows:

1. Nature determines d.
2. Government makes a lockdown decision $\lambda \in \{0,1\}$
3. Nature determines whether citizens become informed about d.
4. Citizens decide whether to comply with the lockdown.

We have already solved for stage 3, where the expected fraction of citizens who comply with a lockdown is

$$\hat{\rho}(\alpha, d) = \frac{\alpha\Phi}{E - \hat{\Delta}(\hat{\pi}(d))} + \frac{(1-\alpha)\Phi}{E - \hat{\Delta}(\bar{\pi})}.$$

It is straightforward to see that this is increasing in d if $d > \hat{d}$. Note that

$$\frac{\partial \hat{\rho}(\alpha, d)}{\partial d} = \frac{\alpha\beta\Phi[\Delta(1) - \Delta(0)]}{\left[E - \hat{\Delta}(\hat{\pi}(d))\right]^2} > 0$$

is a measure of how expected responsive varies with d. The probability of lockdown is

$$\hat{\Lambda}(\alpha, d) = \begin{cases} \theta\hat{\rho}(a, d)\,\hat{\Delta}(\hat{\pi}(d)) & \text{if } \hat{\Delta}(\hat{\pi}(d)) > 0 \\ 0 & \text{otherwise.} \end{cases} \tag{13}$$

Moreover, for $\hat{\Lambda}(\alpha, d) > 0$,

$$\frac{\partial\hat{\Lambda}(\alpha, d)}{\partial d} = \frac{\partial\hat{\rho}(\alpha, d)}{\partial d}\hat{\Delta}(\hat{\pi}(d)) + \hat{\rho}(\alpha, d)\,\beta\Phi\left[\Delta(1) - \Delta(0)\right] > 0.$$

This says that an increase in the progression of the disease is associated with a high probability of a lockdown. Our measure of responsiveness that we also take to the data is

$$m(\alpha, d) = \hat{\Lambda}(\alpha, d)\,\hat{\rho}(\alpha, d)$$

which is also increasing in d when $\hat{\Delta}(\hat{\pi}(d)) > 0$.

Less obvious, is how changes in α affect these results. In other words, how does responsiveness vary with media activism. We report this as follows.

Prediction: *Suppose that $\hat{\Delta}(\hat{\pi}(d)) > 0$, then, with more active media (higher α), governments and citizens are more responsive to the progression of the disease.*

Proof. First note that

$$\frac{\partial^2\hat{\rho}(\alpha, d)}{\partial d\partial\alpha} = \frac{\beta\Phi\left[\Delta(1) - \Delta(0)\right]}{\left[E - \hat{\Delta}(\hat{\pi}(d))\right]^2} > 0.$$

And

$$\frac{\partial^2\hat{\Lambda}(\alpha, d)}{\partial d\partial\alpha} = \frac{\partial^2\hat{\rho}(\alpha, d)}{\partial d\partial\alpha}\hat{\Delta}(\hat{\pi}(d)) + \frac{\partial\hat{\rho}(\alpha, d)}{\partial\alpha}\beta\Phi\left[\Delta(1) - \Delta(0)\right] > 0.$$

And since $m(\alpha, d)$ is the product of two increasing supermodular functions, it is also supermodular, i.e. $\frac{\partial^2 m(\alpha,d)}{\partial d\partial\alpha} > 0$. ■

This prediction is what we take to the data by exploring how responsiveness varies between countries with and without free media which we think of as variation in α.

Link to Empirical Analysis

To link the model to the empirical analysis, note that we construct a variable linked to private compliance by recognizing that mobility is related to the number of citizens abiding by lockdown measures and can be represented by $1 - \hat{\rho}(\alpha_{it}, d_{it})$. Greater compliance during lockdown leads to lower mobility. Our key mobility variable is therefore

$m_{it} = \lambda_{it}\rho_{it}$ which we have shown to be negatively related to media freedom for a given level of reported deaths due to the media effect on both λ_{it} and ρ_{it}.

C Additional Empirical Results

C.1 Electoral Cycle

Our model suggests that governments facing a higher political cost of lockdown are more reluctant to implement such a policy. One possibility is that political accountability in the form of free and fair elections may push incumbents to respond more strongly to information about the severity of COVID-19. However, we do not know *a priori* how political accountability might affect responsiveness, and look for insights from empirical patterns.

Relatedly, we find differences in responsiveness according to whether countries conduct free and fair elections. As reported in Table B1, countries with systems of free and fair elections are more responsive to deaths when deciding to lock down, are see more reductions in mobility associated with a death rise during lock down. Conversely, no such pattern of responsiveness is detected for countries without systems of free and fair elections. This suggests that political costs of lockdown measures are lower in countries with free elections. While incumbents may fear the electoral consequences of locking down, they may be more inclined to decisively respond to the severity of the outbreak if they have more legitimacy for their actions and accountability mechanisms in place to rationalize their decisions. Taken together, these results suggests that political accountability strongly influences the determinants of responsiveness.

C.2 Excess mortality

In this section, we replicate our analysis using excess mortality instead of simulated death from a SEIR model as a benchmark for the evolution of the disease.

Excess mortality compares the weekly death counts from all causes to the average of the similar measure over 2015-2019. It has been argued that excess mortality is a more precise measure of the true impact of the pandemic on the number of deaths than what is being reported by countries or estimated by epidemiological models. However, excess mortality requires granular information on the current and historical number of deaths from all causes. To date, this measure is only available in 39 countries[28], including 30 in

[28]See Figure B1 for a map showing these countries. We are not using data on excess mortality when it is

Europe and with variation in the presence of free media available only among European countries. For these countries, data on excess mortality is available on a weekly basis, and is derived by compared excess deaths from all causes in a week in 2020 compared to the average mortality in the corresponding week over the last 5 years. We use the a sample period of January 1, 2020 - September 6, 2020, the last week for which we have data. Since this period covers more than the Great Lockdown period, we look at the overall mobility trends as opposed to only mobility during lockdown. Data comes from the Human Mortality Database[29], completed with data on deaths by week from Eurostat for European countries, and excess mortality data compiled by the Financial Times for Brazil, Chile, Ecuador, Peru and South Africa.[30] A map of the countries for which excess mortality can be computed is shown in Figure B1. As all the censored-media countries with information on excess mortality are from Eastern Europe, we will restrict analysis using excess mortality to the countries from the Europe and Central Asia region.

Table B2 shows that under-reporting is systematically more pronounced in censored-media countries. Column 1 shows the significant correlation between reported deaths and excess mortality. In Columns 2, we include media freedom and find significantly higher reporting of deaths in free-media countries. Finally, in columns 3 and 4, we interact media freedom status with weekly excess mortality to detect heterogeneous patterns of reporting over time. We find that censored-media countries significantly under-reporting deaths for each increase in excess mortality (i.e. free-media countries report more deaths per thousand for each additional excess death per thousand, resulting in a positive coefficient for the interaction term). This pattern is also observed when focusing on countries in Europe and Central Asia only for which we have better coverage, as displayed in Column 4.

Table B3 explores responsiveness to excess mortality as a proxy for the severity of the disease. We focus only on countries from Europe and Central Asia as the coverage of excess mortality data gives us variation of media freedom in that region only. We find evidence of higher responsiveness during lockdowns on the part of citizens in countries with free media. In those countries, citizens further reduce their time outside in retails and recreation, parks and at groceries and pharmacies in response to higher excess mortality. Using the overall measure of time spent outside, we also find that only citizens in free-media countries reduce their time outdoor following an increase in deaths. We control for country fixed effects and week fixed effects to account for fixed country and

not available at the national level.

[29] https://www.mortality.org/

[30] https://github.com/Financial-Times/coronavirus-excess-mortality-data/

time differences in our panel. We also find that an increase in excess mortality is associated with a greater increase in time spend in residential areas in free-media countries compared to censored-media countries, consistent with citizens in free-media countries complying more with lockdown measures. Although we see a greater probability of imposing a lockdown in response to excess death in free-media countries, this difference is not statistically significant.

In sum, our results on excess mortality confirm our findings that free-media countries are more truthful about death reporting and more responsive to deaths when locking down for the period of January 1 - September 1, 2020.[31] Albeit data limitations force us to restrict our analysis to European countries, these findings are reinforcing our results found earlier on reporting and responsiveness.

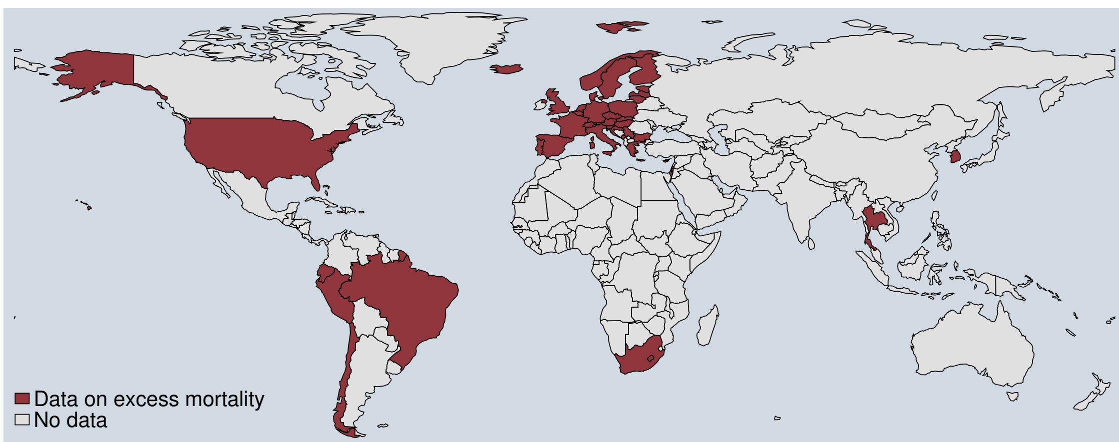


FIGURE B1: EXCESS MORTALITY COVERAGE

Source: Human Mortality Database, Eurostat and the Financial Times.

[31]In Table D8, we run the same analysis for the sample January-May 1, 2020 to be consistent with our main analysis. Although we are underpowered with a sample size of 648 observations, we find similar direction of the effects but not statistically significant at the 5% level.

TABLE B1: RESPONSIVENESS AND FREE AND FAIR ELECTIONS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Panel A: Free and fair elections								
$\widehat{\text{Log deaths}}$	0.198***	-16.51***	-15.95***	-13.57***	-10.49***	-14.16***	6.339***	-14.06***
	(0.0512)	(3.689)	(3.875)	(3.264)	(2.904)	(3.831)	(1.521)	(3.367)
Observations	11,914	11,771	11,771	11,773	11,771	11,773	11,769	11,850
F-stat First Stage	35.80	36.81	36.81	36.80	36.81	36.80	36.83	38.51
Panel B: No free and fair elections								
$\widehat{\text{Log deaths}}$	0.0572	1.627	0.473	0.339	-0.569	1.712	-0.818	0.716
	(0.130)	(7.833)	(8.466)	(6.501)	(4.852)	(6.263)	(3.020)	(6.663)
Observations	9,798	9,416	9,416	9,416	9,416	9,416	9,416	9,416
F-stat First Stage	22.85	18.31	18.31	18.31	18.31	18.31	18.31	18.31
Country fixed effect	X	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X	X
H_0: Equality of coefficients (*p-value*)	0.42	0.03	0.07	0.05	0.07	0.03	0.03	0.04

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Each regression includes as covariate the log number of global COVID-19 deaths. $\widehat{Deaths}$ indicates the value of log deaths from a first stage regression of log reported deaths using as instrument log simulated deaths based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. F-stat First stage indicates the Kleibergen-Paap rk Wald F statistic of the excluded instrument in the first stage. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

TABLE B2: EXCESS MORTALITY AND REPORTING

	(1)	(2)	(3)	(4)
	Dependent variable: New deaths per thousand			
Excess deaths per thousand	0.00911***	0.00904***	0.000899	0.00180*
	(0.00123)	(0.00123)	(0.000934)	(0.000973)
Media Freedom		0.00289**		
		(0.00120)		
Media Freedom × Excess deaths per thousand			0.00734***	0.00627***
			(0.00149)	(0.00145)
Country fixed effect			X	X
Week fixed effect			X	X
Europe and Central Asia only				X
N	1,184	1,150	1,150	920

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Unit of observation: country-week. Excess mortality measured as the difference in deaths from all causes in a week compared to the average in the corresponding week between 2015-2019. A free-media country has a score above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018.

Table B3: Excess Mortality and Responsiveness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Excess deaths per thousand	-0.0235	3.521**	1.044	3.808	2.886*	1.631*	-1.790***	2.588**
	(0.0229)	(1.325)	(0.766)	(3.901)	(1.513)	(0.825)	(0.569)	(1.013)
Media Freedom × Excess deaths per thousand	0.0292	-4.230***	-1.320	-3.745	-3.295**	-2.251**	2.045***	-2.978**
	(0.0264)	(1.448)	(0.963)	(4.375)	(1.580)	(0.890)	(0.593)	(1.263)
Country fixed effect	X	X	X	X	X	X	X	X
Week fixed effect	X	X	X	X	X	X	X	X
N	1046	850	850	850	850	850	850	850

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Unit of observation: country-week. Excess mortality measured as the difference in deaths from all causes in a week compared to the average in the corresponding week between 2015-2019. Sample period: January 1 to September 6, 2020 (Weeks 1 to 36). A free-media country has a score above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

D Calibration of the SEIR model

This section provides details on the calibration of the SEIR model used to construct simulated COVID-19 deaths.

The model takes as input the following parameters:

1. **Epidemiological parameters** come from Noll et al. (2020) : annual average reproduction number R_0, latency time, infectious period, seasonal variation in transmission, average duration of hospital stay, average duration of ICU stay, severity of ICU overflow. The value of each parameter is shown in Table C1. Most parameters are fixed across all countries, but three are country-specific and fit to observations. This is (i) R_0 (ii) the initial date of the outbreak (iii) the size of the initial outbreak (Noll et al. (2020) p.5). We use this calibration done by epidemiologists by fitting cumulative case counts and fatalities on data prior to any mitigation measures. As pointed by Noll et al. (2020), the simulation is not an inference tool, it relies on minimal fitting of the data to provide reasonable estimates, and does not use information on media freedom or actual mitigation measures of the country (e.g. lockdown) in any part of the simulation.

2. **Population and age distribution** from the UN's World Population Prospects 2019

3. **Healthcare capacity**: Number of hospital beds and number of hospital beds in Intensive Care Units (ICUs). Given the paucity of available recent statistics on hospital bed capacity, we rely on an estimate of hospital beds per 1,000 population by income group from Walker et al. (2020). Estimates from Walker et al. (2020) are modelled using data from the World Bank for hospital beds per 1,000 population, and a systematic review for data on ICU capacity. We use the World Bank classification of countries in income groups as low income, lower middle income, upper middle income or high income. Table C2 shows the estimates of healthcare and ICU capacity used in the SEIR model.

4. **Hypothetical mitigation**: We model a hypothetical mitigation scenario for each country reducing social contact rates by 60% and impute a start date using the average time to lockdown by country income group. This corresponds to an enhanced social distancing scenario as discussed by Walker et al. (2020) and Ferguson et al. (2020). See Table C2 on the parameter values of these hypothetical mitigation stratified by income group.

We have also considered alternative assumptions for healthcare availability and efficiency of the mitigation scenario as shown in Figure C1, which replicates Figure A1. Alternative estimates of hospital beds are available from Noll et al. (2020) and lead to a similar pattern of differences between reported and simulated deaths. Second, we consider a 75% efficiency of mitigation instead of a default 60% efficiency. As discussed in Walker et al. (2020) and Ferguson et al. (2020), this corresponds to a suppression scenario aimed at rapidly reducing transmission. Using this level of mitigation efficiency leads to a lower simulated fatality, although the gap in reported vs simulated deaths remains present and large in relative terms for censored-media countries. These alternative assumptions have little bearing on the results of the analysis in Section 2.

TABLE C1: SEIR MODEL PARAMETERS: EPIDEMIOLOGY

Parameter	Value	Source
R_0 (country est.)	2.51 (1.22)	Noll et al. (2020)
Infectious Period (days)	3	Noll et al. (2020)
Latency (days)	3	Noll et al. (2020)
Hospital Stay (days)	3	Noll et al. (2020)
ICU Stay (days)	14	Noll et al. (2020)
Severity of ICU Overflow	2	Noll et al. (2020)
Seasonal Peak	January	Noll et al. (2020)
Seasonal Forcing	0	Noll et al. (2020)
Outbreak Start (country est.)	February 20 (21)	Noll et al. (2020)

Notes: R_0 is the basic reproduction number. Seasonal Peak refers to the month of the year with peak transmission. Seasonal Forcing is the amplitude of seasonal variation in transmission. Latency is the time from infection to onset of infection. Infectious Period refers to the average number of days that a person is infectious. Hospital stay is the average number of days a severe case stays in a regular hospital bed. ICU stay refers to the average stay in Intensive Care Unit (ICU) for critical cases. Severity of ICU overflow is a multiplicative factor to death rate to patients that require but do not have access to an ICU bed relative to those who do. Outbreak start refers to the date of the epidemic in each country. Both R_0 and Outbreak Start are country-specific estimates from Noll et al. (2020). All other parameters are fixed for all countries.

TABLE C2: SEIR MODEL PARAMETERS: HEALTHCARE AND MITIGATION

	World Bank Income Group				
Parameter	Low income	Lower middle income	Upper middle income	High income	Source
Hospital Beds / 1,000	1.24	2.08	3.41	4.82	Walker et al. (2020)
ICU Beds /100 Beds	1.63	2.38	3.32	3.57	Walker et al. (2020)
Mitigation Efficiency	60	60	60	60	Walker et al. (2020)
Trigger for Mitigation (days since outbreak)	28	28	36	39	Average time of lockdown

Notes: Each parameter is assigned to a country based on its World Bank Income Group. Estimates of Hospital Bed and ICU Capacity are taken from Walker et al. (2020) who use data from the World Bank for hospital beds, and data from a systematic review for ICU capacity. Mitigation efficiency refers to the percentage reduction in social contact rates. A 60% reduction in social contact rates corresponds to enhanced social distancing as discussed in Walker et al. (2020). Trigger for mitigation refers to the time relative to the start of the outbreak from which simulated mitigation measures are in place.

TABLE C3: SEIR MODEL PARAMETERS: EPIDEMIOLOGY BY MEDIA FREEDOM STATUS

Parameter	Censored-media country	Free-media country	Source
R_0 (country est.)	2.33 (1.20)	2.79 (1.28)	Noll et al. (2020)
Infectious Period (days)	3	3	Noll et al. (2020)
Latency (days)	3	3	Noll et al. (2020)
Hospital Stay (days)	3	3	Noll et al. (2020)
ICU Stay (days)	14	14	Noll et al. (2020)
Severity of ICU Overflow	2	2	Noll et al. (2020)
Seasonal Peak	January	January	Noll et al. (2020)
Seasonal Forcing	0	0	Noll et al. (2020)
Outbreak Start (country est.)	February 23 (18)	February 18 (21)	Noll et al. (2020)

Notes: R_0 is the basic reproduction number. Seasonal Peak refers to the month of the year with peak transmission. Seasonal Forcing is the amplitude of seasonal variation in transmission. Latency is the time from infection to onset of infection. Infectious Period refers to the average number of days that a person is infectious. Hospital stay is the average number of days a severe case stays in a regular hospital bed. ICU stay refers to the average stay in Intensive Care Unit (ICU) for critical cases. Severity of ICU overflow is a multiplicative factor to death rate to patients that require but do not have access to an ICU bed relative to those who do. Outbreak start refers to the date of the epidemic in each country. Both R_0 and Outbreak Start are country-specific estimates from Noll et al. (2020). All other parameters are fixed for all countries.

TABLE C4: SEIR MODEL PARAMETERS: HEALTHCARE AND MITIGATION BY MEDIA FREEDOM STATUS

Parameter	Censored-media country	Free-media country	Source
Hospital Beds / 1,000	2.69	3.53	Walker et al. (2020)
ICU Beds /100 Beds	2.68	3.05	Walker et al. (2020)
Mitigation Efficiency	60	60	Walker et al. (2020)
Trigger for Mitigation (days since outbreak)	32	35	Average time of lockdown

Notes: Each parameter is assigned to a country based on its World Bank Income Group. Estimates of Hospital Bed and ICU Capacity are taken from Walker et al. (2020) who use data from the World Bank for hospital beds, and data from a systematic review for ICU capacity. Mitigation efficiency refers to the percentage reduction in social contact rates. A 60% reduction in social contact rates corresponds to enhanced social distancing as discussed in Walker et al. (2020). Trigger for mitigation refers to the time relative to the start of the outbreak from which simulated mitigation measures are in place.

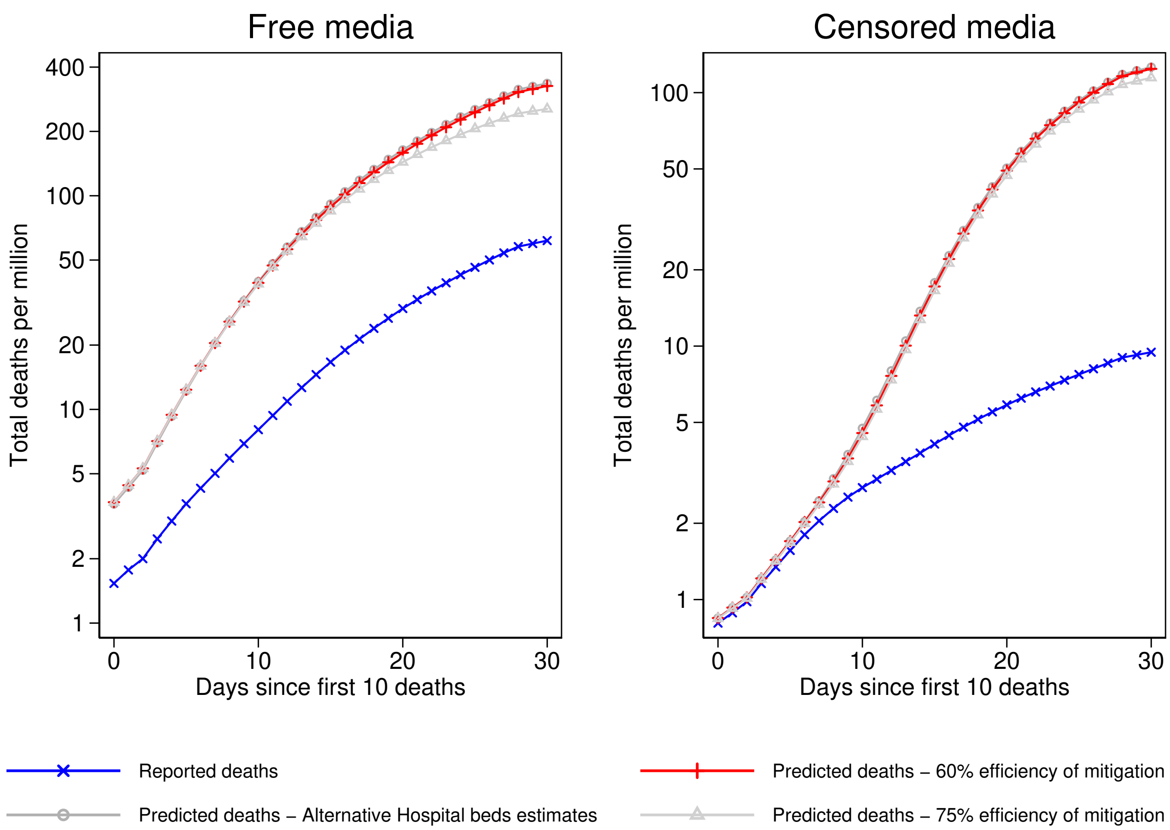


FIGURE C1: CALIBRATION OF SEIR MODEL

Notes: Simulated deaths is based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. Preferred calibration is indicated as "Simulated deaths" in the legend. "Alternative Hospital beds estimates" uses estimates of hospital beds and ICU capacity from Noll et al. (2020) instead of Walker et al. (2020). "60% efficiency of mitigation" is our default calibration for mitigation efficiency and corresponds to enhanced social distancing measures. "75% efficiency of mitigation" models a 75% reduction of social contact rates corresponding to a suppression scenario discussed in Ferguson et al. (2020) and Walker et al. (2020). All series are average values from a balanced panel of countries who reported COVID-19 deaths for at least 30 days after reporting their first 10 confirmed COVID-19 deaths. Values are shown as 5-day moving averages.The y-axis uses a log scale.

E Robustness results

This section presents robustness of the main results using different definitions of media freedom, responsiveness to other COVID-19 statistics, and alternative specifications.

First, we use alternative measures of media freedom provided by either the Freedom House or a measure of press freedom from the RSF World Press Freedom index. As shown in Table D1, we replicate our result of only citizens in free-media countries being responsive. Similar to our main Table 5, we find a larger responsiveness of free-media government for their lockdown decision, but the difference with censored-media governments is not statistically significant at the 5% level.

Second, we replicate our analysis but looking at responsiveness to either total cases or deaths over the last 7 days (the main analysis reports responsiveness estimates to total deaths). As shown in Tables D2 and D3 respectively, we find very similar estimates of responsiveness. Table D3 shows even stronger differences in responsiveness between free- and censored-media countries when looking at recent deaths instead of total deaths, and reports a significant difference in government responsiveness. Table D4 is the analogue of Table 6 and similarly shows that differences in responsiveness between free-media and censored-media countries cannot be attributed to other country characteristics such as income, the presence of democracy, or education.

Third, we test for alternative specifications in Tables D5 to D8. Specifically, compared to our core specification, in Tables D5, D6 and D7, we removed the fixed effects from the interaction between outbreak time (time since first 10 cumulative deaths) and media freedom status. Effectively, this forces the date of the country outbreak to have no impact on lockdown decision or mobility during lockdown by imposing a uniform coefficient of outbreak time for all countries despite outbreaks occurring at significantly later dates in censored-media countries (close to 13 days later, see Table A1). In Table D5, we replicate our findings from Table 1 that governments and citizens are responsive to COVID-19 deaths in an OLS specification. However, in that alternative specification, we fail to replicate our results from Table 2 and find no evidence of statistical difference in responsiveness between free- and censored-media countries using the IV approach. As explained above, this lack of difference can be explained by censored-media countries having access to more information as they were hit by the pandemic at a later date. Our preferred specification is one that accounts for such differences in outbreak characteristics between countries. In the main text, we discussed results using either an interaction between outbreak timing and media freedom status or a subsample approach that more flexibly accounts for timing differences. In both cases, we find evidence of significant differences in responsiveness between free- and censored-media countries. Finally, Table D8 reports our underpowered results from excess mortality if we restrict the sample period to be during the Great Lockdown period (until May 1) to be consistent with our main analysis. Given that excess mortality is only available for less than 40 countries and on a weekly basis rather than daily, we fail to find any significant point estimates.

TABLE D1: RESPONSIVENESS AND ALTERNATIVE MEASURES OF MEDIA FREEDOM

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Panel A: Free-media countries (Freedom House)								
$\widehat{\text{Log deaths}}$	0.167***	-14.49***	-13.84***	-11.88***	-9.459***	-12.80***	5.499***	-12.53***
	(0.0520)	(3.985)	(4.202)	(3.433)	(2.983)	(4.007)	(1.693)	(3.575)
Observations	15,283	14,894	14,894	14,896	14,894	14,896	14,885	15,065
F-stat First Stage	38.03	37.55	37.55	37.54	37.55	37.54	37.57	39.43
Panel B: Censored-media countries (Freedom House)								
$\widehat{\text{Log deaths}}$	0.0215	1.183	1.037	0.199	0.0267	2.380	-0.679	0.965
	(0.136)	(7.880)	(8.254)	(6.190)	(4.303)	(6.187)	(2.758)	(6.469)
Observations	6,891	6,708	6,708	6,708	6,708	6,708	6,708	6,708
F-stat First Stage	25.77	22.36	22.36	22.36	22.36	22.36	22.36	22.36
Country fixed effect	X	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X	X
H_0: Equality of coefficients (*p-value*)	0.44	0.08	0.11	0.09	0.07	0.04	0.06	0.06
Panel C: Free press countries (Press Freedom index)								
$\widehat{\text{Log deaths}}$	0.184***	-15.93***	-15.48***	-13.10***	-10.65***	-14.19***	6.012***	-13.89***
	(0.0530)	(4.141)	(4.410)	(3.586)	(3.106)	(4.214)	(1.793)	(3.739)
Observations	13,505	13,094	13,094	13,096	13,094	13,096	13,085	13,250
F-stat First Stage	36.38	35.88	35.88	35.87	35.88	35.87	35.91	37.74
Panel D: Censored press countries (Press Freedom index)								
$\widehat{\text{Log deaths}}$	0.0107	0.979	0.799	0.000488	-0.148	1.173	-0.233	0.561
	(0.122)	(7.576)	(7.785)	(6.060)	(4.552)	(5.869)	(2.758)	(6.272)
Observations	8,356	8,195	8,195	8,195	8,195	8,195	8,195	8,195
F-stat First Stage	31.21	28.23	28.23	28.23	28.23	28.23	28.23	28.23
Country fixed effect	X	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X	X
H_0: Equality of coefficients (*p-value*)	0.15	0.04	0.05	0.05	0.04	0.03	0.04	0.04

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Each regression includes as covariate the log number of global COVID-19 deaths. $\widehat{Deaths}$ indicates the value of log deaths from a first stage regression of log reported deaths using as instrument log simulated deaths based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. Media freedom (Freedom House) indicates a country with a value above 50 out of 100 on the Media Freedom index from the Freedom House project. Press freedom indicates a country with a score above 50 out of 100 on the RSF World Press Freedom index. F-stat First stage indicates the Kleibergen-Paap rk Wald F statistic of the excluded instrument in the first stage. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

TABLE D2: RESPONSIVENESS TO CASES AND MEDIA FREEDOM

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Panel A: Free-media countries								
$\widehat{\text{Log cases}}$	0.0900**	-9.637***	-9.344***	-7.915***	-6.296***	-7.500***	3.515***	-8.115***
	(0.0377)	(2.315)	(2.420)	(1.950)	(1.777)	(2.318)	(0.992)	(2.099)
Observations	11,822	11,547	11,547	11,547	11,547	11,547	11,545	11,624
F-stat First Stage	61.73	58.10	58.10	58.10	58.10	58.10	58.07	58.76
Panel B: Censored-media countries								
$\widehat{\text{Log cases}}$	0.0294	-3.455	-3.471	-3.082	-2.234	-2.514	0.811	-2.953
	(0.0461)	(2.688)	(2.929)	(2.225)	(1.731)	(2.024)	(1.051)	(2.289)
Observations	11,727	11,327	11,327	11,329	11,327	11,329	11,327	11,329
F-stat First Stage	39.18	36.33	36.33	36.39	36.33	36.39	36.33	36.39
Country fixed effect	X	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X	X
H_0: Equality of coefficients (*p-value*)	0.27	0.07	0.11	0.09	0.08	0.09	0.05	0.08

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Each regression includes as covariate the log number of global COVID-19 cases. $\widehat{Cases}$ indicates the value of log cases from a first stage regression of log reported cases using as instrument log simulated cases based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. F-stat First stage indicates the Kleibergen-Paap rk Wald F statistic of the excluded instrument in the first stage. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

TABLE D3: RESPONSIVENESS TO DEATHS OVER LAST 7 DAYS AND MEDIA FREEDOM

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Panel A: Free-media countries								
$\widehat{\text{Log deaths last 7 days}}$	0.230**	-22.23***	-22.08***	-18.00***	-13.90**	-19.98***	8.017***	-19.12***
	(0.0903)	(7.302)	(7.850)	(6.230)	(5.501)	(7.156)	(3.031)	(6.539)
Observations	11,288	11,040	11,040	11,040	11,040	11,040	11,038	11,117
F-stat First Stage	11.79	10.68	10.68	10.68	10.68	10.68	10.69	11.38
Panel B: Censored-media countries								
$\widehat{\text{Log deaths last 7 days}}$	-0.134	8.788	9.311	5.652	4.697	7.320	-3.638	7.153
	(0.108)	(7.386)	(7.350)	(5.941)	(3.862)	(5.766)	(2.757)	(5.958)
Observations	10,277	10,000	10,000	10,002	10,000	10,002	10,000	10,002
F-stat First Stage	25.84	24.61	24.61	24.61	24.61	24.61	24.61	24.61
Country fixed effect	X	X	X	X	X	X	X	X
Outbreak time fixed effect	X	X	X	X	X	X	X	X
H_0: Equality of coefficients (*p-value*)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Death count is a moving average over the last 7 days. Each regression includes as covariate the log number of global COVID-19 deaths. $\widehat{Cases}$ indicates the value of log deaths from a first stage regression of log reported deaths using as instrument log simulated deaths based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group. F-stat First stage indicates the Kleibergen-Paap rk Wald F statistic of the excluded instrument in the first stage. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

TABLE D4: HETEROGENEITY IN RESPONSIVENESS TO DEATHS OVER LAST 7 DAYS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Media Freedom	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]	[< 0.01]
Free and fair elections	[0.03]	[< 0.01]	[0.01]	[0.01]	[0.02]	[< 0.01]	[< 0.01]	[< 0.01]
Election in 2020	[0.12]	[0.02]	[0.07]	[0.03]	[0.08]	[0.01]	[0.09]	[0.05]
Most people can be trusted	[0.20]	[0.15]	[0.14]	[0.12]	[0.14]	[0.41]	[0.19]	[0.16]
Willingness to fight for country	[0.18]	[0.05]	[0.08]	[0.05]	[0.03]	[0.08]	[0.07]	[0.05]
Democracy	[0.24]	[0.10]	[0.14]	[0.19]	[0.31]	[0.08]	[0.20]	[0.13]
Executive constraints	[0.92]	[0.81]	[0.88]	[0.93]	[0.90]	[0.89]	[0.89]	[0.90]
Log GDP per capita $>$ median	[0.51]	[0.50]	[0.74]	[0.50]	[0.84]	[0.96]	[0.89]	[0.69]
Education $>$ median	[0.50]	[0.75]	[0.97]	[0.99]	[0.75]	[0.83]	[0.93]	[0.98]
Global Health Security index	[0.91]	[0.98]	[0.84]	[0.88]	[0.61]	[0.76]	[0.63]	[0.81]
Tax revenue $>$ median	[0.50]	[0.47]	[0.62]	[0.58]	[0.91]	[0.68]	[0.44]	[0.67]
Access to handwashing facilities	[0.74]	[0.99]	[0.65]	[0.95]	[0.60]	[0.36]	[0.57]	[0.72]
Income inequality	[0.54]	[0.39]	[0.49]	[0.38]	[0.75]	[0.96]	[0.33]	[0.56]
Social protection	[0.88]	[0.87]	[0.62]	[0.80]	[0.77]	[0.55]	[0.83]	[0.72]

Notes: Each cell is the p-value from a separate IV regression based on Equation (2). The p-value tests the null hypothesis of equality of the responsiveness to death coefficient for two subsamples. Death count is a moving average over the last 7 days. See Appendix Section F for definition of subsamples.

TABLE D5: RESPONSIVENESS AND MEDIA FREEDOM: ALTERNATIVE SPECIFICATION, OLS, NO INTERACTED FE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Log deaths	0.152***	-10.16***	-10.05***	-8.239***	-5.874***	-7.902***	3.544***	-8.461***
	(0.0338)	(2.356)	(2.416)	(1.910)	(1.507)	(2.030)	(0.871)	(1.948)
Log deaths × Media Freedom	-0.0325	0.977	1.324	0.650	0.585	1.287	-0.131	0.980
	(0.0218)	(1.575)	(1.548)	(1.263)	(0.990)	(1.323)	(0.581)	(1.306)
Observations	23,570	22,895	22,895	22,897	22,895	22,897	22,893	22,974
Country FE	X	X	X	X	X	X	X	X
Outbreak time FE	X	X	X	X	X	X	X	X

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Reported and simulated deaths in log. Outbreak time indicates the days since a country reported its first 10 COVID-19 deaths. Simulated deaths represent simulated fatalities based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group.

TABLE D6: RESPONSIVENESS AND MEDIA FREEDOM: ALTERNATIVE SPECIFICATION, NO INTERACTED FE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
$\widehat{\text{Log deaths}}$	0.170**	-11.66**	-11.73**	-9.800**	-7.829**	-10.26**	3.951*	-10.26**
	(0.0770)	(5.449)	(5.603)	(4.457)	(3.556)	(4.726)	(2.010)	(4.679)
$\widehat{\text{Log deaths}}$ × Media Freedom	-0.0226	0.321	0.653	0.193	0.264	0.717	0.210	0.461
	(0.0282)	(2.001)	(1.993)	(1.617)	(1.256)	(1.635)	(0.692)	(1.677)
Observations	21,734	21,209	21,209	21,211	21,209	21,211	21,207	21,288
F-stat First Stage	32.78	31.50	31.50	31.50	31.50	31.50	31.51	31.74
F-statistic death	79.81	74.08	74.08	74.07	74.08	74.07	74.09	72.90
F-statistic death x Media Freedom	225.99	175.07	175.07	175.04	175.07	175.04	175.11	166.64
Country FE	X	X	X	X	X	X	X	X
Outbreak time FE	X	X	X	X	X	X	X	X

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Reported and simulated deaths in log. Outbreak time indicates the days since a country reported its first 10 COVID-19 deaths. Simulated deaths represent simulated fatalities based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group.

TABLE D7: RESPONSIVENESS AND MEDIA FREEDOM: ALTERNATIVE SPECIFICATION, REDUCED FORM AND FIRST STAGE, NO INTERACTED FE

	(1)	(2)	(3)
	Time Outside	Log deaths	Log deaths × Media Freedom
Log SEIR deaths	-3.134*	0.291***	-0.325***
	(1.853)	(0.0448)	(0.0743)
Log SEIR deaths × Media Freedom	-0.130	0.0515	0.866***
	(1.325)	(0.0339)	(0.0417)
Observations	21,288	21,288	21,288
F-stat First Stage		31.74	31.74
F-statistic death		72.90	
F-statistic death × Media Freedom			166.64
Country FE	X	X	X
Outbreak time FE	X	X	X

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Reported and simulated deaths in log. Outbreak time indicates the days since a country reported its first 10 COVID-19 deaths. Simulated deaths represent simulated fatalities based on a SEIR model with several levels of infectious severity, age-specific transition rates, epidemiological parameters, and average mitigation measures and healthcare availability by income group.

TABLE D8: EXCESS MORTALITY AND RESPONSIVENESS - GREAT LOCKDOWN PERIOD

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Lockdown decision	Retails and recreation	Public Transport	Workplaces	Groceries and Pharmacies	Parks	Residentials	Time Outside
Excess deaths per thousand	0.00685	1.338	0.754	1.156	0.435	2.036	-0.851	1.182
	(0.0395)	(2.240)	(2.142)	(2.050)	(1.371)	(2.425)	(0.867)	(1.694)
Media Freedom × Excess deaths per thousand	-0.00212	-3.157	-2.344	-2.417	-1.552	-4.045	1.379	-2.741
	(0.0425)	(2.460)	(2.321)	(2.147)	(1.410)	(2.590)	(0.876)	(1.831)
Country fixed effect	X	X	X	X	X	X	X	X
Week fixed effect	X	X	X	X	X	X	X	X
N	657	648	648	648	648	648	648	660

Notes: Clustered standard errors at the country-level in parentheses. Significance levels: * 10%, ** 5%, *** 1%. Unit of observation: country-week. Excess mortality measured as the difference in deaths from all causes in a week compared to the average in the corresponding week between 2015-2019. Sample period: January 1 - May 3, 2020 (Weeks 1 to 18). A free-media country has a score above the median value of 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018. The dependent variable for Column 1 is a dummy variable for the implementation of a national lockdown for at least part of the day. Columns 2 to 7 indicate percentage changes in visits and length of stay after lockdown at different places compared to a median value, for the corresponding day of the week, during the 5-week period Jan 3–Feb 6, 2020.

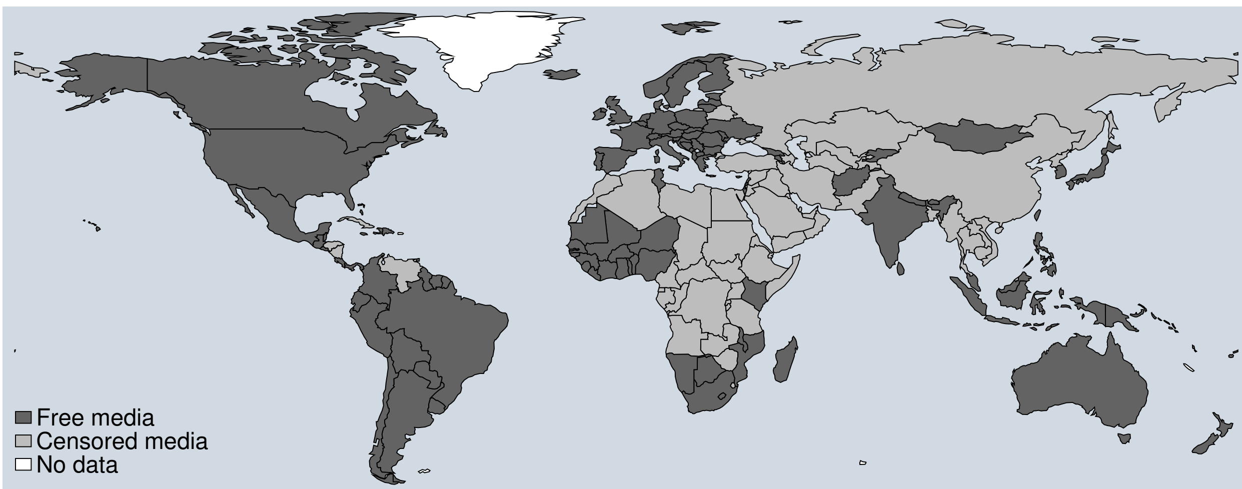


FIGURE D1: FREE-MEDIA AND CENSORED-MEDIA COUNTRIES (FREEDOM HOUSE)

Notes: Free media indicates a country with a value above above or equal to 50 out of 100 on the Freedom House media freedom index in 2020. **Free-media countries**: Afghanistan Albania Andorra Argentina Armenia Australia Austria Bahamas Belgium Belize Benin Bolivia Bosnia and Herzegovina Brazil Bulgaria Burkina Faso Canada Cape Verde Chile Colombia Costa Rica Croatia Cyprus Czech Republic Côte d'Ivoire Denmark Dominican Republic Ecuador El Salvador Estonia Finland France Gambia Georgia Germany Ghana Greece Guatemala Guinea Guinea-Bissau Guyana Haiti Hungary Iceland India Indonesia Ireland Israel Italy Jamaica Japan Kenya Kosovo Kyrgyzstan Latvia Lebanon Lesotho Liberia Lithuania Luxembourg Macedonia Madagascar Malawi Malaysia Mali Malta Mauritania Mauritius Mexico Moldova Montenegro Mozambique Namibia Nepal Netherlands New Zealand Niger Nigeria Norway Panama Paraguay Peru Philippines Poland Portugal Romania San Marino Sao Tome and Principe Senegal Serbia Sierra Leone Singapore Slovakia Slovenia South Africa South Korea Spain Sri Lanka Suriname Sweden Switzerland Togo Trinidad and Tobago Tunisia Ukraine United Kingdom United States Uruguay. **Censored-media countries**: Algeria Angola Azerbaijan Bahrain Bangladesh Belarus Cameroon Central African Republic Chad China Congo Cuba DRC Djibouti Egypt Equatorial Guinea Ethiopia Gabon Honduras Iran Iraq Jordan Kazakhstan Kuwait Libya Maldives Morocco Nicaragua Oman Pakistan Qatar Russia Rwanda Saudi Arabia Somalia South Sudan Sudan Swaziland Syria Tajikistan Tanzania Thailand Turkey Uganda United Arab Emirates Uzbekistan Venezuela Vietnam Yemen Zambia Zimbabwe. Countries not in sample are those with less than 10 reported COVID-19 deaths or not included in the Freedom House media freedom index.

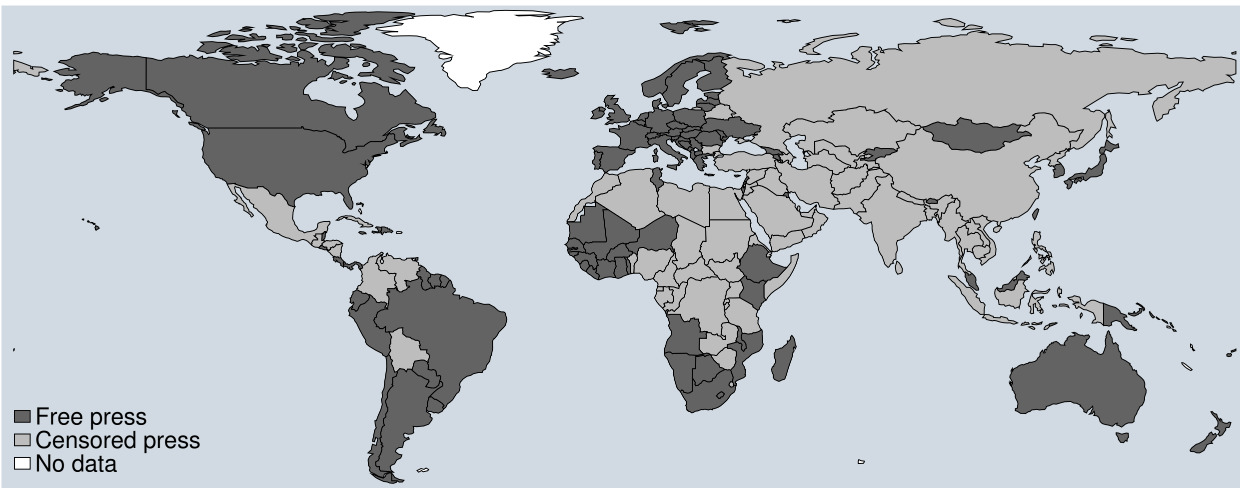


Figure D2: Free-press and Censored-press Countries

Notes: Free press indicates a country with a value above above or equal to 50 out of 100 on the World Press Freedom index in 2020. **Free-press countries**: Albania Andorra Angola Argentina Armenia Australia Austria Belgium Belize Bosnia and Herzegovina Brazil Burkina Faso Canada Cape Verde Chile Costa Rica Croatia Cyprus Czech Republic Côte d'Ivoire Denmark Dominican Republic Ecuador El Salvador Estonia Ethiopia Finland France Gambia Georgia Germany Ghana Greece Guinea Guinea-Bissau Guyana Haiti Hungary Iceland Ireland Israel Italy Jamaica Japan Kenya Kosovo Kuwait Kyrgyzstan Latvia Lebanon Lesotho Liberia Lithuania Luxembourg Macedonia Madagascar Malawi Malaysia Maldives Mali Malta Mauritania Mauritius Moldova Montenegro Mozambique Namibia Netherlands New Zealand Niger Norway Panama Paraguay Peru Poland Portugal Romania Senegal Serbia Sierra Leone Slovakia Slovenia South Africa South Korea Spain Suriname Sweden Switzerland Togo Trinidad and Tobago Tunisia Ukraine United Kingdom United States Uruguay. **Censored-press countries**: Afghanistan Algeria Azerbaijan Bahrain Bangladesh Belarus Benin Bolivia Bulgaria Cameroon Central African Republic Chad China Colombia Congo Cuba DRC Djibouti Egypt Equatorial Guinea Gabon Guatemala Honduras India Indonesia Iran Iraq Jordan Kazakhstan Libya Mexico Morocco Nepal Nicaragua Nigeria Oman Pakistan Palestine Philippines Qatar Russia Rwanda Saudi Arabia Singapore Somalia South Sudan Sri Lanka Sudan Swaziland Syria Tajikistan Tanzania Thailand Turkey Uganda United Arab Emirates Uzbekistan Venezuela Vietnam Yemen Zambia Zimbabwe. Countries not in sample are those with less than 10 reported COVID-19 deaths or not included in the World Press Freedom index.

F Subsamples cutoffs

Free-media country indicates a country with a value above the median value 0.7 in the V-Dem Freedom of Expression and Alternative Sources of Information index in 2018.

Free-media country (Freedom House) indicates a country with a value above above or equal to 50 out of 100 on the Freedom House media freedom index in 2020.

Free-press country indicates a country with a value above above or equal to 50 out of 100 on the World Press Freedom index in 2020.

Free and fair elections indicates a country with a value above the median value 0.6 on the V-Dem index for free and fair elections in 2018.

"Most people can be trusted" takes a value of 1 if the average national share of respondents is above the median for the corresponding World Value Survey question between 2000-2014.

"Willingness to fight for country" takes a value of 1 if the average national share of respondents is above the median for the corresponding World Value Survey question between 2000-2014.

Democracy indicates a country with value above the median value 0.8 on the normalised polity2 score from Polity IV Project in 2018.

Executive constraints indicates a country with a value above the median value of 0.65 in the V-Dem Executive constraint index.

Global Health Security index is an assessment of countries health securities and capabilities in 2019 including their ability to prevent, detect and respond to the spread of an epidemic.

High income indicates a country with GDP per capita above the median value.

Tax revenue measures the share of taxes to GDP in 2016 from Besley and Persson (2011).

Access to hand-washing facilities takes the value of 1 for countries above the median share of population with basic hand-washing facilities taken from the 2015 World Development Indicator (WDI).

Income inequality indicates countries with a Gini coefficient above the median from the 2015 WDI.

Social protection indicates a country with a percentage of population participating in social insurance, social safety net, unemployment benefits and active labor market programs above the median, from the 2015 WDI.