Lockdown Responses to COVID-19

Violeta A. Gutkowski

This article describes the relationship between countries' lockdown responses to the COVID-19 pandemic and those countries' political rights and civil liberties, macroeconomic variables, and vulnerability to the virus. Political rights and civil liberties cannot explain the differences in lockdown timing across countries. Countries with high contagion exposure due to weak water sanitation and weak health systems locked down their economies as fast as possible to reduce contagion. However, countries more vulnerable to COVID-19 due to large fractions of elderly and smokers in the population did not respond differently from less-vulnerable countries. Interestingly, macroeconomic variables that did affect the timing of lockdowns were the sizes of a country's financial and trading sectors, even when differences in income and population density are taken into account. (JEL C10, H4, I18)

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1 INTRODUCTION

Why did some countries lock down their economies faster than others? Was lockdown speed related to a country's economic condition, democratic rights and civil liberties, or vulnerability to contagion and death? This article aims at understanding differences across countries in response to the COVID-19 pandemic, focusing on lockdown speed.

Figure 1A shows that there is dispersion in countries' responses to COVID-19. After having 100 confirmed cases, some countries remained fully open, while others had closed their economy even before reaching this point. In addition, while many countries locked down their economy after having a "sufficient" number of confirmed cases, as shown in Figure 1B, what each country considered *sufficient* seems to vary. For many countries 100 cases was enough, while for others 2,000 cases was not enough to restrict activity.

Recently, a wide literature combining economic models with the SIR model of contagion, used by public health specialists, has highlighted the trade-off between reducing economic activity by reducing social interaction at businesses and reducing the rate of infections. At

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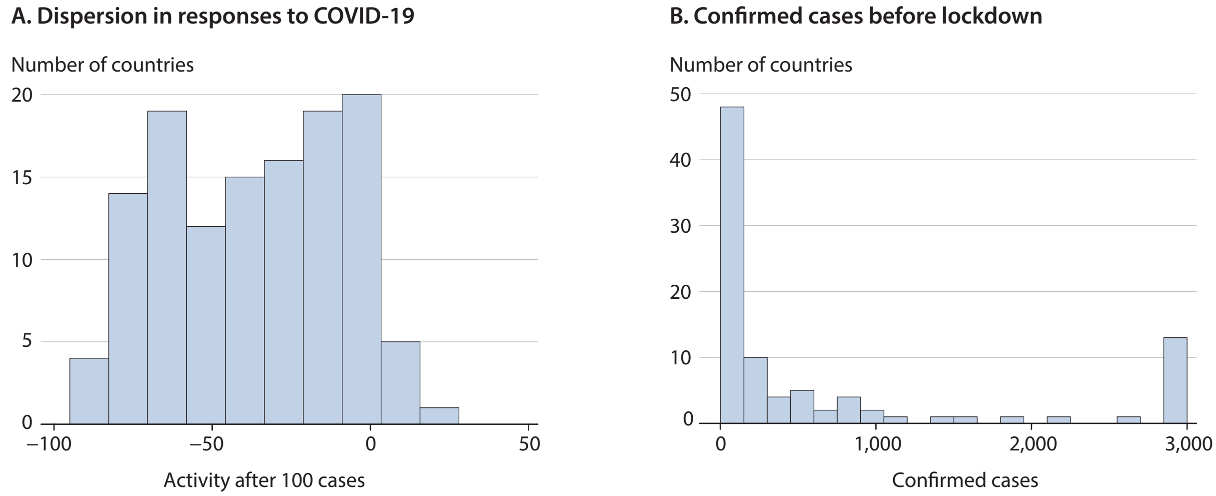
Figure 1

Country Containment Responses to COVID-19



NOTE: The lockdown measure in Panel B accounts for a country's economic activity falling at least 65 percent relative to the baseline. Note that while retail and recreation activity is positively correlated with economic activity, a 65 percent fall in that activity does not imply a fall in overall economic activity of the same degree.

SOURCE: Retail and recreation activity constructed using Google's (2020) "COVID-19 Community Mobility Reports."

the heart of the standard SIR model, there is a matching function that mixes susceptible individuals (S) with infected individuals (I).[1] Because private and public returns to social distancing differ due to externalities not taken into account by private agents, intervention could be desirable. Farboodi, Jarosch, and Shimer (2020) show that optimal policy reduces social interaction immediately relative to laissez-fare where individuals only reduce activity once the risk of infection becomes nonnegligible. Optimal social distancing starts as soon as the disease emerges, immediately imposing social distancing, for example, through stay-at-home orders. This sudden drop in activity delays the spread of infection and hence "buys time." That is, prior to development of a cure, social distancing enormously reduces expected fatalities and yields a substantial welfare gain, albeit at the cost of a reduction in social and economic activity.

The first and main hypothesis of this study is that lockdown timing and intensity in response to the pandemic can be explained by country differences in political rights and civil liberties. The lack of political rights and civil liberties can improve the externality problem. In other words, less individual liberty might imply more coordination and compliance, making the solution to the problem closer to the social optimum.

On one hand, on January 23, 2020, with a population of more than 11 million and less than 500 confirmed cases, Wuhan, China, was the first city to lock down; several other cities in the province of Hubei, China, followed immediately. On the other hand, on March 19, with a population of 36 million and already more than 1,000 confirmed cases, California was the first U.S. state to issue a statewide stay-at-home order.[2] China and the Unites States have very different degrees of civil liberties, and stay-at-home orders have been of different intensities and at different points in time. For example, while many cities in China faced a full quarantine where people were not allowed to leave their homes, this did not happen at any point in the United States.

Disparity in the responses of the United States and China to COVID-19 could be driven by the differences in the countries' individual liberties. How did countries between these two extremes respond to COVID-19? I would expect to see that countries with high levels of freedom, political rights, and civil liberties would take significantly longer to force their population to quarantine and issue lockdowns. However, I do not find evidence to support the idea that countries with lower levels of freedom responded faster to the pandemic through lockdowns.

This finding is consistent with Frey, Chen, and Presidente (2020). Using the Oxford COVID-19 Government Response Tracker (OxCGRT), they test the belief that autocratic governments have been more effective in reducing the movement of people to curb the spread of COVID-19. They find that autocratic regimes imposed more-stringent lockdowns and relied more on contact tracing. However, they find no evidence that autocratic governments were more effective in reducing travel and find evidence to the contrary: Countries with democratically accountable governments introduced less-stringent lockdowns but were approximately 20 percent more effective in reducing mobility than their less-democratic counterparts who enforced the same level of policy stringency. Cronert (2020) investigates the institutional determinants of the timing of COVID-19-related school closures around the world, focusing on the role of democracy and administrative state capacity. That study finds that other things being equal, democratic countries tended to implement school closures quicker than those with a more authoritarian regime, while countries with high government effectiveness tended to take longer to implement school closures than those with less-effective state apparatuses. Similarly, Bosancianu et al. (2020) find that, to date, political and social variables such as populist governments, right-leaning governments, or women-led governments have little explanatory power over and above simple demographic and health indicators.

Second, I study whether differences in health systems and sanitation services as well as fatal vulnerability to the virus can explain the variation in country responses. The health status of the population measures the set of individuals potentially susceptible to the virus. In the SIR model, infected people transmit the virus to susceptible people at a rate that depends on the nature of the virus and on the frequency of social interactions. Populations with potentially better health might not get infected as easily from contact with individuals with the disease or if infected might have a lower likelihood of death. Additionally, populations with better sanitation services might also have a reduced likelihood of contagion. Similarly, hospital capacity could affect the payoff function of the policymaker. For example, some models assume that there is a capacity constraint in the health care system and that part of the reason to lock down is to avoid exceeding hospital capacity (Jones, Philippon, and Venkateswaran, 2020). One would expect that countries that are more vulnerable to contagion, have a weak health system to fight the virus, or have a large fraction of the population with pre-existing characteristics that increase the likelihood of death would respond faster to the pandemic. I find that countries that were highly exposed to fast COVID-19 contagion had a much faster response than countries that had better access to safe drinking water and sanitation. However, countries more vulnerable to COVID-19 due to a large fraction of elderly or smokers in the population do not seem to have responded faster than less-vulnerable countries. Nevertheless, after controlling for differences in income, none of these health- and sanitation-related variables can explain the variation in country responses to COVID-19. It is worth noting that this article is silent regarding whether differences in responses across countries are due to differences in sanitation and health systems or differences in incomes across countries, since these variables are highly correlated.

Early in 2020, the general expectation was that the coronavirus pandemic's effects would be more severe in developing countries than in advanced economies, on both the public health and economic fronts. According to Goldberg and Reed (2020), preliminary evidence as of June 2020 supports a more optimistic assessment. According to their investigation, to date, most low- and middle-income countries have had a significantly lower death toll per capita than richer countries, a pattern they attribute primarily to younger populations and limited obesity. On the economic front, emerging market and developing economies have seen massive capital outflows and large price declines for certain commodities, especially oil and non-precious metals; however, Goldberg and Reed (2020) suggest that these changes are in line with earlier commodity price shocks. They conclude that in the long run, the highest costs may be due to the indirect effects of virus containment policies on poverty, health, and education as well as to the effects of the accelerating deglobalization of emerging market and developing economies.

Finally, I look at whether economic variables that could affect the resources that countries have to navigate the impact of a substantial fall in economic activity could be responsible for the variation in responses. Macroeconomic variables could be changing the payoff function of the policymaker. Rich economies might have a different threshold for minimum consumption than poor countries; hence, they might be able to afford larger investment in health at the expense of the economy. I find that once differences in income and population density are taken into account, differences in the sizes of the financial and trading sectors can additionally explain variation in responses across countries. Demirguc-Kunt, Lokshin, and Torre (2020) provide an estimate of the economic impacts of the non-pharmaceutical interventions implemented by countries in Europe and Central Asia over the initial stages of the COVID-19 pandemic. Their results suggest that non-pharmaceutical interventions led to about a 10 percent decline in economic activity across the regions. On average, countries that implemented non-pharmaceutical interventions in the early stages of the pandemic appear to have had better short-term economic outcomes and lower cumulative mortality, compared with countries that imposed non-pharmaceutical interventions during the later stages of the pandemic. In part, this is because the interventions have been less stringent. Moreover, there is evidence that COVID-19 mortality at the peak of a local outbreak has been lower in countries that acted earlier.

The article is organized as follows. Section 2 reports the sources and the construction of the main variables used throughout the article. Section 3 presents the empirical analysis and main results. Section 4 concludes.

2 DATA

This article puts together databases from several sources. Data on COVID-19 total cases and deaths are from Roser et al. (2020), who collect this information as posted by the European Center for Disease Prevention and Control. Data on "activity" are from Google's (2020) "COVID-19 Community Mobility Reports." I use changes in retail and recreation activity relative to January 2020 as the main measure of activity. This variable is highly correlated with other mobility measures in the dataset such as workplace mobility and transit station activity (see Figure A2 in the appendix). The relative fall in mobility accounts for the fall in activity overall, not necessarily just from measures imposed by local governments. Additionally, a fall in retail and recreation activity does not necessarily imply a fall in economic activity of the same degree, since many people continued working from home and attended on-line activities. Nevertheless, a substantial fall in activity relative to January 2020 indicates a significant change in the population's behavior during the early months of the pandemic.

I use Freedom House's "Freedom in the World 2020" global report on political rights and civil liberties and the freedom index therein to assess the degree of real-world rights and freedoms enjoyed by individuals within each country, which I call *freedom*. Given wide variation in government containment measures in response to COVID-19, the goal is to assess whether differences in the speeds of quarantine and lockdown measures can be explained by differences in the degree of freedom. I would expect to see that countries that have high levels of freedom would take significantly longer to engage their population into quarantines and lockdowns.

The variable *Freedom* comes from the Freedom House freedom index, which is constructed by analysts who use a broad range of sources, including news articles, academic analyses, reports from nongovernmental organizations, individual professional contacts, and on-the-ground research. The index is composed of a combination of points from political rights questions, including on the electoral process, political pluralism and participation, and the functioning of government, and from civil liberties questions, including on freedom of expression and beliefs, associational and organizational rights, rule of law and personal autonomy, and individual rights.[3]

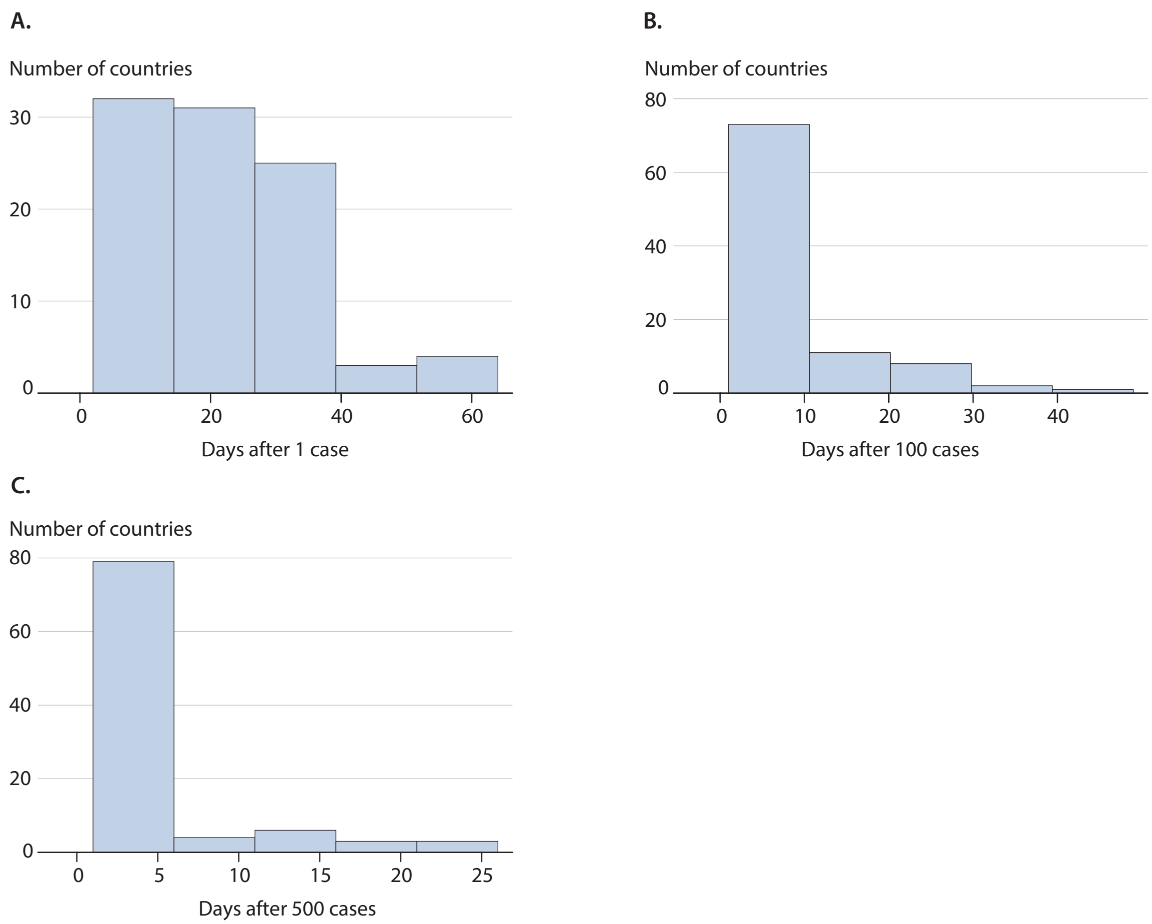
Data on macroeconomic variables such as gross domestic product (GDP) per capita, unemployment, public debt, health, water access and sanitation, and population variables are from World Development Indicators (WDI, 2020). My dataset includes 128 countries with the daily evolution of total cases, deaths, and mobility from February 15 to June 27, 2020. Macroeconomic, health, and freedom data are the most-recent annual data, so I only have one observation per country. In the appendix, see Table A9 for a list of all countries included in the sample, Table A1 for descriptive statistics of the main variables used, and Table A10 for short descriptions and sources of all the variables used.

2.1 Lockdown

I construct a measure of lockdown speed as the number of days before the country reduces its activity by 65 percent. Figure 2 shows how long it took for countries to reduce their activity

Figure 2

Number of Country Lockdowns After 1, 100, and 500 Confirmed Cases



NOTE: A lockdown is defined as at least a 65 percent fall in activity relative to the baseline.

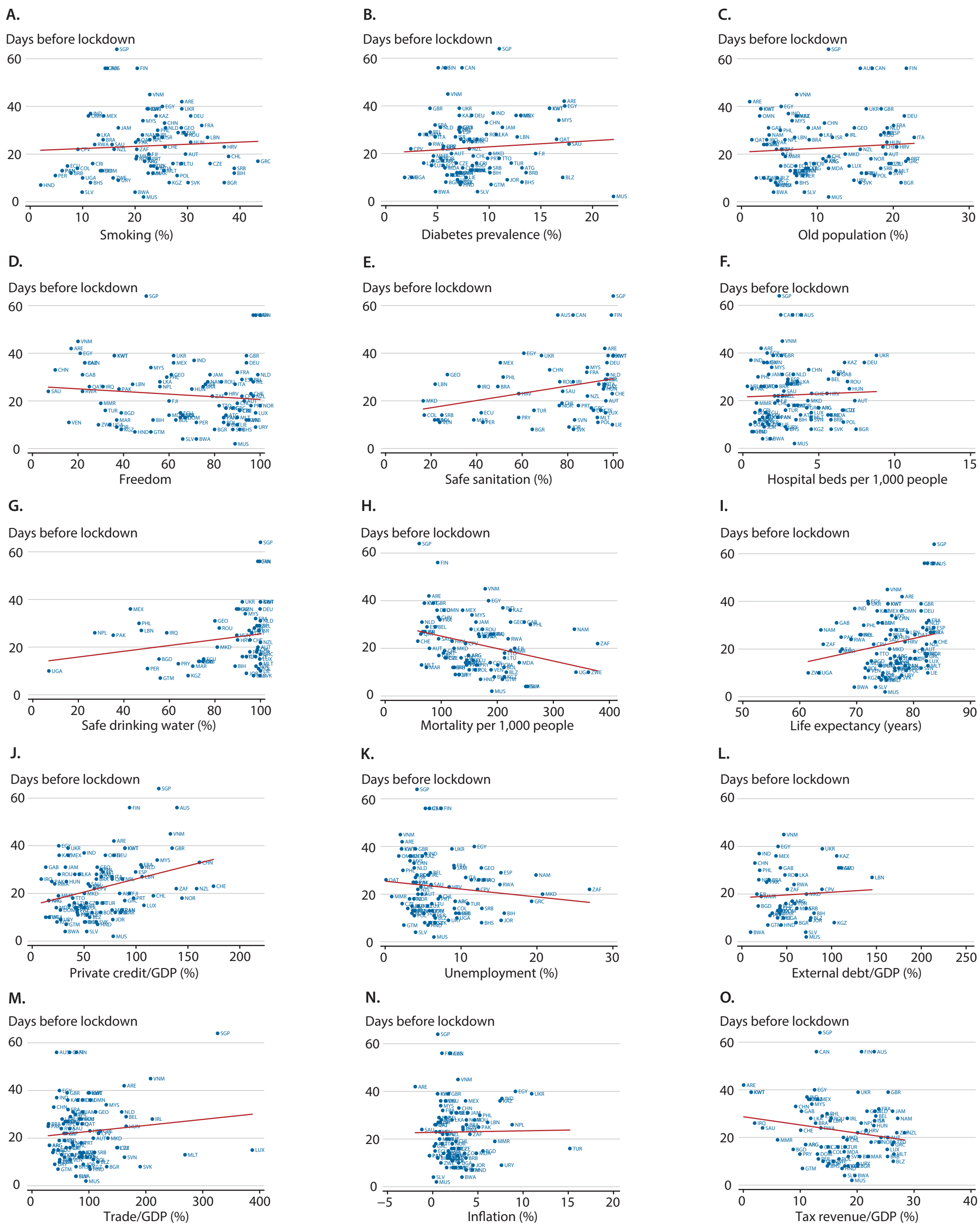
SOURCE: The lockdown measure is constructed using Google's (2020) "COVID-19 Community Mobility Reports."

to this level after the first confirmed case, 100 cases, and 500 cases. While most countries had substantially reduced their activity a few days after reaching 500 confirmed cases, there is more dispersion in their responses when the number of confirmed cases is lower. I study the correlation between lockdown speed (measured in days) and freedom in addition to several economic and health variables that could be related to vulnerability to COVID-19.

Various measures for government containment responses to the virus have been used in the literature. For example, Hale et al. (2020) construct a COVID-19 Government Response Stringency Index that is a composite measure of seven indicators related to school and workplace closings, international travel bans, restrictions on public events and gatherings, and stay-at-home requirements, among others. The lockdown measure used in this article is not directly related to government measures per se but is the likelihood of lockdown measures

Figure 3

Correlation of Lockdown Speed



NOTE: Correlation between lockdown speed and health or economic vulnerability. *y*-axes: Days between first COVID-19 case and lockdown (65 percent fall in activity). *x*-axes: See Table A10 for descriptions of measurements.

Table 1

Correlation Between Lockdown Speed and Health or Economic Vulnerability

Life expectancy	Freedom	Political rights	Civil liberties
1.003***	0.065	0.146	0.112
(0.1690)	(0.0394)	(0.0907)	(0.0680)
Smoking	**Old population**	**Population density**	**Diabetes prevalence**
0.127	0.584***	0.000887	0.180
(0.1210)	(0.1620)	(0.00404)	(0.2520)
Safe drinking water	**Safe sanitation**	**Hospital beds per 1,000 people**	**Mortality**
0.156***	0.126***	0.447	–0.0593***
(0.0511)	(0.0309)	(0.5080)	(0.0125)
Trade/GDP	**External debt/GDP**	**Unemployment**	**Private credit/GDP**
0.012	–0.058	–0.408**	0.122***
(0.0179)	(0.0338)	(0.1870)	(0.0219)
GDP per capita	**Financial sector credit/GDP**	**Tax revenue/GDP**	**Public debt/GDP**
3.983***	0.115***	–0.179	–0.005
(0.6590)	(0.0171)	(0.1750)	(0.0548)

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Lockdown speed is days between the first confirmed COVID-19 case and a 65 percent fall in activity.

enforcing changes in the population's behavior. Nevertheless, Figure A1 shows that lockdown speed based on this measurement is highly correlated with the speed or timing that would result from using the Hale et al. (2020) Stringency Index.

Figure 3 plots the main variables of interest—freedom, macroeconomic, and health conditions variables—against the measure of lockdown speed; Table 1 shows the significance of these correlations, taking into account that countries had different lockdown starting dates. Note that a significant positive correlation implies a significantly longer time until lockdown. For example, the significant positive correlation for *life expectancy* implies that countries with a higher life expectancy took significantly longer to lock down than countries with a lower life expectancy.

I find that countries that were more vulnerable to contagion achieved faster non-pharmaceutical measures to reduce the probability of the spread of the pandemic by locking down their economies earlier. In particular, countries with better access to safe sanitation and drinking water, higher life expectancy, and lower mortality rates responded more slowly to the pandemic. However, countries more vulnerable to the virus due to health conditions, such as large fractions of older adults, smokers, or diabetics in the population, did not respond faster than less-vulnerable countries.[4] Finally, richer countries with a larger financial sector took longer to lock down their economies, while other macroeconomic conditions such as the tax-revenue-to-GDP ratio, public debt, and political rights and civil liberties were uncorrelated with the decision to lock down.

3 EMPIRICAL STRATEGY

So far I have provided a description of lockdowns across countries. What could be driving the variation in country responses to COVID-19? At first sight, it seems that richer countries (in per capita terms)—with higher life expectancy and a large fraction of the population with access to safe drinking water and sanitation—took longer to respond. Can the degree of political rights and civil liberties explain differences in lockdown speeds across countries? Can the variation in economic conditions explain the differences? Or can the ease of contagion and the vulnerability of the population to the disease explain the differences?

A wide literature combining economic models with the SIR model of contagion used by public health specialists has highlighted the trade-off between reducing economic activity by reducing social interaction and reducing the rate of infections. At the heart of the standard SIR model, there is a matching function that mixes susceptible individuals (S) with infected individuals (I). Because private and public returns from social distancing differ due to externalities not taken into account by private agents, intervention could be desirable. The lack of political rights and civil liberties could reduce the externality problem. In other words, less individual liberty might imply more coordination and compliance, making the solution to the problem closer to the social optimum. The health status of the population measures the set of potentially susceptible individuals; thus, populations with a potentially better health status might be less likely to get infected from contact with individuals with the disease. Additionally, hospital capacity as well as macroeconomic variables can change the payoff function of the policymaker.

I find that freedom cannot explain differences in behavior across countries. Countries with a larger private-credit-to-GDP ratio took significantly longer to reduce their activity, probably because the cost of locking down the economy was higher. Additionally, countries with a larger trading sector were faster at implementing measures against COVID-19 contagion. Finally, countries more vulnerable to contagion were faster at implementing effective containment measures against COVID-19, while countries with populations more vulnerable to death from COVID-19 due to pre-existing characteristics do not seem to have behaved differently from less-vulnerable countries. However, once GDP per capita is taken into account, these differences in behavior to suppress contagion are no longer significant.

3.1 Freedom, Political Rights, and Civil Liberties

First, I test whether countries with higher levels of freedom took longer to lock down. I perform the following analysis:

$$Days_i = \beta_0 + \beta_1 Freedom + \beta_2 \mathbf{X}_i + \epsilon_i.$$

The dependent variable is days between the day in which the first 100 cases were confirmed and the day in which the country had reached a large lockdown (activity fell 65 percent relative to the baseline in January 2020). The main explanatory variable to assess the degree of real-world rights and freedoms enjoyed by individuals within each country is *Freedom*. One could think that given the substantial polarity in the responses of the United States and China, civil

Table 2

Civil Freedom and Lockdown Timing

	(1) L65_day1	(2) L65_day100	(3) L65_day500	(4) L65_day100	(5) L65_day100	(6) L50_day100	(7) L80_day100
Freedom	0.0174 (0.0371)	–0.0933 (0.0606)	–0.0103 (0.0289)			–0.0067 (0.0259)	–0.0098 (0.0790)
Political rights				–0.177 (0.130)			
Civil liberties					–0.179 (0.106)		
GDP per capita	1.187 (1.734)	5.031** (1.987)	2.458* (1.310)	4.741** (1.901)	5.213** (2.005)	3.386*** (0.604)	4.879* (2.747)
Population density	0.00135 (0.00395)	0.00229 (0.00485)	0.00059 (0.00264)	0.00230 (0.00504)	0.00230 (0.00472)	0.00146 (0.00214)	–0.00250 (0.00612)
Constant	–5.09 (14.84)	–33.86** (15.29)	–18.65* (10.60)	–32.63** (14.90)	–34.66** (15.40)	–23.90*** (5.56)	–31.37 (24.03)
Observations	92	92	92	92	92	113	60
R^2	0.521	0.625	0.621	0.617	0.631	0.924	0.891

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC*: *X* percent fall in activity after the first *C* COVID-19 case(s) confirmed. These regressions include time fixed effects to account for differences across countries in the dates of the first confirmed COVID-19 case.

liberties could account for the differences in country responses to COVID-19. A positive and significant coefficient β_1 would imply that countries with a higher level of freedom took longer to enforce non-pharmaceutical measures to protect their population from the spread of the disease. $\mathbf{X}_i$ is a vector of control variables that includes the logarithm of GDP per capita and population density.

Table 2 shows the results for this analysis. *LXdayC* stands for a lockdown that implied an *X* percent fall in activity after the first *C* confirmed case(s). After controlling for GDP per capita and population density, none of the variables related to levels of *Freedom*—the freedom index, political rights index, or civil liberties index—can explain differences in lockdown speeds. This finding is robust to using partial (50 percent) and extreme (80 percent) lockdown measures (Columns 6 and 7 of Table 2) as well as considering days until the first 500 confirmed cases (Column 3 of Table 2).[5] My results are in line with the findings of Hale et al. (2020) and Frey, Chen, and Presidente (2020). Additionally, these results are robust to controlling by region, clustering at the region level, and analyzing different combinations of lockdown intensity and confirmed cases. These results are also robust when I allow the model to be nonlinear; Table A3 in the appendix provides analysis under different scenarios to support this finding.

3.2 Macroeconomic Variables

Next, I test whether macroeconomic variables can explain the variation in responses across countries, specifically, the public debt-to-GDP ratio, the unemployment rate, openness

Table 3

Macroeconomic Variables and Lockdown Timing

	L65_day100					
	(1)	(2)	(3)	(4)	(5)	(6)
Trade/GDP	–0.0435* (0.0241)					
Public debt/GDP		–0.0563 (0.0713)				
Unemployment			–0.242 (0.209)			
External debt/GDP				–0.0647 (0.0530)		
Financial sector credit/GDP					0.0755*** (0.0236)	
Private credit/GDP						0.0723*** (0.0230)
GDP per capita	4.557*** (1.483)	5.401* (2.785)	3.914** (1.422)	3.648 (2.475)	2.226* (1.139)	2.610** (1.140)
Population density	0.00550 (0.00434)	0.00255 (0.00965)	0.00101 (0.00567)	0.00969** (0.00462)	0.00121 (0.00424)	0.00322 (0.00474)
Constant	–32.26** (12.49)	–39.68 (24.53)	–27.63** (12.79)	–24.38 (19.07)	–20.41* (10.13)	–22.79** (10.50)
Observations	91	28	86	48	91	91
R^2	0.641	0.828	0.642	0.793	0.662	0.633

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC*: *X* percent fall in activity after the first *C* cases confirmed. These regressions include time fixed effects to account for differences across countries in the dates of the first confirmed COVID-19 case.

to trade, or the size of the financial sector. Macroeconomic variables could be changing the payoff function of the policymaker. For example, one could think that countries more economically unstable would have taken longer to respond to COVID-19 due to the devastating economic consequences a lockdown could bring and their scarce resources to navigate the expected economic downturn.

Following a similar exercise as before,

$$Days_i = \beta_0 + \beta_1 MacroVar + \beta_2 \mathbf{X}_i + \epsilon_i.$$

I regress the number of days it took each country after its first 100 confirmed cases to reach activity 65 percent lower than it had in January 2020. Table 3 shows the main results. Note that a positive and significant coefficient β_1 implies a significantly slower response to COVID-19.

I find that countries with a larger financial sector took significantly longer than other countries to reduce their activity. This is true using several measures of financial sector such as the private credit-to-GDP ratio, financial sector credit-to-GDP ratio, or private credit provided by banks-to-GDP ratio (see Tables A4 and A5 in the appendix).

Surprisingly, macroeconomic variables such as the unemployment rate, external debt to GDP, inflation, and tax revenue to GDP (among others) do not explain the variation in country responses to COVID-19. One would have expected that countries would be concerned about the economic consequences of lockdowns. What I observe is that countries with a larger financial sector took significantly longer to lock down their economies, probably due to the fears of repeating the previous large financial crisis. In addition, countries with a higher trade-to-GDP ratio reacted faster than countries with a lower degree of trade. Tables A4 and A5 in the appendix provide robustness analysis that takes into account regional fixed effects and different combinations of lockdown intensity and confirmed cases. These tables also include other macroeconomic variables not included in Table 3; however, the do not have any explanatory power for differences in country responses to COVID-19.

3.3 Health and Sanitation Variables

In this section, I perform a similar analysis as before but now look into the health vulnerability and sanitation variables. In the SIR model, infected people transmit the virus to susceptible people at a rate that depends on the nature of the virus and on the frequency of social interaction. Populations with a potentially better health status are less likely to get infected from contact with individuals with the disease or if infected might have a lower likelihood of death. I find that, surprisingly, countries more vulnerable to COVID-19 due to large fractions of older adults, smokers, and/or diabetics in the population did not respond differently from less-vulnerable countries. The analysis I conduct is the following:

$$Days_i = \beta_0 + \beta_1 HealthVar + \beta_2 \mathbf{X}_i + \epsilon_i.$$

Results can be found in Table 4. Although contagion variables such as water sanitation, access to drinking water, and the mortality rate significantly correlate with lockdown speed,[6] once GDP per capita is taken into account, these variables lose explanatory power. It is worth mentioning that this analysis is silent about whether differences in the responses across countries are due to differences in sanitation and health systems or differences in income across countries, since these variables are highly correlated. Also, note that a negative coefficient on access to drinking water implies that countries with better access to drinking water took significantly fewer days to lock down their economies. Nevertheless, this significance is not robust to different measures of lockdown intensity.[7]

If we allow the model to be nonlinear to better fit the data, mortality becomes statistically significant—with a negative coefficient. That is, countries with a higher mortality rate locked down their economies significantly faster (see Table A6). Note that while the significance of mortality is robust to different levels of lockdown intensity and confirmed cases, the significance of the coefficient on the smoking population is not.

Finally, it would be interesting to know if richer countries with a higher health care capacity or better hygiene system actually took longer to lock down their economies relative to rich countries with a lower-quality hygiene system. Thus, I allow the model to have an interaction term between the health variable and GDP per capita:

Table 4

Health and Contagion Variables and Lockdown Timing

	Days before large lockdown after 100 cases (L65_day100)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Smoking	0.0818 (0.0713)							
Old population		0.0741 (0.2550)						
Diabetes prevalence			0.0950 (0.2910)					
Safe drinking water				–0.0665* (0.0381)				
Safe sanitation					0.0543 (0.0492)			
Hospital beds per 1,000 people						–0.468 (0.425)		
Mortality							–0.0280 (0.0186)	
Life expectancy								0.433 (0.457)
GDP per capita	4.195** (1.565)	3.626** (1.430)	3.545** (1.478)	4.503*** (1.083)	2.651 (1.777)	4.075*** (1.451)	2.902** (1.131)	2.469* (1.434)
Population density	0.00235 (0.00588)	0.00240 (0.00554)	0.00021 (0.00686)	0.00215 (0.00696)	–0.000679 (0.00693)	0.00245 (0.00522)	–0.000567 (0.00557)	0.00182 (0.00552)
Constant	–33.91** (13.96)	–28.02** (12.56)	–26.64** (14.54)	–29.30*** (10.15)	–20.48 (15.02)	–29.91** (12.86)	–15.88 (10.50)	–49.32 (29.02)
Observations	83	93	93	58	56	91	82	93
R^2	0.626	0.594	0.518	0.832	0.827	0.621	0.558	0.607

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC*: *X* percent fall in activity after the first *C* cases confirmed. These regressions include time fixed effects to account for differences across countries in the dates of the first confirmed COVID-19 case.

$$Days_i = \beta_0 + \beta_1 HealthVar + \beta_2 GDP + \beta_3 HealthVar{*}GDP + \beta_4 \mathbf{X}_i + \epsilon_i.$$

If β_3 were positive and significant, it would imply that richer countries with a better health care system took longer to lock down their economies, providing evidence to support differences in the payoff function of the policymaker that can be incorporated into the SIR model. Nevertheless, I do not find supportive evidence for this statement (Table 5), and this finding is robust to different levels of lockdown intensity and confirmed cases.

4 CONCLUSION

To sum up, this article combines several databases to study whether civil liberties and political rights influenced country responses to the pandemic. I find that different levels of

Table 5

Health and Contagion Variables Interaction with GDP

	(1) L65_day100	(2) L65_day100	(3) L65_day100	(4) L80_day1	(5) L80_day1	(6) L80_day1
Hospital beds per 1,000 people	–4.147 (4.394)			–10.030 (15.880)		
Hospital beds per 1,000 people × GDP	0.423 (0.458)			1.140 (1.678)		
Safe sanitation		0.106 (0.603)			–1.432 (2.497)	
Safe sanitation x GDP		–0.004 (0.062)			0.165 (0.269)	
Safe drinking water			–0.412 (0.562)			–1.840 (1.952)
Safe drinking water × GDP			0.040 (0.063)			0.204 (0.240)
GDP per capita	2.500 (1.787)	2.199 (4.147)	1.009 (5.395)	–0.690 (6.121)	–10.330 (18.950)	–14.120 (24.520)
Population density	–0.00041 (0.00595)	–0.00364 (0.00712)	0.00162 (0.00686)	0.00126 (0.01040)	–0.00086 (0.01190)	–0.00365 (0.01380)
Constant	–15.69 (15.57)	–16.30 (37.20)	0.32 (47.01)	32.29 (54.83)	117.10 (167.50)	154.20 (202.70)
Observations	92	57	58	62	45	42
R^2	0.543	0.702	0.836	0.793	0.857	0.822

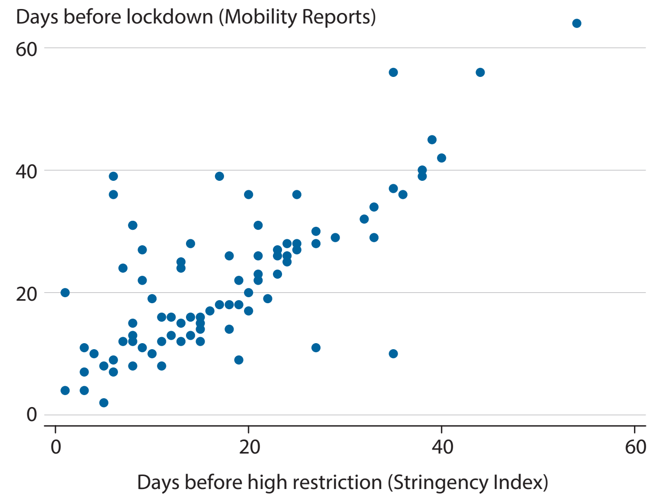
NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC*: *X* percent fall in activity after the first *C* case(s) confirmed. These regressions include time fixed effects to account for differences across countries in the dates of the first confirmed COVID-19 case.

political rights and civil liberties—freedom—cannot explain differences in lockdown timing across countries. Vulnerability to fast contagion seems to have been at the heart of lockdown decisions. The health and contagion variables are highly correlated with a country's income level. Thus, once GDP per capita is taken into account, most health and contagion variables cannot further explain differences in country responses to the pandemic. Interestingly, macroeconomic variables that did affect lockdown were the sizes of a country's financial and trade sectors, even when taking into account income and population density differences across countries. This finding suggests that fears of another financial crisis might have played an important role in how countries decided to manage the COVID-19 pandemic. I perform several robustness checks and show that the main results are robust to controlling for differences in the timing of a country's first confirmed case (by controlling for time fixed effects); regional differences (by controlling for regional fixed effects); and different measures of lockdown intensity, that is, activity falling by 50 percent, 65 percent, or 80 percent. ■

APPENDIX: FIGURES AND TABLES

Figure A1

Correlation Between Mobility and Stringency Index

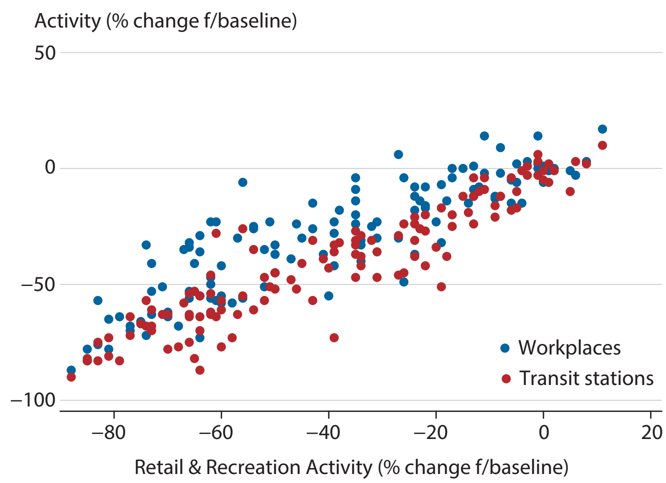


NOTE: *x*-axis: Days before a country reached a high level of restriction (65 percent fall in activity) using the Stringency Index. *y*-axis: Days to a 65 percent fall in activity (relative to January 2020) after the first confirmed COVID-19 case in a country.

SOURCE: Activity is based on Google's (2020) "COVID-19 Community Mobility Reports." The Stringency Index is from Hale et al. (2020).

Figure A2

Correlation Between Mobility Variables



NOTE: Activity is measured as changes in mobility in retail and recreation, workspaces, and transit stations one day after the first 100 confirmed COVID-19 cases in a country relative to January 2020.

SOURCE: Activity is based on Google's (2020) "COVID-19 Community Mobility Reports."

Table A1

Descriptive Statistics: Explanatory Variables

Variables	(1) Mean	(2) SD	(3) Min	(4) Max	(5) *p5*	(6) *p50*	(7) *p95*	(8) *N*
GDP per capita	8.92	1.41	6.00	11.61	6.57	8.95	10.97	128
Population density	155.80	212.50	1.98	1.45	6.68	83.48	528.00	127
Freedom	62.69	28.11	7.00	100.00	16.00	66.00	98.00	127
Political rights	25.02	12.59	0.00	40.00	2.00	27.00	40.00	127
Civil liberties	37.67	15.80	6.00	60.00	12.00	38.00	58.00	127
External debt (% of GDP)	53.32	35.81	9.71	253.90	18.19	42.97	107.60	73
Domestic credit to private sector by banks (% of GDP)	56.94	37.10	8.70	174.60	13.02	50.21	133.10	124
Financial sector credit (% of GDP)	76.76	50.71	6.98	271.70	19.77	64.46	176.70	123
Private credit (% of GDP)	61.76	41.80	8.70	187.20	13.09	52.54	144.60	123
Public debt (% of GDP)	59.90	41.30	0.05	196.40	14.18	51.42	141.40	37
Tax revenue (% of GDP)	16.76	6.39	0.02	33.37	6.02	16.03	26.46	108
Trade (% of GDP)	90.11	54.52	27.54	387.10	36.18	77.24	165.50	124
Unemployment	6.69	4.53	0.11	26.92	2.16	5.37	15.27	106
Smoking (% of population)	20.90	9.10	2.00	43.40	6.40	21.60	37.00	109
Old population (% of population)	9.89	6.75	1.09	27.58	2.39	7.27	21.02	128
Access to safe drinking water (% of population)	80.13	25.95	7.07	100.00	23.72	93.95	100.00	76
Access to safe sanitation (% of population)	71.16	28.43	9.61	100	18.71	82.41	99.65	73
Hospital beds per thousand people	3.14	2.54	0.10	13.05	0.50	2.40	8.00	119
Life expectancy	74.14	7.00	54.69	84.63	61.04	75.28	83.03	130
Mortality	180.10	81.65	58.20	406.20	65.56	171.90	341.80	116

NOTE: SD, standard deviation.

Table A2

Descriptive Statistics: Days to Lockdown

	Mean	SD	Min	Max	*p5*	*p50*	*p95*	*N*
Large lockdown: 500 cases (days) (L65_day500)	3.65	5.80	1.00	26.00	1.00	1.00	19.00	95.00
Large lockdown: 100 cases (days) (L65_day100)	7.05	8.96	1.00	49.00	1.00	3.00	25.00	95.00
Large lockdown: 1 case (days) (L65_day1)	22.33	12.57	2.00	64.00	7.00	20.00	45.00	95.00
Partial lockdown: 100 cases (days) (L50_day100)	6.86	12.67	1.00	105.00	1.00	1.00	32.00	118.00
Extreme lockdown: 100 cases (days) (L80_day100)	13.53	14.54	1.00	69.00	1.00	8.50	41.00	64.00
Extreme lockdown: 500 cases (days) (L80_day500)	7.98	11.41	1.00	62.00	1.00	1.50	29.00	64.00

NOTE: SD, standard deviation.

Table A3

Civil Freedom and Lockdown Timing

	L65_day1	L65_day100	L65_day500	L65_day100	L65_day100	L50_day100	L80_day100	L65_day100
Freedom	0.0151 (0.0888)	–0.0577 (0.0308)	–0.0060 (0.0213)			–0.0155 (0.0135)	0.0640 (0.0556)	–0.2520 (0.2940)
Political rights				–0.0857 (0.0747)				
Civil liberties					–0.1280* (0.0534)			
Freedom 2								0.0014 (0.0022)
GDP per capita	3.227 (1.707)	4.365** (1.234)	1.982 (1.043)	4.135** (1.165)	4.549** (1.318)	2.617** (0.864)	2.971 (1.462)	4.232** (1.796)
Population density	–0.00151 (0.00449)	0.00171 (0.00534)	0.00085 (0.00328)	0.00152 (0.00532)	0.00184 (0.00536)	0.00048 (0.00125)	–0.00583** (0.00135)	0.00035 (0.00547)
Constant	–1.28 (24.98)	–24.26 (18.41)	–10.30 (13.10)	–23.81 (18.17)	–24.65 (18.61)	–13.76 (10.04)	–16.42 (9.96)	–17.03 (15.74)
Observations	92	92	92	92	92	113	60	93
R^2	0.615	0.664	0.639	0.660	0.668	0.936	0.909	0.625

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC* : *X* percent fall in activity after the first *C* confirmed COVID-19 case(s). Freedom 2 is the squared term for Freedom. These regressions include time and region fixed effects to account for differences across countries in the dates of the first-reported COVID-19 case and regional differences.

Table A4

Macroeconomic Variables and Lockdown Timing

	Days until partial lockdown date after 100 cases (L50_day100)							
Trade/GDP	−0.0204 (0.0368)							
Public debt/GDP		−0.0083 (0.0334)						
Tax revenue/GDP			−0.0770 (0.0677)					
Unemployment				−0.0545 (0.1270)				
External debt/GDP					−0.0603*** (0.0116)			
Financial sector credit/GDP						0.0662** (0.0154)		
Private credit/GDP							0.0594*** (0.0124)	
Private credit (by banks)/GDP								0.0622*** (0.0130)
GDP per capita	2.845* (1.116)	2.167 (1.027)	2.685** (0.820)	2.677** (0.866)	3.362*** (0.306)	1.014*** (0.131)	1.467** (0.377)	1.466** (0.581)
Population density	0.00117 (0.00237)	0.00879 (0.02100)	0.00015 (0.00072)	8.06e-06 (0.00150)	0.00027 (0.00296)	−0.00224 (0.00113)	−0.00092 (0.00119)	−0.00094 (0.00147)
Constant	−16.74 (10.700)	−11.88 (9.918)	−14.16 (9.734)	−15.01 (10.480)	−17.25*** (3.351)	−6.28* (2.502)	−9.59 (6.049)	−9.41 (7.400)
Observations	111	35	98	101	63	109	109	111
R^2	0.942	0.947	0.941	0.942	0.921	0.956	0.950	0.947

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC* : *X* percent fall in activity after the first *C* confirmed COVID-19 cases. These regressions include time and region fixed effects to account for differences across countries in the dates of the first-reported COVID-19 case and regional differences.

Table A5

Macroeconomic Variables and Lockdown Timing

	Days until extreme lockdown date after 100 COVID-19 cases (L80_day100)						
Trade/GDP	–0.0823*** (0.0141)						
Public debt/GDP		0.0548 (0.117)					
Unemployment			–0.200 (0.242)				
External debt/GDP				–0.0690 (0.0303)			
Financial sector credit/GDP					0.0550** (0.0190)		
Private credit/GDP						0.0727** (0.0212)	
Private credit (by banks)/GDP							0.0595*** (0.0073)
GDP per capita	4.260** (1.415)	4.153** (1.054)	3.127** (1.055)	1.928 (1.826)	2.145** (0.533)	2.188* (0.901)	2.340* (0.902)
Population density	–0.00146 (0.00241)	–0.00580 (0.00968)	–0.00712*** (0.00149)	0.00116 (0.00230)	–0.00725* (0.00272)	–0.00548 (0.00334)	–0.00602 (0.00368)
Constant	–18.11 (12.75)	–27.06** (6.29)	–10.63 (11.87)	–3.84 (17.34)	–10.42 (5.70)	–12.83 (6.20)	–10.92 (8.33)
Observations	62	20	59	27	62	62	62
R^2	0.939	0.959	0.906	0.988	0.911	0.913	0.908

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC* : *X* percent fall in activity after the first *C* confirmed COVID-19 cases. These regressions include time and region fixed effects to account for differences across countries in the dates of the first-reported COVID-19 case and regional differences.

Table A6

Nonlinear Specification for Health and Contagion Variables

	Days before large lockdown after 100 COVID-19 cases (L65_day100)				
Smoking	0.613* (0.3450)				
Smoking 2	–0.011* (0.006)				
Old population		–0.661 (1.240)			
Old population 2		0.029 (0.0489)			
Mortality			–0.135** (0.0617)		
Mortality 2			0.000250* (0.0001)		
Life expectancy				–3.807 (5.347)	
Life expectancy 2				0.029 (0.0374)	
Hospital beds per 1,000 people					–1.838 (1.8070)
Hospital beds per 1,000 people 2					0.209 (0.1970)
GDP per capita	3.754** (1.690)	3.431** (1.421)	1.871 (1.106)	1.739 (1.676)	3.868** (1.691)
Population density	–3.69e-05 (0.00686)	–8.68e-05 (0.00589)	–0.00417 (0.00627)	–0.000268 (0.00686)	4.40e-07 (0.00621)
Constant	–34.25** (14.12)	–22.05 (13.31)	3.91 (13.00)	112.70 (196.70)	–25.90* (14.10)
Observations	84	94	83	94	92
R^2	0.549	0.523	0.507	0.536	0.543

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC* : *X* percent fall in activity after the first *C* confirmed COVID-19 cases. These regressions include time and region fixed effects to account for differences across countries in the dates of the first-reported COVID-19 case and regional differences. *X* 2 is the squared term for *X*.

Table A7

Robustness: Health and Contagion Variables and Lockdown Timing

	Days until extreme lockdown date after 500 cases (L65_day500)						
Smoking	–0.0060 (0.0537)						
Old population		0.2350 (0.2050)					
Safe drinking water			–0.0273 (0.0463)				
Safe sanitation				0.0129** (0.0031)			
Hospital beds per 1,000 people					–0.4360 (0.2690)		
Mortality						–0.0103 (0.0093)	
Life expectancy							0.4060* (0.1880)
GDP per capita	2.109* (0.951)	1.729 (1.121)	3.028** (0.993)	2.697* (0.992)	2.186* (0.854)	1.587 (1.246)	0.887* (0.413)
Population density	0.00105 (0.00349)	0.00069 (0.00336)	0.00079 (0.00112)	0.00105 (0.00138)	0.00071 (0.00310)	–0.00179 (0.00110)	8.16e-05 (0.00324)
Constant	–12.09 (12.12)	–11.68 (11.38)	–29.83** (9.16)	–21.76* (9.78)	–12.10 (10.70)	–9.50 (8.19)	–32.86 (21.09)
Observations	83	93	58	56	91	82	93
R^2	0.644	0.648	0.846	0.846	0.671	0.547	0.661

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC* : *X* percent fall in activity after the first *C* confirmed COVID-19 cases. These regressions include time and region fixed effects to account for differences across countries in the dates of the first-reported COVID-19 case and regional differences.

Table A8

Robustness: Health and Contagion Variables and Lockdown Timing

	Days until extreme lockdown date after 100 cases (L80_day100)						
Smoking	0.052 (0.280)						
Old population		0.966** (0.318)					
Safe drinking water			0.033 (0.133)				
Safe sanitation				–0.115 (0.057)			
Hospital beds per 1,000 people					1.632 (0.893)		
Mortality						0.00950 (0.00993)	
Life expectancy							0.371 (0.869)
GDP per capita	2.799 (1.779)	1.291 (0.632)	5.473*** (0.686)	6.004*** (1.270)	2.811** (0.865)	4.511* (1.885)	2.022 (1.567)
Population density	–0.00493** (0.00127)	–0.01010 (0.00584)	–0.00521 (0.00321)	–0.00707 (0.00352)	–0.00543 (0.00343)	–0.00739 (0.00507)	–0.00738 (0.00574)
Constant	–11.24 (14.33)	–4.82 (7.41)	–35.47* (13.06)	–33.02** (9.69)	–14.03 (10.04)	–25.59 (15.79)	–29.86 (52.09)
Observations	54	63	42	44	61	56	63
R^2	0.916	0.916	0.905	0.944	0.915	0.920	0.904

NOTE: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. *LXdayC* : *X* percent fall in activity after the first *C* confirmed COVID-19 cases. These regressions include time and region fixed effects to account for differences across countries in the dates of the first-reported COVID-19 case and regional differences.

Table A9

List of Countries

Afghanistan	Ecuador	Libya	Romania
Angola	Egypt	Lithuania	Russia
Antigua and Barbuda	El Salvador	Luxembourg	Rwanda
Argentina	Estonia	Macedonia	Saudi Arabia
Aruba	Fiji	Malaysia	Senegal
Australia	Finland	Mali	Serbia
Austria	France	Malta	Singapore
Bahamas	Gabon	Mauritius	Slovakia
Bahrain	Georgia	Mexico	Slovenia
Bangladesh	Germany	Moldova	South Africa
Barbados	Ghana	Mongolia	South Korea
Belarus	Greece	Morocco	Spain
Belgium	Guatemala	Mozambique	Sri Lanka
Belize	Guinea-Bissau	Myanmar	Sweden
Benin	Haiti	Namibia	Switzerland
Bolivia	Honduras	Nepal	Taiwan
Bosnia and Herzegovina	Hungary	Netherlands	Tajikistan
Botswana	India	New Zealand	Tanzania
Brazil	Indonesia	Nicaragua	Thailand
Bulgaria	Iraq	Niger	Togo
Burkina Faso	Ireland	Nigeria	Trinidad and Tobago
Cambodia	Israel	Norway	Turkey
Cameroon	Italy	Oman	Uganda
Canada	Jamaica	Pakistan	Ukraine
Cape Verde	Japan	Panama	United Arab Emirates
Chile	Jordan	Papua New Guinea	United Kingdom
China	Kazakhstan	Paraguay	United States
Colombia	Kenya	Peru	Uruguay
Costa Rica	Kuwait	Philippines	Venezuela
Cote d'Ivoire	Kyrgyzstan	Poland	Vietnam
Croatia	Laos	Portugal	Yemen
Czech Republic	Latvia	Puerto Rico	Zambia
Denmark	Lebanon	Qatar	Zimbabwe
Dominican Republic			

Table A10

Robustness: Health and Contagion Variables and Lockdown Timing

Variable	Short description	Source
GDP per capita	GDP per capita (logs)	WDI (2020)
Trade/GDP	Trade (% of GDP)	WDI (2020)
External debt/GDP	External debt stocks (% of GDP)	WDI (2020)
Unemployment	Unemployment, total (% of total labor force)	WDI (2020)
Private credit/GDP	Domestic credit to private sector (% of GDP)	WDI (2020)
Public debt/GDP	Central government debt, total (% of GDP)	WDI (2020)
Banks private credit/GDP	Domestic credit to private sector by banks (% of GDP)	WDI (2020)
Financial sect. credit/GDP	Domestic credit provided by financial sector (% of GDP)	WDI (2020)
Tax revenue/GDP	Tax revenue (% of GDP)	Freedom House (2020)
Inflation	Inflation, consumer prices (annual %)	Freedom House (2020)
Political rights	Political rights category score (40 points)	Freedom House (2020)
Civil liberties	Civil liberties category score (60 points)	WDI (2020)
Freedom	Aggregate score for political rights and civil liberties categories (100 points)	WDI (2020)
Smoking	Smoking prevalence, total, ages 15+	WDI (2020)
Old population	Population ages 65 and above (% of total)	WDI (2020)
Population density	Population density (people per sq. km of land area)	WDI (2020)
Diabetes prevalence	Diabetes prevalence (type 1 or 2 diabetes) (% of population ages 20 to 79)	WDI (2020)
Safe drinking water	People using safely managed drinking water services (% of population)	WDI (2020)
Safe sanitation	People using safely managed sanitation services (% of population)	WDI (2020)
Hospital beds per 1,000 people	Hospital beds in public, private, general, and specialized hospitals and rehabilitation centers	WDI (2020)
Mortality	Mortality rate, adult males (per 1,000)	WDI (2020)
Life expectancy	Life expectancy at birth, total (years)	WDI (2020)
Total cases	Total confirmed cases	
L65_day100	Days before large lockdown (65% fall in activity) since first 100 confirmed COVID-19 cases	Roser et al. (2020)
L50_day100	Days before partial lockdown (50% fall in activity) since first 100 confirmed COVID-19 cases	Calculated using Google (2020)
L80_day100	Days before extreme lockdown (80% fall in activity) since first 100 confirmed COVID-19 cases	Calculated using Google (2020)
LXdayC	Days before *X* lockdown (*X*% fall in activity) since first *C* confirmed COVID-19 case(s)	Calculated using Google (2020)

NOTES

[1] Atkeson (2020) provides a good summary of this framework. The "R" of SIR is for recovered individuals, who are no longer contagious.

[2] Many counties within California had issued a "shelter in place" order a few days before.

[3] See https://freedomhouse.org/reports/freedom-world/freedom-world-research-methodology for details and methodology used by Freedom House.

[4] Moreover, these results show that the opposite is true: Countries with a higher fraction of older adults took significantly longer to lock down.

[5] Many countries have never reached an extreme quarantine, thus there are fewer observations for the extreme-lockdown scenario.

[6] This correlation is consistent with the fact that populations with a lower-quality hygiene system might have a higher rate of contagion

[7] Robustness exercises can be found in Tables A7 and A8.

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