Mobility and policy responses during the COVID-19 pandemic in 2020*

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Abstract

This paper quantitatively explores determinants of governments' non-pharmaceutical policy responses to the COVID-19 pandemic. Our focus is on the extent to which geographic mobility affected the stringency of governmental policy responses. Using daily data since the beginning of 2020, we find that societies that are more geographically mobile have governmental policy responses that are less stringent. We pursue an instrumental variable strategy that exploits climate data to identify arguably exogenous variation in geographic mobility levels, which lends a causal interpretation to our results. One explanation for the sub-optimal result is that it may be more costly (economically and politically) for governments to impose stringent policies on more mobile societies. By examining disaggregated mobility data, we show that the negative relation between geographic mobility and policy stringency is the strongest for commercially-oriented movements. The relation is weaker for geographic movements that relate to civil society. This suggests that policy-makers are more willing to trade-off public health for economic concerns relative to other civil concerns.

Keywords: COVID-19, Geographic mobility, Policy responses

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1 Introduction

Since the beginning of 2020, policy-makers around the world have been grappling with how to slow the spread of the novel coronavirus through their populations. There has been heterogeneity across countries and over time as to the stringency of policy responses and their effects, which has been the subject of much recent research in the social sciences Bonaccorsi et al. (2020); Cepaluni, Dorsch and Branyiczki (2020); Gibbs et al. (2020); Koren and Pető (2020); Sebhatu et al. (2020); Sheridan et al. (2020); Weill et al. (2020). This paper contributes to the research on the determinants of country-level policy responses to the COVID-19 pandemic. We examine one specific factor, geographic mobility, that may influence the stringency of policy responses. Using daily variation in community-level mobility data from smartphones, we demonstrate a robust negative correlation between geographic mobility and policy stringency. An instrumental variable strategy allows us to identify a causal impact of geographic mobility on the stringency of policy responses.

Using climate data to identify exogenous variation in geographic mobility, our results establish that geographic mobility has a negative impact on the stringency of COVID-19 policy responses. Our explanation for this sub-optimal result is that the implementation of stringent policies is more costly (economically and politically) in mobile societies. Further analysis also suggests that business interests play a larger role in limiting the intensity of governments' policy response than other civil society interests. Our results have broader implications for preventing and controlling pandemics. After all, many times, mobile societies are those most in need to restrict people's movements. As policy responses to the COVID-19 crisis have been far from optimal from a public health perspective, an important contribution from social scientists is to identify and better understand the constraints on policy-makers.

Data, methods, and results

Overview of data

Our study employs country-level data over a sample of non-advanced economies over the period of January 22nd, 2020 until August 31, 2020.[1] Our principal variables are high frequency, varying daily, while most of the control variables are fixed over the period of analysis.

Our main dependent variable is the Stringency Index of the Oxford COVID-19 Government Response

[1] We adopted the IMF classification of non-advanced economies, see Appendix Table A.1. In the Appendix, we also presented the full description of all variables employed in this paper.

Tracker (OxCGRT), which aggregates governmental responses over 17 distinct policy areas (Hale et al., 2020) for 197 countries and territories since the beginning of 2020. We also consider the disaggregated policy measures implemented by countries in a further analysis.[2]

The main explanatory variable of interest is geographic mobility, collected by Apple and Google.[3] Mobility Trend Reports (MTR) from the former reflect requests for directions in Apple Maps, whereas Community Mobility Reports (CMR) from the latter include aggregated mobility statistics from Google Maps.[4] In our analysis, we primarily rely on mobility data from Google, as it has better coverage for non-advanced economies and also allows us to disentangle mobility trends related to leisure, commercial or business purposes, or staying at home. In our baseline specification, we lag the mobility data by its seven-day moving average, as we do not expect mobility to have instantaneous impact on policy decisions.[5] In distinguishing between mobility related to the economy from that related to civil society, we make use of the COVID-19 Disorder Tracker, a curated selection of the Armed Conflict Location and Event Dataset (ACLED) (Raleigh et al., 2010). It provides daily frequency data on political violence and protests related to COVID-19, with a coverage of 150 countries. We also consider all political movement, not just COVID-19 related, as a placebo treatment (Table A.13).

Our strategy for identifying the effect of geographic mobility employs precipitation as an instrument for mobility. Data on rainfall comes from the Global Surface Summary of the Day (GSOD) database, collected by the National Oceanic and Atmospheric Administration (2020) (NOAA). For the purpose of our analysis, we compute daily average values for each country by adding up reported observations of precipitation levels for each country-day dyad and dividing them by the number of weather stations within a particular country. Following Madestam et al. (2013), we create a binary variable, *rainy day*, that takes value 1 with rainfall higher than 0.10 inch and 0 otherwise; we then subsequently calculate their 7-day moving averages.[6]

We employ several control variables in our analysis: an indicator of quality of government (PRS, 2019), the level of democracy, which is an average of Freedom House and Polity indicators (Teorell et al., 2020), the (log

[2] The policy areas are school closures, workplace closures, canceling public events, closing public transport, public information campaigns, restrictions on internal movement, international travel controls, fiscal measures, monetary measures, emergency investment in health care, investment in vaccines, testing frameworks, contact tracing, restrictions on gatherings, stay-at-home measures, income support, and international support.

[3] The meta mobility data that we use in this paper has also been used in recent studies on COVID-19 (Allcott et al., 2020; Bonaccorsi et al., 2020; Buckee et al., 2020; Gibbs et al., 2020; Kraemer et al., 2020; Poom et al., 2020; Xiong et al., 2020; Weill et al., 2020).

[4] There is no one-to-one correspondence between using an Apple/Google device and having one's movement recorded as data point in MTR/CMR. For instance, one can use Google Maps when planning a journey on an iPhone.

[5] We also consider alternative moving average lags, such as 5, 10, and 14 days (Table A.9).

[6] As a robustness check, we also operationalize the instrument in a handful of other ways: we use the raw precipitation data, an inverse hyperbolic sine transformation of precipitation as suggested by Kapoor et al. (2020), and we employ different thresholds for the *rainy day* dummy (Table A.15).

of the) number of confirmed COVID-19 cases, the (log of) real GDP per capita, population density, the share of the elderly within the population, the share of trade as percentage of GDP, the number of hospital beds per 1000 people, experience with the SARS epidemic in 2002-2003, as well as the (log of the) number of airports in the country. Furthermore, we construct a measure for policy adoption density, capturing prior adoption of policies (as recorded by OxCGRT) among spatially proximate countries.[7] Besides the COVID-19 cases, these controls are repeated daily observations from data measured in 2019.

Online Appendix Figure A.2 shows world maps of the incidence of our two principal mobility variables and the policy stringency index. Online Appendix Table A.2 provides summary statistics for all the data used in the analysis. The Online Appendix also contains a detailed description of all of the variables used in the analysis as well as their sources.

Quantitative methods

Our analysis employs regression techniques. First, we utilize the standard Ordinary Least Squares (OLS) regression with regional and time fixed fixed effects.

$$Policy\_stringency_{i,j,t} = \alpha Mobility_{i,j,t-1} + \mathbf{X}'_{i,j}\beta + \gamma_j + \delta_t + u_{i,j,t}, \tag{1}$$

where $Mobility_{i,j,t-1}$ is the measure of geographic mobility that was described above for country i of region j on day $t-1$. Note that we have lagged the time-varying independent variables by their 7-day moving average. The γ_j's denote a set of regional dummies that capture any time-invariant regional characteristics that affect countries' policy responses and the δ_t's denote a full set of period (day) dummies that capture common shocks to policy stringency levels. The vector $\mathbf{X}_{i,j}$ includes the battery of controls described in the previous section. The error term $u_{i,j,t}$ captures all other factors not correlated with our controls which may also explain policy stringency, with $E(u_{i,j,t}) = 0$ for all i, j, and t. All reported standard errors are robust to heteroskedasticity. Following Sebhatu et al. (2020), in some specifications, we also control for policy "adoption density," which is calculated as the neighborhood average of the policy stringency index. For country i in a region j with K

[7] In our robustness analysis we also show regressions that include the same battery of controls used in related studies published in this journal (Sebhatu et al., 2020), including measures such as GINI index and the share of tax revenue as percentage of GDP (Tables A.7 and A.8).

countries in period t, it is calculated as follows:

$$Adoption\_density_{i,j,t} = \frac{1}{K-1}\sum_{k\neq i}^{K} Policy\_stringency_{k,j,t} \tag{2}$$

The policy adoption density control adds a powerful time-varying regional control.

One concern with estimating such a specification with OLS is that geographic mobility, even when lagged, may be endogenously determined. Such a concern would introduce a bias into our estimation of α and preclude a causal interpretation of the estimated results. We therefore pursue an instrumental variable identification strategy, in which we identify exogenous variation in lagged geographic mobility using lagged rainfall data.[8] Rainfall is well-suited to instrumenting for geographic movement because it is intuitive that people stay more at home and walk less during rainy days.

In our baseline specification, we use the binary *rainy day* variable as the instrument. Employing a Two-Stage Least Squares (TSLS) estimation procedure, in the first stage we estimate the following:

$$Mobility_{i,j,t-1} = \eta Rainy_{i,j,t-1} + \mathbf{X'}_{i,j}\theta + \gamma_j + \delta_t + e_{i,j,t}, \tag{3}$$

We use the fitted values from equation (3) to estimate the impact of exogenous variation in geographic mobility on policy stringency in the second stage:

$$Policy\_stringency_{i,j,t} = \alpha^{2S}\widehat{Mobility}_{i,j,t-1} + \mathbf{X'}_{i,j}\beta + \gamma_j + \delta_t + u_{i,j,t}. \tag{4}$$

In order for the estimation of α^{2S} to be free of bias and provide a credible causal estimate of the impact of mobility on policy stringency, the rainfall instrument must satisfy two criteria: relevance and the exclusion restriction. First, the instrument should be strongly correlated with the main independent variable. The economic literature conventionally uses a first-stage F-statistic greater than 10 to indicate a strong instrument (Staiger and Stock, 1997). The second condition requires that the instrument's effect on the outcome variable occurs only through its influence on the potentially endogenous variable. As this assumption is not verifiable, we appeal to the intuition that rainfall affects mobility, but it does not directly affect governmental policy responses against

[8] There is precedent in the political economy literature to employ rainfall as an instrumental variable for protests and other social conflicts (Aidt and Leon, 2016; Couttenier and Soubeyran, 2014; Madestam et al., 2013; Dorsch and Maarek, 2018; Hidalgo et al., 2010; Kapoor et al., 2020; Miguel, Satyanath and Sergenti, 2004; Wasow, 2020). Dell, Jones and Olken (2014) and Hsiang, Burke and Miguel (2013) provide surveys.

Table 1: OLS regressions — Stringency index

	(1)	(2)	(3)	(4)	(5)
Dependent variable: Stringency index					
Residential (7-day moving averages)	2.031***	1.571***	1.576***		
	(0.016)	(0.022)	(0.023)		
Walking (7-day moving averages)				-0.059***	-0.055***
				(0.006)	(0.005)
Level of Democracy (Freedom House/Imputed Polity)		1.547***	1.541***	-3.216***	-3.247***
		(0.082)	(0.082)	(0.175)	(0.173)
ICRG Indicator of Quality of Government		-38.850***	-38.890***	56.498***	57.618***
		(1.330)	(1.333)	(3.068)	(2.986)
Log (Confirmed cases)		0.234*	0.237*	3.808***	3.816***
		(0.096)	(0.096)	(0.142)	(0.143)
Log (Real GDP per capita)		1.310***	1.293***	-13.971***	-14.213***
		(0.275)	(0.274)	(0.754)	(0.747)
Population density (people per sq. km of land area)		0.006***	0.006***	0.028***	0.028***
		(0.000)	(0.000)	(0.004)	(0.004)
Population ages 65 and above (% of total population)		-1.185***	-1.178***	-1.928***	-1.974***
		(0.071)	(0.071)	(0.115)	(0.114)
Trade (% of GDP)		-0.101***	-0.101***	-0.084***	-0.087***
		(0.006)	(0.006)	(0.006)	(0.006)
Hospital beds (per 1,000 people)		-0.647***	-0.646***	2.603***	2.766***
		(0.178)	(0.178)	(0.318)	(0.315)
SARS		0.602***	0.601***	-0.246***	-0.254***
		(0.021)	(0.021)	(0.037)	(0.036)
Log (Airports)		1.602***	1.601***	-3.838***	-4.006***
		(0.115)	(0.115)	(0.293)	(0.290)
Adoption density			-0.026+		0.148***
			(0.014)		(0.016)
R-squared	0.534	0.664	0.664	0.823	0.826
N	16907	11720	11720	4574	4574
Region fixed effects		✓	✓	✓	✓
Day fixed effects		✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

the COVID-19 pandemic. To guard against possible exclusion restriction violations, we also employ a rich set of control variables, robustness checks, and a sensitivity analysis.

Ordinary Least Squares results

First, Table 1 presents results from estimation of equation (1) with OLS. In columns (1) – (3) we use the Google data on staying put in residential areas, while in columns (4) and (5) we use the Apple data on walking.

The first column of Table 1 presents the raw bivariate correlation between residential mobility and the stringency index. The positive coefficient on the residential mobility variable indicates that as movement in country becomes more residential compared to the baseline of January 2020, the stringency of responses has tended to

increase. Using the summary statistics for the sample (see Appendix Table A.2), we calculate that one standard deviation increase in residential movement is associated with an 0.59 standard deviation increase in the policy stringency index. This result is confirmed as we add a battery of controls to the specification in column (2). Our most-preferred battery of controls follows from previous work on COVID-19 policy responses (Allcott et al., 2020; Cepaluni, Dorsch and Branyiczki, 2020; Kapoor et al., 2020; Sebhatu et al., 2020). First we control for a measure of COVID-19 incidence, using daily data on confirmed cases (which we also lag using a seven-day moving average). We additionally include some time-invariant country-level controls for political institutions, state capacity, economic development, population density and demographics, economic globalization, experience with the SARS pandemic, and health care capacity. The coefficient on residential movement is estimated to be a somewhat smaller magnitude when we include the battery of controls, but it remains positive and statistically significant at the 0.1% level. In column (3) of Table 1, we include the policy adoption density measure of Sebhatu et al. (2020), which does not substantially affect the estimate on residential movement.

The next two columns of Table 1 estimate the impact of walking mobility using the Apple data. Including our standard battery of controls, column (4) estimates a statistically significant (at 0.1% level) negative relationship between lagged walking mobility and policy stringency. This estimated negative effect is consistent with previous results. Geographic mobility out of residential areas (by walking) leads to less stringent COVID-19 policy responses. According to our calculations, one standard deviation increase in walking movement is associated with a 0.11 standard deviation decrease in the policy stringency index. In column (5), we have also included the policy adoption density control.

Two-Stage Least Squares results

In this subsection we implement our instrumental variable strategy.[9] In Table 2 we show in Panel A the coefficient on our excluded rainfall instrument in the first stage regression, while Panel B shows the second stage regression output for the variables of interest. To conserve space, we suppress the estimates for the control variables.[10] As expected, more rainfall is associated with people staying put more at residential locations and less walking mobility. The first stage impact of rainfall on our mobility variables is highly statistically significant (usually at the 0.1% level) and the relevant first stage diagnostic, the K-P F-statistic, is above its threshold value

[9] We present a visual description of the effect of rainfall on mobility in Figure A.3

[10] The complete first-stage and second stage results are shown in Online Appendix Table A.4.

Table 2: Two-Stage Least Squares regressions — Stringency index

Dependent variable: Mobility (7-day moving averages)					
Panel A: First-Stage	(1) Residential	(2) Residential	(3) Residential	(4) Walking	(5) Walking
Rainfall (7-day moving averages)	1.010***	1.083***	1.173***	-8.197***	-8.892***
	(0.242)	(0.211)	(0.209)	(2.384)	(2.376)
Dependent variable: Stringency index					
Panel B: Second-Stage	(1)	(2)	(3)	(4)	(5)
Residential (7-day moving averages)	1.559***	2.186***	2.150***		
	(0.453)	(0.436)	(0.402)		
Walking (7-day moving averages)				-0.391**	-0.380***
				(0.122)	(0.111)
Adoption density			-0.037		-0.098
			(0.036)		(0.092)
First-stage C-D F-stat	14.549	25.371	30.331	6.115	7.332
First-stage K-P F-stat	17.467	26.420	31.402	11.819	14.005
N	15533	11009	11009	4574	4574
Complete controls		✓	✓	✓	✓
Region fixed effects		✓	✓	✓	✓
Day fixed effects		✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). The full table with the coefficients of the control variables is reported in the Appendix. $+p < .1, *p < .05, **p < .01, ***p < .001$.

of ten (Staiger and Stock, 1997).[11] Thus the relevance criteria for a valid instrument is satisfied.[12]

The second stage estimations, shown in Panel B of Table 2, are consistent with the results from the OLS estimations. Staying put at residential locations is positively associate with policy stringency and walking mobility is negatively associated. In column 3, one standard deviation increase in residential movement is associated with 0.60 standard deviation increase in the stringency index. This increase in the magnitude is consistent with the supposition that OLS was under-estimating the impact due to a reverse causality bias. For example, if households anticipate an increase in policy stringency tomorrow, they may increase their mobility levels today (staying home less and walking more), so the reverse causal mechanism would predict a positive relation which would deflate the negative coefficient if not corrected for.

In order for our results to be credible estimates of a causal impact of geographic mobility on policy responses,

[11] Since the Cragg-Donald (C-D) F-statistics assumes homoscedastic errors, the Kleibergen-Paap (K-P) F-statistics, which is valid under non-i.i.d errors, is more reliable for our data.

[12] Moreover, we have also ran reduced-form regressions, in which we regress the instrument directly on the policy stringency index using OLS (see Online Appendix Table A.5). In those regressions, more rainfall is positively correlated with the policy stringency index and statistically significant at the 0.1% level. We have also considered alternative operationalizations of the rainfall instrument in Online Appendix Table A.6.

Table 3: Two-Stage Least Squares regressions — Business vs. civil society

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Stringency index; Instrument: Rainfall (7-day moving averages)						
Retail and recreation (7-day moving avgs)	-0.577***					
	(0.101)					
Grocery and Pharmacy (7-day moving avgs)		-0.575***				
		(0.100)				
Workplaces (7-day moving averages)			-0.806***			
			(0.172)			
Protests (7-day moving averages)				-133.889		
				(283.494)		
Riots (7-day moving averages)					-41.813***	
					(12.009)	
Parks (7-day moving averages)						-0.291***
						(0.061)
First-stage C-D F-stat	90.734	95.534	49.623	0.258	33.048	65.722
First-stage K-P F-stat	97.283	99.479	55.871	0.218	17.431	99.910
N	10936	10954	11007	12364	12364	10892
Complete controls	✓	✓	✓	✓	✓	✓
Region fixed effects	✓	✓	✓	✓	✓	✓
Day fixed effects	✓	✓	✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). The full table with the coefficients of the control variables is reported in the Appendix. $+p < .1, *p < .05, **p < .01, ***p < .001$.

one must accept that the instrument satisfies the "exclusion restriction," which requires that the instrument (rainfall) affects the dependent variable (policy stringency) only through the instrument's impact on the potentially endogenous variable (mobility). One possible violation of the exclusion restriction would be if rainy weather leads to an uptick in colds and flus, which may put a strain on public health care systems and make public officials more sensitive to upticks in coronavirus cases (for any level of mobility). We believe that our control for hospital beds per 1,000 people effectively deals with this channel. A second possible violation may be that extreme rainfall conditions (droughts and floods, eg) lead directly to some governmental restrictions on public life (school and public transport closures, eg) that may get lumped together with other COVID-19 policy responses. On this possibility, we note that closures of public services are only a fraction of the overall index of policy stringency that we use. Additionally, we have conducted a robustness check that trims the sample of extreme rainfall values, dropping country-day observations that are in the top percentile, the top 5 percentiles, and the top 10 percentiles in the distribution of rainfall, which should "purge" the analysis of extreme rainfall events that might violate the exclusion restriction (Table A.10).

Discussion and investigation of "channels"

At first glance, the estimated negative relationship between geographic mobility and policy stringency may seem counter-intuitive. After all, more mobile societies are likely to transport and transmit the virus at a higher rate than less mobile societies, so the public health benefits of stringent policy responses should be higher, which would imply a positive association between mobility and policy stringency. On the other hand, it may be more costly for policymakers to impose stringent regulations on a more geographically mobile society, which would imply a negative association between mobility and policy stringency. In considering these costs and benefits of policy stringency as a function of mobility, our estimations in Tables 1 and 2 imply that on net, higher mobility seems to impact the cost side of policy stringency more than the benefit side. At least two types of policy stringency costs may be increasing in the degree of geographic mobility. First, policymakers are likely to face greater *political backlash costs* to more stringent policies in more mobile societies, as policy restrictions are more impinging in mobile societies. Second, to the extent that geographic mobility correlates with economic and commercial activity, the *foregone economic activity cost* of more stringent policies are also greater in societies with more mobile populations.[13]

In order to evaluate which of the cost channels are the most likely to explain the negative relation between geographic mobility and stringency of policy responses, we have analyzed some more focused categories of mobility. Specifically, we look at movements that are related to commerce and those that are related to civil society. To that end, in Table 3 we analyze Google movement data that relates to "retail and recreation," "grocery and pharmacy," "parks and recreation," as well as ACLED's COVID-19 Disorder Tracker data Raleigh et al. (2010) that relates to "protests" and "riots". The TSLS results indicate that the commercial and leisure movement variables are quite significantly negatively related to policy stringency. The estimates on the civil society movements are mixed. The estimated effect of protest movement is statistically insignificant (though we note that the lower strength of the rainfall instrument for this kind of movement may be driving the insignificant result), while the estimated negative effect of riot and parks is statistically significant. In column (1), one standard deviation in retail and recreation mobility decreases the stringency index by 0.43 standard deviations. In column (2), one standard deviation in grocery and pharmacy mobility decreases the stringency index by 0.34 standard deviations. In column (4), one standard deviation increase in riot-related mobility decreases the stringency index by

[13] In Appendix Figure S5 and Tables S17 and S18, we employed a panel event study and a generalized difference-in-differences strategy, where we find that stringency measures reduce mobility, and this reduction is more clearly related to business than to civil society movements.

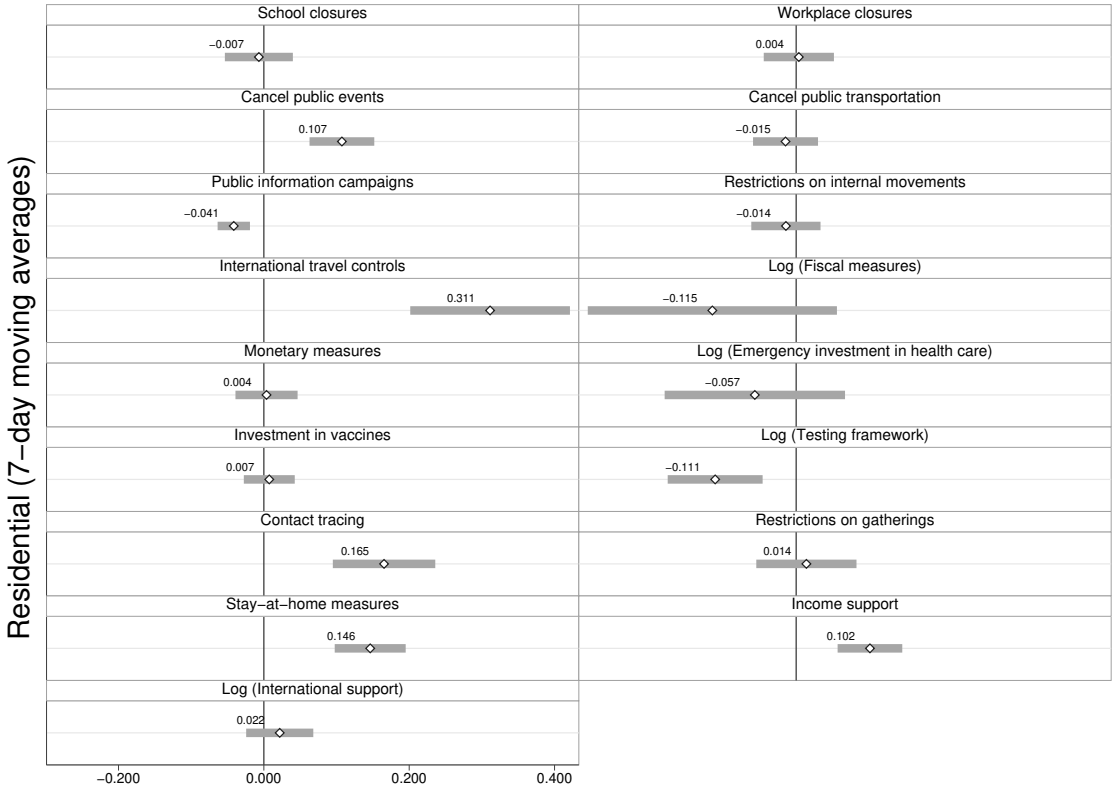

Figure 1: Disaggregated policy responses. All Two-Stage Least Squares regression models include the same controls as column 3 from Table 1. Coefficients are represented by open dots and their respective numbers. Bars are 95% confidence intervals, calculated with robust standard errors.

0.385 standard deviations. These results give some credence to the *forgone economic activity cost* that we have identified above. The impact of movement related to commercial activity is a robust explanatory factor for less stringent policy, while civil society movements do not have such a clear impact on policy stringency.

Furthermore, we have taken a look at finer grained policy response measures. Rather than the composite policy stringency index, we examine how the individual policy components of the index respond to the instrumented variation in geographic mobility. In Figure 1, we show statistically significantly positive associations between instrumented residential movement and policies such as contact tracing, canceling public events, stay-at-home orders, regulating international travel control, and income supports. On the other hand, we also document statistically significant negative associations between instrumented movement and policies that regulate public information campaigns and testing frameworks. All statistically significant variables are ordinal variables, registering progressively higher levels of intensity of policy responses.[14] Although our results are heterogeneous,

[14]Cancel public events is an ordinal variable with three values: 0 — no measures; 1 — recommended canceling; and 2 — require

statistically significant positive variables tend to reduce mobility, increasing business costs. In contrast, significant negative variables tend to improve prevention, not substantially affecting commercial activities. Therefore, the disaggregated analysis follows a pattern consistent with our previous results.

Further robustness analysis

We have conducted extensive robustness analysis on our main results, which is presented in the Online Appendix that accompanies this article. Here we briefly describe some of that analysis.

First, readers may be concerned that the results are being driven by specific countries. We have performed "leave-one-out" checks that drop the lowest and highest mobility countries for both the OLS and TSLS models, which are graphically summarized in Figure A.4. Concerning our battery of controls, we have also considered some alternatives. For instance, we have also reproduced Tables 1 and 2 with the same controls found in Sebhatu et al. (2020), published in this journal, in Tables A.7 and A.8. Some readers may find our use of a seven-day lagged moving average to be arbitrary, so Table A.9 reproduces the main TSLS results using alternative lag structures, namely moving averages of 5, 10, and 14 days, respectively.

We have dropped the extreme rainfall observations (Table A.10), dropped the largest countries in terms of their population (Table A.11) and geography (Table A.12). We also have employed quadratic effects of the IV's (Table A.14). Concerning the instrument, we have considered alternative operationalizations, such as using the raw data, an inverse hyperbolic sine transformation, and alternative thresholds for the binary variable (Tables A.14 and A.15). The instruments are often much stronger in these alternative operationalizations, with first-stage K-P F-statistics greater than 47, and coefficients are also remarkably stable, ranging from 2.1 to 2.6. As our baseline results in column 3 from Table 2 is 2.0, we present a slightly conservative estimate in the main paper. Finally, we have considered alternative climate variables, such as maximum wind speed, volatility of wind speed and visibility conditions in Table A.16.

canceling. International travel controls consist of restrictions for foreign travelers, not citizens. The variable has four values: 0 — no restrictions; 1 — screening arrivals; 2 — quarantine arrivals from some or all regions; 3 — ban arrivals from some regions; and 4 — ban on all regions or total border closure. Contact tracing records government policy on contact tracing after a positive COVID-19 diagnosis and has four values: 0 — no contact tracing; 1 — limited contact tracing; not done for all cases; and 2 — comprehensive contact tracing; done for all identified cases. Public information campaigns variable is also an ordinal measure with two values: 0 no Covid-19 public information campaign; 1 — public officials urging caution about Covid-19; and 2 — coordinated public information campaign (e.g., across traditional and social media). Finally, testing policy has three values: 0 - no testing policy; 1 - only those who both (a) have symptoms and (b) meet specific criteria (e.g., key workers, admitted to hospital, came into contact with a known case, returned from overseas); 2 - testing of anyone showing Covid-19 symptoms; and 3 - open public testing (e.g., "drive-through" testing available to asymptomatic people).

Conclusion

This paper has established that governments' policy responses to the COVID-19 pandemic are to some extent determined by how mobile their societies are. While shutting down movement should have the largest public health benefit in highly mobile societies, it may also have the largest political and economic costs. Our analysis demonstrates that the political economic costs of shutting down, which vary with geographic mobility, may have an important role in explaining why some countries have pursued more stringent policy responses than others.

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A Online Appendix – Not for Print Publication

Sensitivity analysis for 2SLS

To illustrate the robustness of our IV results to limited violations of the exclusion restriction, we perform the test proposed by Conley, Hansen and Rossi (2012). In this exercise, we allow "Rainfall (7-day moving averages)" to have a direct effect on "Stringency index" and then re-estimate the IV coefficient of "Residential (7-day moving averages)." We let the direct effect take any value between zero and the coefficient of the reduced form[15]: for each of these direct effects, we calculate the union of the 95% confidence intervals of the IV coefficient. In Figure A.1 we plot these confidence intervals (y-axis) against the assumed direct effect of the instrument (x-axis). The figure employs our baseline estimate. The blue vertical line flags the value of the reduced form coefficients. The green vertical line represents the value that brings our estimates to zero. To read the results of this test, we compare the reduced form coefficients to the value of the direct effect where the union of confidence intervals crosses the zero. We find that the direct effect of "Rainfall (7-day moving averages)" on "Stringency index" would have to account for 50% of the overall reduced form effect before the estimated coefficient becomes insignificant. As "Rainfall (7-day moving averages)" is unlikely to be strong correlated with "Stringency index", we consider such large direct effect unlikely.

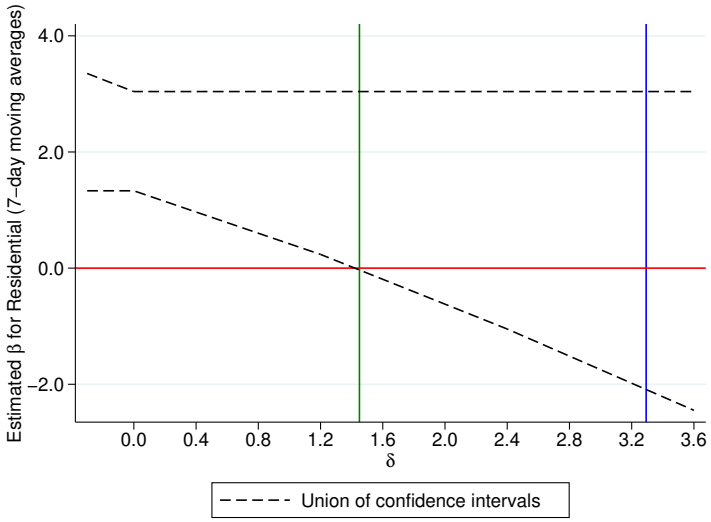

Figure A.1: Union of confidence intervals of the IV estimates (y-axis) when the exclusion restriction is violated (x-axis). Blue vertical line: point estimate of the reduced form coefficient (column 3 of Table A.5). Green vertical line: point estimate that brings our estimates to zero.

[15] The coefficient of 2SLS estimates are identical to the ratio of the reduced form point estimate to the first stage coefficient. Therefore, confounders can bring the instrumental variable point estimate to zero if they also bring the reduced-form coefficient to zero (Angrist and Pischke, 2008; Cinelli and Hazlett, 2020).

Table A.1: Non-advanced CIA countries and their respective regions.

Eastern Europe and post Soviet Union	Latin America	North Africa and the Middle East	Sub-Saharan Africa	Western Europe and North America	East Asia	South-East Asia	South Asia	The Pacific	The Caribbean
Albania	Argentina	Algeria	Angola	Gibraltar	China	Brunei	Afghanistan	American Samoa	Anguilla
Armenia	Bolivia	Bahrain	Benin	Greenland	Mongolia	Cambodia	Bangladesh	Cook Islands	Antigua and Barbuda
Azerbaijan	Brazil	Egypt	Botswana	Isle of Man	North Korea	Christmas Island	Bhutan	Fiji	Aruba
Belarus	Chile	Iran	Burkina Faso	St. Pierre and Miquelon		Cocos (Keeling) Islands	British Indian Ocean Territory	French Polynesia	Bahamas
Bosnia and Herzegovina	Colombia	Iraq	Burundi	Svalbard and Jan Mayen		Indonesia	India	Guam	Barbados
Bulgaria	Costa Rica	Jordan	Cameroon			Laos	Maldives	Kiribati	Belize
Croatia	Cuba	Kuwait	Cape Verde			Malaysia	Nepal	Marshall Islands	British Virgin Islands
Georgia	Dominican Republic	Lebanon	Central African Republic			Myanmar (Burma)	Pakistan	Micronesia (Federated States of)	Cayman Islands
Hungary	Ecuador	Libya	Chad			Philippines	Sri Lanka	New Caledonia	Curaçao
Kazakhstan	El Salvador	Morocco	Comoros			Thailand		Niue	Dominica
Kyrgyzstan	Falkland Islands	Oman	Congo - Brazzaville			Timor-Leste		Norfolk Island	Grenada
Moldova	French Guiana	Palestinian Territories	Congo - Kinshasa			Vietnam		Northern Mariana Islands	Guadeloupe
Montenegro	Guatemala	Qatar	Côte d'Ivoire					Palau	Guyana
North Macedonia	Haiti	Saudi Arabia	Djibouti					Papua New Guinea	Jamaica
Poland	Honduras	Syria	Equatorial Guinea					Pitcairn Islands	Martinique
Romania	Mexico	Tunisia	Eritrea					Samoa	Montserrat
Russia	Nicaragua	Turkey	Eswatini					Solomon Islands	Sint Maarten
Serbia	Panama	United Arab Emirates	Ethiopia					Tokelau	St. Kitts and Nevis
Tajikistan	Paraguay	Western Sahara	French Southern Territories					Tonga	St. Lucia
Turkmenistan	Peru	Yemen	Gabon					Tuvalu	St. Vincent and Grenadines
Ukraine	South Georgia and South Sandwich Islands		Gambia					United States Minor Outlying Islands (the)	Suriname
Uzbekistan	Turks and Caicos Islands		Ghana					Vanuatu	Trinidad and Tobago
	Uruguay		Guinea					Wallis and Futuna	U.S. Virgin Islands
	Venezuela		Guinea-Bissau						
			Kenya						
			Lesotho						
			Liberia						
			Madagascar						
			Malawi						
			Mali						
			Mauritania						
			Mauritius						
			Mayotte						
			Mozambique						
			Namibia						
			Niger						
			Nigeria						
			Rwanda						
			Réunion						
			Senegal						
			Seychelles						
			Sierra Leone						
			Somalia						
			South Africa						
			South Sudan						
			St. Helena						
			Sudan						
			São Tomé and Príncipe						
			Tanzania						
			Togo						
			Uganda						
			Zambia						
			Zimbabwe						

Table A.2: Summary statistics (main paper)

Variable	Obs	Mean	Std. Dev.	Min	Max
Stringency index	34278	48.148	34.044	0	100
Residential	19003	11.801	10.293	-35	52
Residential (7-day moving averages)	17783	12.046	9.802	-13.375	42.5
Walking	6440	82.291	61.555	6.96	888.44
Walking (7-day moving averages)	6048	82.557	61.558	9.328	793.898
Retail and Recreation	19189	-29.01	26.526	-98	54
Retail and recreation (7-day moving avgs)	18383	-29.761	25.282	-93	27.375
Grocery and Pharmacy	19178	-14.359	22.409	-98	162
Grocery and Pharmacy (7-day moving avgs)	18273	-14.628	20.113	-85.75	62.625
Workplaces	19502	-23.203	22.791	-91	43
Workplaces (7-day moving averages)	18661	-23.813	20.524	-83.75	24.5
Protests	32208	.293	1.724	0	122
Protests (7-day moving averages)	31284	.297	1.198	0	31.875
Riots	32208	.051	.411	0	22
Riots (7-day moving averages)	31284	.053	.31	0	8.375
Parks	19048	-16.793	39.317	-100	484
Parks (7-day moving averages)	18156	-17.423	37.888	-92.875	424.125
Rainfall	43771	.227	.419	0	1
Rainfall (7-day moving averages)	39450	.238	.278	0	1
Cancel public events	34413	1.198	.946	0	2
Close public transport	34540	.601	.8	0	2
Public information campaigns	33944	1.506	.803	0	2
Restrict internal movement	34491	.903	.942	0	2
Inttravel controls	34429	2.472	1.62	0	4
Log (Fiscal measures)	32698	1.10e+08	7.51e+09	0	1.19e+12
Monetary measures	33026	.696	.831	0	2
Log (Emergency invest health care)	32654	2863792	1.55e+08	0	1.94e+10
Log (Invest vaccines)	32663	189006.7	2.09e+07	0	3.44e+09
Testing framework	33582	1.195	.963	0	3
Contact tracing	33572	1.027	.855	0	2
Restrictions on gatherings	34379	1.961	1.734	0	4
Stay-at-home measures	34379	.916	1.009	0	3
Income support	33464	.502	.673	0	2
Log (International support)	32716	.016	.517	0	24.25
Level of Democracy (Freedom House/Imputed Polity)	37293	5.917	2.977	0	10
ICRG Indicator of Quality of Government	25376	.436	.128	.083	.75
Log (Confirmed cases)	25784	6.478	3.414	0	15.167
Log (Real GDP per capita)	31196	8.844	1.08	6.428	11.848
Population density (people per sq. km of land area)	36561	145.334	239.685	1.967	1832.636
Population ages 65 and above (% of total population)	35832	6.161	4.212	.987	20.429
Trade (% of GDP)	34891	78.566	33.812	20.723	184.686
Hospital beds (per 1,000 people)	22806	2.509	2.066	.1	11
SARS	48031	27.641	378.705	0	5327
Log (Airports)	45063	3.33	1.69	.693	8.317
Adoption density	34278	58.978	49.46	0	226.28

Table A.3: Summary statistics (appendix)

Variable	Obs	Mean	Std. Dev.	Min	Max
School closing	34440	1.738	1.395	0	3
Workplace closing	34338	1.19	1.15	0	3
Residential (5-day moving averages)	18045	11.956	9.849	-17.333	43.833
Residential (10-day moving averages)	17477	12.174	9.728	-11.182	42.545
Residential (14-day moving averages)	17069	12.344	9.616	-9.867	41.933
PRCP	43771	.103	.302	0	15.03
Precipitation (hundreth of inches) (7-day moving averages)	39450	.107	.174	0	2.575
PRCP (hundreth of inches, IHS)	43771	.092	.215	0	3.404
Precipitation (hundreth of inches, IHS) (7-day moving averages)	39450	.096	.135	0	1.487
Rainfall ($>$ 0.2 inches)	43771	.14	.347	0	1
Rainfall ($>$ 0.2 inches) (7-day moving averages)	39450	.147	.214	0	1
Rainfall ($>$ 0.3 inches)	43771	.095	.293	0	1
Rainfall ($>$ 0.3 inches) (7-day moving averages)	39450	.099	.171	0	1
Rainfall ($>$ 0.5 inches)	43771	.08	.271	0	1
Rainfall ($>$ 0.35 inches) (7-day moving averages)	39450	.083	.155	0	1
Rainfall (5-day moving averages)	40242	.237	.29	0	1
Rainfall (10-day moving averages)	38452	.239	.268	0	1
Rainfall (14-day moving averages)	37296	.24	.259	0	1
Rainfall (7-day moving averages) squared	39450	.134	.23	0	1
PRCP (hundreth of inches) squared	39450	.093	.129	0	1.274
PRCP (hundreth of inches, IHS) squared	39450	.086	.109	0	.911
Rainfall ($>$ 0.2 inches) squared	39450	.122	.167	0	.693
Rainfall ($>$ 0.3 inches) squared	39450	.084	.137	0	.693
Rainfall ($>$ 0.5 inches) squared	39450	.071	.126	0	.693
Rapid fluct. of wind speed (7-day moving averages)	6980	23.413	4.991	12.714	48.525
Max. wind speed (7-day moving averages)	42714	11.918	3.906	2.484	35.388
Visibility (7-day moving averages)	41529	8.428	3.63	1.322	27.992
Electoral democracy index	33636	.464	.22	.022	.893
Death rate (per 100,000)	25784	10.653	60.327	0	1208.28
Tax revenue (% of GDP)	25863	15.551	6.248	0	31.674
GINI index (World Bank estimate)	20496	40.207	7.725	25	63
Urban population (% of total population)	37049	52.718	21.613	12.388	100

Table A.4: Two-Stage Least Squares regressions — Stringency index

Dependent variable: Mobility (7-day moving averages)					
Panel A: First-Stage	(1) Residential	(2) Residential	(3) Residential	(4) Walking	(5) Walking
Rainfall (7-day moving averages)	1.010***	1.083***	1.173***	-8.197***	-8.892***
	(0.242)	(0.211)	(0.209)	(2.384)	(2.376)
Level of Democracy (Freedom House/Imputed Polity)		0.825***	0.836***	-0.231	-0.047
		(0.032)	(0.031)	(0.542)	(0.529)
ICRG Indicator of Quality of Government		6.521***	6.452***	26.330*	20.082+
		(0.635)	(0.626)	(12.390)	(12.016)
Log (Confirmed cases)		0.942***	0.916***	-8.654***	-8.540***
		(0.039)	(0.039)	(0.755)	(0.746)
Log (Real GDP per capita)		1.938***	1.964***	21.807***	22.619***
		(0.122)	(0.121)	(2.306)	(2.286)
Population density (people per sq. km of land area)		-0.001***	-0.001***	-0.056***	-0.055***
		(0.000)	(0.000)	(0.013)	(0.013)
Population ages 65 and above (% of total population)		-0.674***	-0.688***	5.563***	5.682***
		(0.024)	(0.024)	(0.823)	(0.819)
Trade (% of GDP)		0.022***	0.022***	-0.092***	-0.074***
		(0.002)	(0.002)	(0.022)	(0.021)
Hospital beds (per 1,000 people)		0.354***	0.350***	-17.931***	-18.414***
		(0.049)	(0.048)	(1.990)	(1.986)
SARS		-0.054***	-0.052***	1.715***	1.719***
		(0.008)	(0.008)	(0.118)	(0.117)
Log (Airports)		-0.689***	-0.676***	24.197***	24.591***
		(0.060)	(0.059)	(2.210)	(2.202)
Adoption density			0.085***		-0.762***
			(0.006)		(0.072)
Dependent variable: Stringency index					
Panel B: Second-Stage	(1)	(2)	(3)	(4)	(5)
Residential (7-day moving averages)	1.559***	2.186***	2.150***		
	(0.453)	(0.436)	(0.402)		
Walking (7-day moving averages)				-0.391**	-0.380***
				(0.122)	(0.111)
Level of Democracy (Freedom House/Imputed Polity)		1.057**	1.082**	-3.351***	-3.325***
		(0.370)	(0.347)	(0.219)	(0.210)
ICRG Indicator of Quality of Government		-47.785***	-47.520***	65.183***	64.091***
		(3.287)	(3.055)	(5.469)	(4.894)
Log (Confirmed cases)		-0.157	-0.112	0.963	1.072
		(0.419)	(0.378)	(1.037)	(0.928)
Log (Real GDP per capita)		0.982	1.040	-6.675*	-6.809**
		(0.859)	(0.807)	(2.692)	(2.548)
Population density (people per sq. km of land area)		0.006***	0.006***	0.011	0.011
		(0.001)	(0.001)	(0.009)	(0.008)
Population ages 65 and above (% of total population)		-0.891**	-0.909**	-0.048	-0.093
		(0.297)	(0.280)	(0.719)	(0.671)
Trade (% of GDP)		-0.081***	-0.081***	-0.115***	-0.111***
		(0.011)	(0.011)	(0.014)	(0.011)
Hospital beds (per 1,000 people)		-1.490***	-1.476***	-3.390	-3.257
		(0.225)	(0.216)	(2.264)	(2.122)
SARS		0.605***	0.602***	0.333	0.315
		(0.032)	(0.030)	(0.211)	(0.193)
Log (Airports)		1.671***	1.641***	4.222	4.009
		(0.321)	(0.294)	(2.981)	(2.756)
Adoption density			-0.037		-0.098
			(0.036)		(0.092)
First-stage C-D F-stat	14.549	25.371	30.331	6.115	7.332
First-stage K-P F-stat	17.467	26.420	31.402	11.819	14.005
N	15533	11009	11009	4574	4574
Region fixed effects		✓	✓	✓	✓
Day fixed effects		✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.5: Reduced form — Stringency index

	(1)	(2)	(3)
Dependent variable: Stringency index			
Rainfall (7-day moving averages)	10.522***	3.341***	3.293***
	(0.654)	(0.558)	(0.549)
Level of Democracy (Freedom House/Imputed Polity)		0.611***	0.610***
		(0.078)	(0.078)
ICRG Indicator of Quality of Government		-8.025***	-7.767***
		(1.574)	(1.565)
Log (Confirmed cases)		2.219***	2.039***
		(0.109)	(0.106)
Log (Real GDP per capita)		2.024***	2.136***
		(0.289)	(0.289)
Population density (people per sq. km of land area)		0.003***	0.003***
		(0.001)	(0.001)
Population ages 65 and above (% of total population)		-1.646***	-1.663***
		(0.070)	(0.070)
Trade (% of GDP)		-0.048***	-0.049***
		(0.005)	(0.005)
Hospital beds (per 1,000 people)		-0.790***	-0.789***
		(0.199)	(0.199)
SARS		0.003***	0.003***
		(0.000)	(0.000)
Log (Airports)		-0.992***	-0.931***
		(0.132)	(0.131)
Adoption density			0.185***
			(0.013)
R-squared	0.008	0.564	0.571
N	27910	13100	13100
Region fixed effects		✓	✓
Day fixed effects		✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.6: Two-Stage Least Squares regressions — Stringency index — Robustness check

	Instruments: Rainfall measures (7-day moving averages)				
	(1)	(2)	(3)	(4)	(5)
	PRCP (hundreth of inches)	PRCP (hundreth of inches, IHS)	Rainfall (> 0.2 inches)	Rainfall (> 0.3 inches)	Rainfall (> 0.35 inches)
Dependent variable: Stringency index					
Residential (7-day moving averages)	2.486***	2.565***	2.075***	2.437***	2.373***
	(0.234)	(0.263)	(0.325)	(0.287)	(0.274)
Level of Democracy (Freedom House/Imputed Polity)	0.802***	0.735**	1.145***	0.843***	0.896***
	(0.214)	(0.237)	(0.284)	(0.255)	(0.245)
ICRG Indicator of Quality of Government	-49.791***	-50.328***	-47.012***	-49.459***	-49.028***
	(2.092)	(2.260)	(2.570)	(2.362)	(2.292)
Log (Confirmed cases)	-0.425+	-0.499*	-0.042	-0.379	-0.320
	(0.228)	(0.254)	(0.308)	(0.275)	(0.263)
Log (Real GDP per capita)	0.401	0.250	1.183+	0.494	0.616
	(0.526)	(0.578)	(0.676)	(0.621)	(0.595)
Population density (people per sq. km of land area)	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Population ages 65 and above (% of total population)	-0.683***	-0.630***	-0.960***	-0.716***	-0.759***
	(0.171)	(0.189)	(0.227)	(0.203)	(0.195)
Trade (% of GDP)	-0.088***	-0.089***	-0.079***	-0.087***	-0.085***
	(0.008)	(0.008)	(0.009)	(0.009)	(0.008)
Hospital beds (per 1,000 people)	-1.586***	-1.612***	-1.451***	-1.570***	-1.549***
	(0.188)	(0.191)	(0.200)	(0.193)	(0.191)
SARS	0.621***	0.625***	0.597***	0.618***	0.614***
	(0.024)	(0.025)	(0.027)	(0.026)	(0.025)
Log (Airports)	1.873***	1.927***	1.589***	1.839***	1.795***
	(0.205)	(0.222)	(0.249)	(0.232)	(0.224)
Adoption density	-0.065**	-0.072**	-0.031	-0.061*	-0.056*
	(0.024)	(0.026)	(0.030)	(0.027)	(0.026)
First-stage C-D F-stat	85.843	74.218	45.130	62.300	64.049
First-stage K-P F-stat	106.763	82.808	47.756	72.455	77.145
N	11009	11009	11009	11009	11009
Region fixed effects	✓	✓	✓	✓	✓
Day fixed effects	✓	✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.7: OLS regressions — Stringency index

	(1)	(2)	(3)	(4)	(5)
Dependent variable: Stringency index					
Residential (7-day moving averages)	1.875***	1.871***	1.807***	1.870***	1.890***
	(0.036)	(0.036)	(0.033)	(0.035)	(0.036)
Log (Real GDP per capita)	0.360	0.399	-0.649	-0.711	-0.725
	(0.466)	(0.452)	(0.447)	(0.461)	(0.455)
Tax revenue (% of GDP)	-0.915***	-0.948***	-0.975***	-0.954***	-0.983***
	(0.059)	(0.060)	(0.061)	(0.062)	(0.062)
GINI index (World Bank estimate)	-0.022	0.046	0.058+	-0.010	0.034
	(0.031)	(0.030)	(0.030)	(0.031)	(0.031)
Hospital beds (per 1,000 people)	-2.699***	-2.702***	-2.136***	-2.253***	-2.107***
	(0.236)	(0.229)	(0.222)	(0.228)	(0.238)
Population ages 65 and above (% of total population)	-0.334***	-0.330***	-0.629***	-0.533***	-0.484***
	(0.084)	(0.082)	(0.076)	(0.078)	(0.078)
Urban population (% of total population)	-0.008	0.005	0.010	0.002	-0.025+
	(0.015)	(0.015)	(0.016)	(0.016)	(0.015)
Log (Population density)	-0.156	-0.230	-0.253	-0.239	-0.088
	(0.210)	(0.206)	(0.205)	(0.211)	(0.219)
Death rate (per 100,000)	0.018***			0.017***	0.016***
	(0.001)			(0.001)	(0.001)
Adoption density		-0.071***		-0.079***	0.003
		(0.017)		(0.018)	(0.023)
Electoral democracy index			10.860***	8.434***	25.663***
			(1.472)	(1.453)	(3.476)
Adoption density × Electoral democracy index					-0.175***
					(0.028)
R-squared	0.630	0.672	0.675	0.633	0.635
N	8088	8329	8329	8088	8088
Region fixed effects	✓	✓	✓	✓	✓
Day fixed effects	✓	✓	✓	✓	✓

Notes: This table employes the same controls and specifications from Table 2 in Sebahaty et al. (2020). Robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.8: Two-Stage Least Squares regressions — Stringency index

Dependent variable: Mobility (7-day moving averages)					
Panel A: First-Stage	(1) Residential	(2) Residential	(3) Residential	(4) Residential	(5) Residential
Rainfall (7-day moving averages)	1.858***	1.747***	1.548***	1.673***	1.581***
	(0.250)	(0.245)	(0.242)	(0.240)	(0.238)
Log (Real GDP per capita)	4.287***	4.038***	3.188***	3.338***	3.309***
	(0.168)	(0.161)	(0.167)	(0.165)	(0.164)
Tax revenue (% of GDP)	0.390***	0.391***	0.361***	0.357***	0.370***
	(0.020)	(0.019)	(0.020)	(0.019)	(0.019)
GINI index (World Bank estimate)	0.073***	0.056***	0.063***	0.089***	0.066***
	(0.013)	(0.012)	(0.013)	(0.012)	(0.012)
Hospital beds (per 1,000 people)	0.000	0.002	0.357***	0.401***	0.320***
	(0.069)	(0.068)	(0.070)	(0.067)	(0.065)
Population ages 65 and above (% of total population)	-0.699***	-0.672***	-0.838***	-0.899***	-0.910***
	(0.028)	(0.027)	(0.030)	(0.028)	(0.028)
Urban population (% of total population)	-0.052***	-0.049***	-0.036***	-0.040***	-0.027***
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Log (Population density)	0.759***	0.696***	0.636***	0.657***	0.581***
	(0.091)	(0.091)	(0.089)	(0.090)	(0.090)
Death rate (per 100,000)	-0.001***			-0.004***	-0.003***
	(0.000)			(0.000)	(0.000)
Adoption density		0.117***		0.136***	0.095***
		(0.007)		(0.007)	(0.008)
Electoral democracy index			7.101***	7.886***	-0.825
			(0.460)	(0.467)	(1.069)
Adoption density × Electoral democracy index					0.086***
					(0.009)
Dependent variable: Stringency index					
Panel B: Second-Stage	(1)	(2)	(3)	(4)	(5)
Residential (7-day moving averages)	2.190***	2.223***	2.262***	2.251***	2.311***
	(0.306)	(0.321)	(0.360)	(0.337)	(0.358)
Log (Real GDP per capita)	-3.230*	-3.214*	-3.043**	-2.878**	-3.048**
	(1.280)	(1.270)	(1.140)	(1.116)	(1.173)
Tax revenue (% of GDP)	-0.794***	-0.823***	-0.826***	-0.796***	-0.832***
	(0.130)	(0.136)	(0.141)	(0.131)	(0.142)
GINI index (World Bank estimate)	0.064+	0.121***	0.116**	0.049	0.068+
	(0.038)	(0.035)	(0.037)	(0.043)	(0.039)
Hospital beds (per 1,000 people)	-1.978***	-1.974***	-2.114***	-2.239***	-2.174***
	(0.225)	(0.217)	(0.243)	(0.251)	(0.248)
Population ages 65 and above (% of total population)	-0.354	-0.338	-0.248	-0.180	-0.113
	(0.220)	(0.222)	(0.302)	(0.303)	(0.325)
Urban population (% of total population)	-0.035+	-0.026	-0.030	-0.040*	-0.052**
	(0.020)	(0.020)	(0.018)	(0.019)	(0.016)
Log (Population density)	-1.302***	-1.395***	-1.404***	-1.282***	-1.239***
	(0.310)	(0.304)	(0.310)	(0.303)	(0.296)
Death rate (per 100,000)	0.014***			0.015***	0.015***
	(0.001)			(0.002)	(0.002)
Adoption density		-0.084*		-0.099*	-0.062
		(0.042)		(0.049)	(0.040)
Electoral democracy index			-2.780	-5.115+	3.951
			(2.802)	(2.920)	(3.235)
Adoption density × Electoral democracy index					-0.094*
					(0.042)
First-stage C-D F-stat	49.602	46.803	36.018	43.735	39.418
First-stage K-P F-stat	55.169	51.023	40.949	48.491	44.131
N	7771	8011	8011	7771	7771
Region fixed effects	✓	✓	✓	✓	✓
Day fixed effects	✓	✓	✓	✓	✓

Notes: This table employes the same controls and specifications from Table 2 in Sebahaty et al. (2020). Robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.9: Two-Stage Least Squares regressions — Stringency index — alternative moving averages

	(1)	(2)	(3)
Dependent variable: Stringency index; Instrument: Rainfall (7-day moving averages)			
Residential (5-day moving averages)	2.172***		
	(0.407)		
Residential (10-day moving averages)		2.141***	
		(0.409)	
Residential (14-day moving averages)			2.035***
			(0.418)
Level of Democracy (Freedom House/Imputed Polity)	1.065**	1.103**	1.195***
	(0.351)	(0.349)	(0.354)
ICRG Indicator of Quality of Government	-47.559***	-47.650***	-46.862***
	(3.102)	(3.108)	(3.166)
Log (Confirmed cases)	-0.101	-0.136	-0.063
	(0.374)	(0.389)	(0.404)
Log (Real GDP per capita)	1.023	1.073	1.341+
	(0.818)	(0.809)	(0.803)
Population density (people per sq. km of land area)	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)
Population ages 65 and above (% of total population)	-0.873**	-0.940***	-1.031***
	(0.284)	(0.282)	(0.287)
Trade (% of GDP)	-0.082***	-0.080***	-0.077***
	(0.010)	(0.011)	(0.012)
Hospital beds (per 1,000 people)	-1.472***	-1.478***	-1.460***
	(0.219)	(0.215)	(0.218)
SARS	0.610***	0.595***	0.583***
	(0.030)	(0.031)	(0.033)
Log (Airports)	1.637***	1.660***	1.626***
	(0.290)	(0.304)	(0.316)
Adoption density	-0.044	-0.031	-0.018
	(0.035)	(0.037)	(0.039)
First-stage C-D F-stat	29.121	29.907	28.648
First-stage K-P F-stat	30.097	31.077	29.776
N	11085	10914	10782
Region fixed effects	✓	✓	✓
Day fixed effects	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.10: Two-Stage Least Squares regressions — Stringency index — dropping extreme cases of rainfalls

	(1) > 1%	(2) > 5%	(3) > 10%
Dependent variable: Stringency index; Instrument: Rainfall (7-day moving averages)			
Residential (7-day moving averages)	2.150***	2.162***	2.956***
	(0.402)	(0.373)	(0.399)
Level of Democracy (Freedom House/Imputed Polity)	1.082**	1.321***	0.922**
	(0.347)	(0.324)	(0.352)
ICRG Indicator of Quality of Government	-47.520***	-45.853***	-50.590***
	(3.055)	(2.892)	(3.239)
Log (Confirmed cases)	-0.112	0.086	-0.569
	(0.378)	(0.359)	(0.365)
Log (Real GDP per capita)	1.040	0.734	-1.117
	(0.807)	(0.771)	(0.858)
Population density (people per sq. km of land area)	0.006***	0.007***	0.008***
	(0.001)	(0.001)	(0.001)
Population ages 65 and above (% of total population)	-0.909**	-1.082***	-0.711*
	(0.280)	(0.260)	(0.285)
Trade (% of GDP)	-0.081***	-0.083***	-0.107***
	(0.011)	(0.011)	(0.012)
Hospital beds (per 1,000 people)	-1.476***	-1.306***	-1.353***
	(0.216)	(0.207)	(0.206)
SARS	0.602***	0.622***	0.676***
	(0.030)	(0.036)	(0.043)
Log (Airports)	1.641***	1.725***	2.169***
	(0.294)	(0.259)	(0.265)
Adoption density	-0.037	-0.035	-0.102*
	(0.036)	(0.038)	(0.042)
First-stage C-D F-stat	30.331	37.066	45.178
First-stage K-P F-stat	31.402	38.463	44.596
N	11009	10403	9557
Region fixed effects	✓	✓	✓
Day fixed effects	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

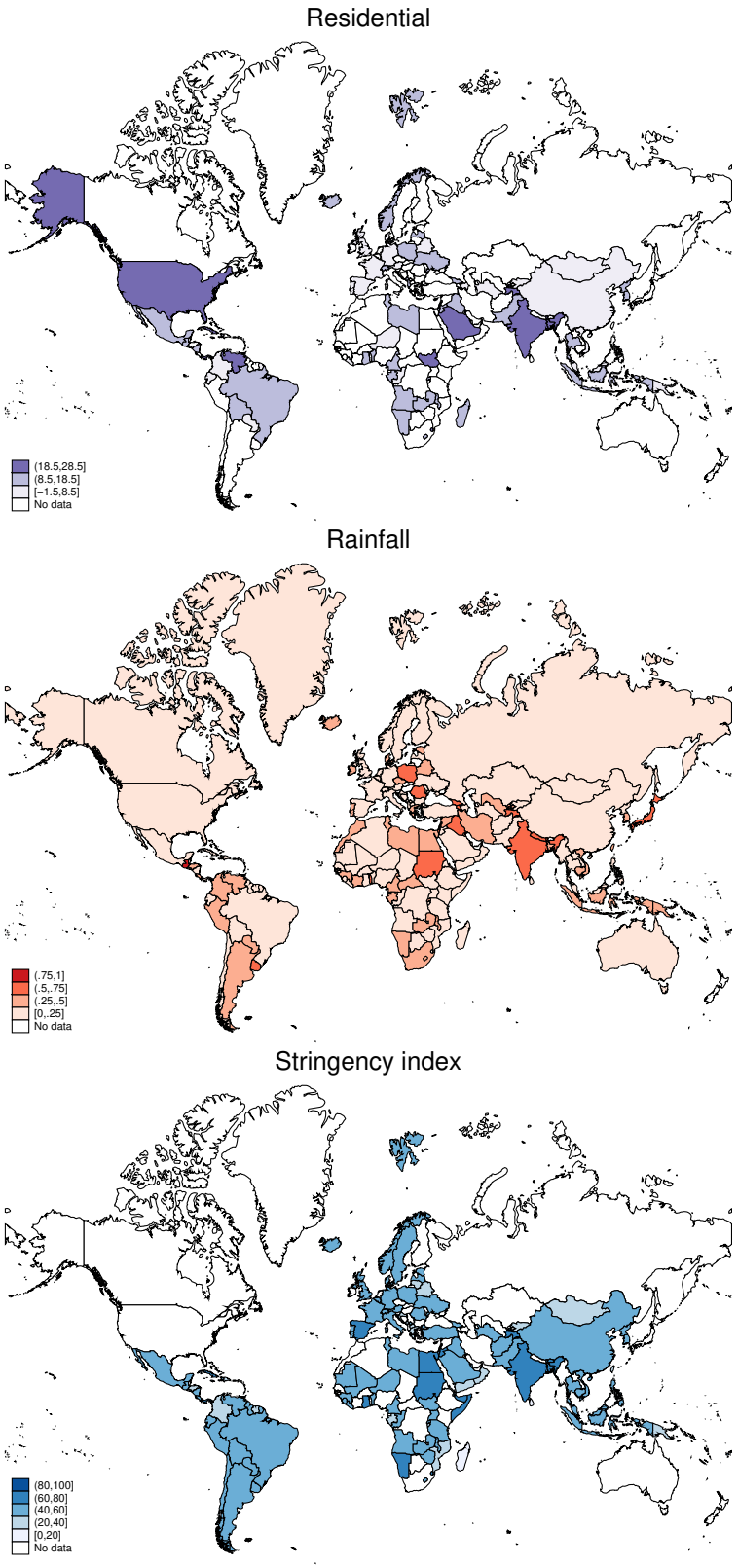

Figure A.2: **Geographic Variation in Mobility, Rainfall and Stringency index (means). The maps show territories and their respective sovereign states, even if the last ones are not in our sample.**

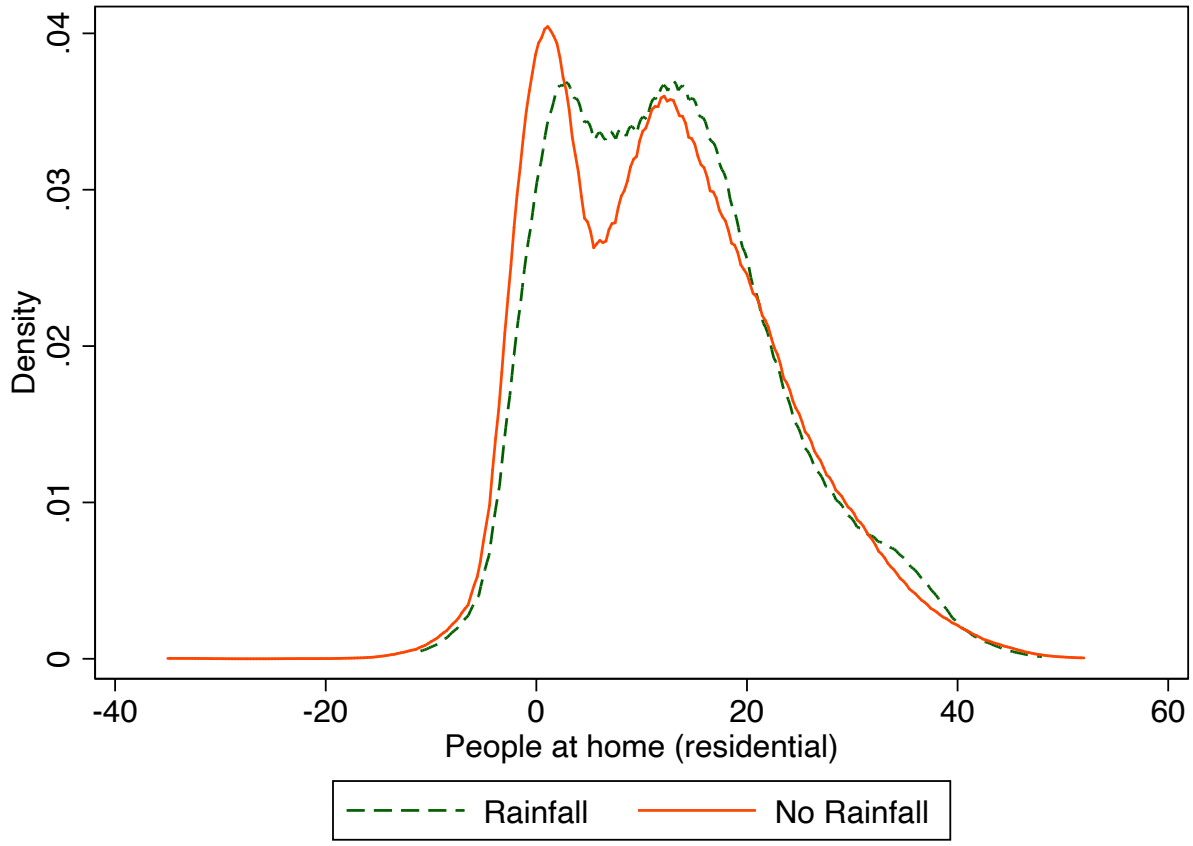

Figure A.3: Kernel densities are plotted with bandwidth equals two. *Rainfall* shifts the residential distributions outwards, i.e., in rainy days people stay more at home.

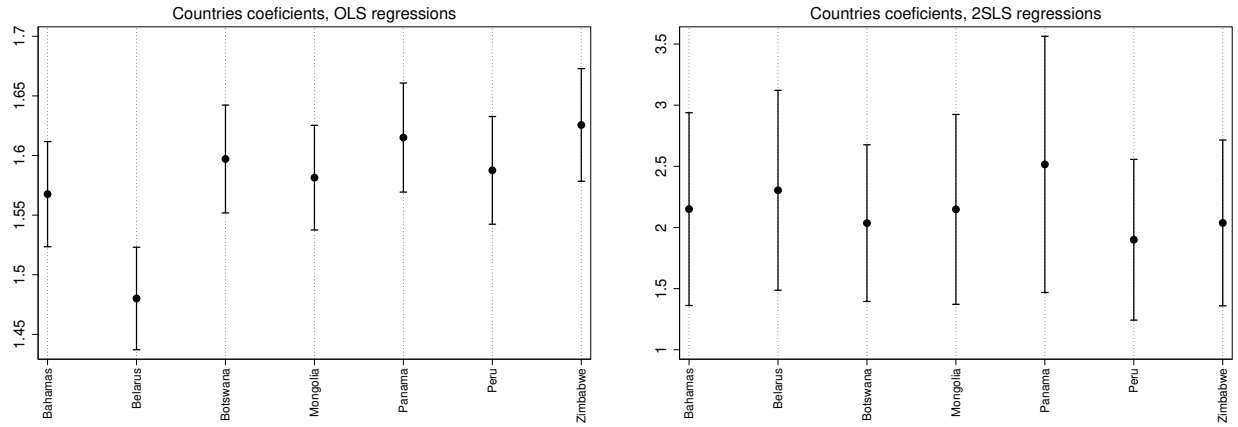

Figure A.4: Leave-One-Out Checks for the OLS and 2SLS models. Each estimate is based on a sample that omits countries with extreme low and high values on Walking on the x-axis. Dots are coefficients; bars are 95% CIs. The dependent variable is the Stringency index. All models include the same controls as column 3 from Tables 1 and 2. All specifications include robust standard errors.

Table A.11: Two-Stage Least Squares regressions — Stringency index — dropping extreme cases of population

	(1) > 1%	(2) > 5%	(3) > 10%
Dependent variable: Stringency index; Instrument: Rainfall (7-day moving averages)			
Residential (7-day moving averages)	2.197***	2.070***	2.504***
	(0.408)	(0.404)	(0.544)
Level of Democracy (Freedom House/Imputed Polity)	1.033**	1.334**	1.343**
	(0.355)	(0.408)	(0.456)
ICRG Indicator of Quality of Government	-48.138***	-46.894***	-44.007***
	(3.189)	(2.584)	(1.390)
Log (Confirmed cases)	-0.164	-0.273	-0.654
	(0.384)	(0.524)	(0.839)
Log (Real GDP per capita)	0.982	1.363+	-0.682
	(0.808)	(0.768)	(1.282)
Population density (people per sq. km of land area)	0.006***	0.004***	0.007***
	(0.001)	(0.001)	(0.001)
Population ages 65 and above (% of total population)	-0.870**	-1.000**	-1.034***
	(0.286)	(0.330)	(0.294)
Trade (% of GDP)	-0.082***	-0.082***	-0.127***
	(0.011)	(0.010)	(0.020)
Hospital beds (per 1,000 people)	-1.484***	-1.102***	-0.853***
	(0.216)	(0.175)	(0.216)
SARS	0.603***	0.562***	1.321***
	(0.030)	(0.025)	(0.396)
Log (Airports)	1.643***	1.410***	1.823***
	(0.290)	(0.129)	(0.225)
Adoption density	-0.038	-0.086+	-0.131*
	(0.037)	(0.048)	(0.066)
First-stage C-D F-stat	29.908	32.389	21.701
First-stage K-P F-stat	30.634	32.269	22.027
N	10824	9954	9066
Region fixed effects	✓	✓	✓
Day fixed effects	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.12: Two-Stage Least Squares regressions — Stringency index — dropping large countries

	(1)	(2)	(3)	(4)	(5)
Dependent variable: Stringency index; Instrument: Rainfall (7-day moving averages)					
Residential (7-day moving averages)	2.148***	2.316**	2.323**	3.061***	3.618***
	(0.400)	(0.769)	(0.751)	(0.902)	(0.967)
Level of Democracy (Freedom House/Imputed Polity)	1.123**	0.973	0.953	0.089	-0.245
	(0.353)	(0.691)	(0.686)	(0.847)	(0.940)
ICRG Indicator of Quality of Government	-46.533***	-47.322***	-47.719***	-55.417***	-59.877***
	(3.127)	(4.367)	(4.574)	(5.886)	(6.164)
Log (Confirmed cases)	-0.204	-0.442	-0.471	-1.300	-1.816+
	(0.393)	(0.842)	(0.833)	(0.997)	(1.088)
Log (Real GDP per capita)	0.966	0.658	0.687	-0.095	-1.501
	(0.779)	(1.524)	(1.454)	(1.680)	(1.743)
Population density (people per sq. km of land area)	0.006***	0.006***	0.006***	0.006***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Population ages 65 and above (% of total population)	-0.930***	-0.826	-0.812	-0.237	0.347
	(0.278)	(0.514)	(0.509)	(0.621)	(0.631)
Trade (% of GDP)	-0.079***	-0.083***	-0.084***	-0.083***	-0.078***
	(0.011)	(0.017)	(0.017)	(0.018)	(0.022)
Hospital beds (per 1,000 people)	-1.441***	-1.494***	-1.487***	-3.077***	-3.282***
	(0.217)	(0.304)	(0.293)	(0.486)	(0.531)
SARS	0.596***	0.600***	0.598***	0.607***	0.604***
	(0.031)	(0.031)	(0.029)	(0.032)	(0.037)
Log (Airports)	1.586***	1.685***	1.650***	1.673***	1.848***
	(0.315)	(0.384)	(0.346)	(0.382)	(0.423)
Adoption density	-0.034	-0.043	-0.041	-0.102	-0.136+
	(0.035)	(0.063)	(0.062)	(0.075)	(0.080)
First-stage C-D F-stat	30.723	9.030	9.494	8.284	9.131
First-stage K-P F-stat	31.738	9.292	9.660	8.494	9.464
N	10828	10648	10463	10286	10120
Region fixed effects	✓	✓	✓	✓	✓
Day fixed effects	✓	✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). The regressions progressively exclude countries with large areas based on the ranking of the first ten countries of *The World Factbook*. The first column drops Russia, and China. The second drops Russia, China, and Brazil. The third drops Russia, China, Brazil, and India. The fourth drops. Finally, the fifth column drops Russia, Antarctica, China, Brazil, India, and Kazakhstan. $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.13: Two-Stage Least Squares regressions — Stringency index — COVID-19 "unrelated" conflicts

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Stringency index; Instrument: Rainfall (7-day moving averages)						
Fatalities (7-day mov. avgs) - not just C-19	13.153					
	(22.347)					
Protests (7-day mov. avgs) - not just C-19		-5.663				
		(4.986)				
Riots (7-day mov. avgs) - not just C-19			-5.357**			
			(2.039)			
Viol. civilians (7-day mov. avgs) - not just C-19				351.041		
				(8566.893)		
Battles (7-day mov. avgs) - not just C-19					2.896*	
					(1.170)	
Viol. remote (7-day mov. avgs) - not just C-19						1.931**
						(0.658)
Level of Democracy (Freedom House/Imputed Polity)	-2.285	3.912**	3.435***	11.347	1.721***	1.750***
	(8.115)	(1.296)	(0.438)	(216.673)	(0.341)	(0.276)
ICRG Indicator of Quality of Government	127.442	-2.625	-9.703	260.278	-31.435***	-16.459**
	(271.766)	(26.721)	(8.744)	(7139.105)	(3.423)	(5.412)
Log (Confirmed cases)	-1.984	2.901***	1.874***	-28.832	1.406***	1.678***
	(7.264)	(0.771)	(0.228)	(758.779)	(0.404)	(0.259)
Log (Real GDP per capita)	26.573	8.409+	7.185***	144.210	9.464***	11.579***
	(38.880)	(4.502)	(1.565)	(3429.200)	(2.656)	(2.930)
Population density (people per sq. km of land area)	-0.076	-0.032	0.007+	-2.221	-0.002	0.000
	(0.125)	(0.027)	(0.004)	(54.152)	(0.002)	(0.002)
Population ages 65 and above (% of total population)	2.742	-5.614***	-4.566***	70.585	-2.322**	-3.731***
	(11.487)	(1.421)	(0.263)	(1820.343)	(0.710)	(0.174)
Trade (% of GDP)	-1.623	0.406	0.026	-27.599	-0.130***	-0.171***
	(2.660)	(0.417)	(0.037)	(672.119)	(0.035)	(0.042)
Hospital beds (per 1,000 people)	9.088	3.944**	1.664*	136.712	1.899**	-0.300
	(10.883)	(1.215)	(0.704)	(3269.215)	(0.629)	(1.166)
SARS	3.248	-0.963	0.271	94.185	0.291	1.018***
	(4.508)	(1.437)	(0.188)	(2283.382)	(0.191)	(0.168)
Log (Airports)	-41.413	7.270	-0.421	-737.905	-5.019***	-4.892***
	(64.689)	(9.452)	(1.192)	(17926.234)	(0.831)	(0.697)
Adoption density	0.416+	-0.419	0.323***	-0.027	0.277***	0.275***
	(0.235)	(0.622)	(0.026)	(7.618)	(0.019)	(0.018)
First-stage C-D F-stat	0.309	1.317	34.873	0.001	14.548	37.036
First-stage K-P F-stat	0.381	1.140	35.494	0.002	17.638	50.420
N	3733	3733	3733	3733	3733	3733
Region fixed effects	✓	✓	✓	✓	✓	✓
Day fixed effects	✓	✓	✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.14: Two-Stage Least Squares regressions — Stringency index — Squared IVs

	Instruments: Rainfall measures (7-day moving averages)					
	(1) Rainfall	(2) PRCP (hundreth of inches)	(3) PRCP (hundreth of inches, IHS)	(4) Rainfall (> 0.2 inches)	(5) Rainfall (> 0.3 inches)	(6) Rainfall (> 0.35 inches)
Dependent variable:Mobility (7-day moving averages)						
Panel A: First-Stage	(1) Residential	(2) Residential	(3) Residential	(4) Residential	(5) Residential	(6) Residential
Rainfall (7-day moving averages)	3.632***					
	(0.571)					
Rainfall (7-day moving averages) squared	-3.037***					
	(0.635)					
Precipitation (hundreth of inches) (7-day moving averages)		12.321***				
		(2.143)				
PRCP (hundreth of inches) squared		-10.409***				
		(2.931)				
Precipitation (hundreth of inches, IHS) (7-day moving averages)			21.865***			
			(3.526)			
PRCP (hundreth of inches, IHS) squared			-21.075***			
			(4.512)			
Rainfall (> 0.2 inches) (7-day moving averages)				3.617		
				(2.233)		
Rainfall (> 0.2 inches) squared				-2.418		
				(2.972)		
Rainfall (> 0.3 inches) (7-day moving averages)					7.360**	
					(2.646)	
Rainfall (> 0.3 inches) squared					-6.083+	
					(3.488)	
Rainfall (> 0.35 inches) (7-day moving averages)						5.641+
						(2.994)
Rainfall (> 0.5 inches) squared						-3.259
						(3.901)
Level of Democracy (Freedom House/Imputed Polity)	0.831***	0.843***	0.846***	0.844***	0.846***	0.847***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
ICRG Indicator of Quality of Government	6.391***	6.632***	6.598***	6.476***	6.536***	6.568***
	(0.624)	(0.626)	(0.627)	(0.625)	(0.628)	(0.628)
Log (Confirmed cases)	0.903***	0.929***	0.932***	0.928***	0.940***	0.943***
	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)
Log (Real GDP per capita)	1.992***	1.936***	1.938***	1.951***	1.940***	1.930***
	(0.121)	(0.121)	(0.121)	(0.121)	(0.121)	(0.121)
Population density (people per sq. km of land area)	-0.001***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population ages 65 and above (% of total population)	-0.702***	-0.687***	-0.685***	-0.684***	-0.680***	-0.683***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Trade (% of GDP)	0.022***	0.023***	0.023***	0.022***	0.023***	0.023***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Hospital beds (per 1,000 people)	0.337***	0.357***	0.360***	0.358***	0.362***	0.361***
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
SARS	-0.056***	-0.053***	-0.053***	-0.051***	-0.051***	-0.054***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Log (Airports)	-0.639***	-0.657***	-0.663***	-0.671***	-0.671***	-0.662***
	(0.059)	(0.059)	(0.059)	(0.060)	(0.060)	(0.060)
Adoption density	0.083***	0.086***	0.087***	0.087***	0.088***	0.088***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Dependent variable: Stringency index						
Panel B: Second-Stage	(1)	(2)	(3)	(4)	(5)	(6)
Residential (7-day moving averages)	2.996***	2.397***	2.472***	1.987***	2.550***	2.435***
	(0.381)	(0.194)	(0.212)	(0.317)	(0.277)	(0.270)
Level of Democracy (Freedom House/Imputed Polity)	0.374	0.876***	0.813***	1.219***	0.748**	0.844***
	(0.337)	(0.183)	(0.197)	(0.277)	(0.248)	(0.242)
ICRG Indicator of Quality of Government	-53.246***	-49.190***	-49.697***	-46.418***	-50.224***	-49.451***
	(2.934)	(1.874)	(1.975)	(2.517)	(2.322)	(2.277)
Log (Confirmed cases)	-0.900*	-0.342+	-0.412+	0.040	-0.484+	-0.378
	(0.357)	(0.196)	(0.213)	(0.302)	(0.269)	(0.261)
Log (Real GDP per capita)	-0.572	0.570	0.427	1.351*	0.279	0.496
	(0.799)	(0.461)	(0.493)	(0.660)	(0.608)	(0.590)
Population density (people per sq. km of land area)	0.007***	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Population ages 65 and above (% of total population)	-0.339	-0.743***	-0.692***	-1.019***	-0.640**	-0.717***
	(0.270)	(0.146)	(0.156)	(0.221)	(0.197)	(0.192)
Trade (% of GDP)	-0.099***	-0.086***	-0.087***	-0.077***	-0.089***	-0.087***
	(0.010)	(0.007)	(0.007)	(0.009)	(0.008)	(0.008)
Hospital beds (per 1,000 people)	-1.753***	-1.557***	-1.581***	-1.422***	-1.607***	-1.569***
	(0.217)	(0.182)	(0.184)	(0.198)	(0.191)	(0.190)
SARS	0.649***	0.616***	0.620***	0.592***	0.624***	0.618***
	(0.030)	(0.023)	(0.023)	(0.027)	(0.025)	(0.025)
Log (Airports)	2.225***	1.811***	1.863***	1.529***	1.917***	1.838***
	(0.296)	(0.183)	(0.194)	(0.243)	(0.229)	(0.223)
Adoption density	-0.108**	-0.058**	-0.064**	-0.023	-0.071**	-0.061*
	(0.036)	(0.021)	(0.022)	(0.029)	(0.027)	(0.026)
First-stage C-D F-stat	26.130	46.852	43.434	22.869	32.410	32.287
First-stage K-P F-stat	25.080	89.016	90.049	25.659	45.495	45.626
N	11009	11009	11009	11009	11009	11009
Region fixed effects	✓	✓	✓	✓	✓	✓
Day fixed effects	✓	✓	✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.15: Two-Stage Least Squares regressions — Replication with strongest IVs

Dependent variable: Stringency index										
Instrumental variables:										
	PRCP (hundreth of inches)					PRCP (hundreth of inches, IHS)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Residential (7-day moving averages)	1.559***	2.540***	2.486***			1.559***	2.642***	2.565***		
	(0.453)	(0.254)	(0.234)			(0.453)	(0.293)	(0.263)		
Walking (7-day moving averages)				-0.565**	-0.536**				-0.548**	-0.519**
				(0.205)	(0.177)				(0.195)	(0.168)
Level of Democracy (Freedom House/Imputed Polity)		0.765***	0.802***	-3.422***	-3.362***		0.681**	0.735**	-3.415***	-3.358***
		(0.227)	(0.214)	(0.304)	(0.274)		(0.257)	(0.237)	(0.296)	(0.267)
ICRG Indicator of Quality of Government		-50.198***	-49.791***	69.726***	67.188***		-50.890***	-50.328***	69.278***	66.855***
		(2.221)	(2.092)	(9.164)	(7.574)		(2.446)	(2.260)	(8.784)	(7.273)
Log (Confirmed cases)		-0.496*	-0.425+	-0.524	-0.240		-0.593*	-0.499*	-0.378	-0.099
		(0.252)	(0.228)	(1.849)	(1.579)		(0.287)	(0.254)	(1.757)	(1.495)
Log (Real GDP per capita)		0.315	0.401	-2.859	-3.266		0.124	0.250	-3.236	-3.648
		(0.556)	(0.526)	(4.660)	(4.189)		(0.623)	(0.578)	(4.433)	(3.969)
Population density (people per sq. km of land area)		0.006***	0.006***	0.001	0.003		0.007***	0.006***	0.002	0.004
		(0.001)	(0.001)	(0.013)	(0.011)		(0.001)	(0.001)	(0.012)	(0.011)
Population ages 65 and above (% of total population)		-0.657***	-0.683***	0.936	0.807		-0.589**	-0.630***	0.839	0.710
		(0.181)	(0.171)	(1.307)	(1.166)		(0.205)	(0.189)	(1.243)	(1.105)
Trade (% of GDP)		-0.089***	-0.088***	-0.131***	-0.123***		-0.091***	-0.089***	-0.129***	-0.122***
		(0.008)	(0.008)	(0.023)	(0.018)		(0.009)	(0.008)	(0.022)	(0.017)
Hospital beds (per 1,000 people)		-1.609***	-1.586***	-6.525	-6.138+		-1.643***	-1.612***	-6.215	-5.828+
		(0.191)	(0.188)	(4.037)	(3.607)		(0.197)	(0.191)	(3.841)	(3.419)
SARS		0.625***	0.621***	0.636+	0.587+		0.631***	0.625***	0.606+	0.557+
		(0.025)	(0.024)	(0.367)	(0.319)		(0.027)	(0.025)	(0.349)	(0.302)
Log (Airports)		1.920***	1.873***	8.438	7.844+		1.991***	1.927***	8.023	7.431+
		(0.220)	(0.205)	(5.328)	(4.700)		(0.244)	(0.222)	(5.067)	(4.451)
Adoption density			-0.065**		-0.216			-0.072**		-0.203
			(0.024)		(0.143)			(0.026)		(0.136)
First-stage C-D F-stat	14.549	73.230	85.843	5.848	7.249	14.549	61.023	74.218	5.907	7.389
First-stage K-P F-stat	17.467	88.048	106.763	6.730	8.197	17.467	66.313	82.808	7.050	8.650
N	15533	11009	11009	4574	4574	15533	11009	11009	4574	4574
Region fixed effects		✓	✓	✓	✓		✓	✓	✓	✓
Day fixed effects		✓	✓	✓	✓		✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). The full Table with the coefficients of the First-stage regressions are reported in the Appendix. $+p < .1, *p < .05, **p < .01, ***p < .001$.

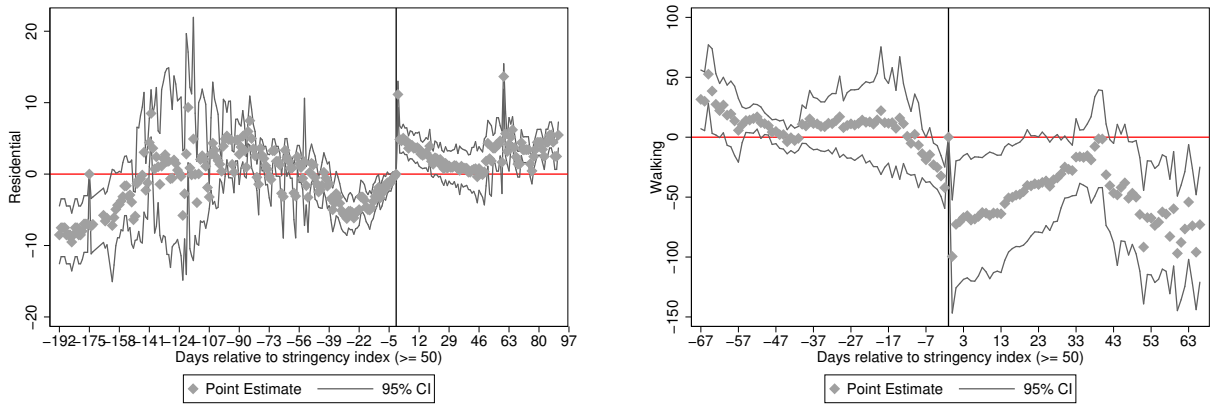

Figure A.5: Panel Event Study: before and after the policy response. Point estimates are displayed along with their 95% confidence intervals. The baseline base period is 1 day prior to the adoption of the policy implementation in each country, indicated by the solid vertical line in the plot. Control variables include: Log (Confirmed cases), day and country fixed-effects. Standard error was cluster at country-level.

Table A.16: Two-Stage Least Squares regressions — Alternative IVs

	Max. wind speed (7-day moving averages)	Rapid fluct. of wind speed (7-day moving averages)	Visibility (7-day moving averages)
	(1)	(2)	(3)
Dependent variable: Stringency index			
Residential (7-day moving averages)	5.795***	1.886***	1.857***
	(0.285)	(0.502)	(0.331)
Level of Democracy (Freedom House/Imputed Polity)	0.141	1.034**	1.027***
	(0.486)	(0.340)	(0.226)
ICRG Indicator of Quality of Government	-75.061***	-41.945***	-41.801***
	(7.633)	(4.945)	(3.395)
Log (Confirmed cases)	-3.788***	0.138	0.235
	(0.517)	(0.463)	(0.296)
Log (Real GDP per capita)	8.637***	1.661+	1.846**
	(1.483)	(0.897)	(0.645)
Population density (people per sq. km of land area)	0.111***	0.007***	0.007***
	(0.026)	(0.001)	(0.001)
Population ages 65 and above (% of total population)	0.600	-0.912**	-0.902***
	(0.374)	(0.313)	(0.216)
Trade (% of GDP)	-0.140***	-0.095***	-0.095***
	(0.021)	(0.008)	(0.007)
Hospital beds (per 1,000 people)	-0.051	-1.659***	-1.762***
	(0.521)	(0.205)	(0.189)
SARS	1.410***	0.602***	0.603***
	(0.346)	(0.035)	(0.028)
Log (Airports)	8.773***	1.497***	1.403***
	(0.832)	(0.370)	(0.253)
Adoption density	-0.394***	-0.032	-0.031
	(0.052)	(0.042)	(0.029)
First-stage C-D F-stat	228.392	23.385	39.609
First-stage K-P F-stat	260.485	22.616	41.082
N	2925	11320	11321
Region fixed effects	✓	✓	✓
Day fixed effects	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.17: Difference-in-Difference Design — Mobility

Dependent variables:										
	Residental			Walking		Res. (7-day mov. avgs.)			Walk. (7-day mov.avgs.)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time to treatment	0.118***	0.043***	0.046***	-1.297***	-1.272***	0.101***	0.041***	0.044***	-1.318***	-1.275***
	(0.004)	(0.004)	(0.004)	(0.223)	(0.232)	(0.004)	(0.003)	(0.003)	(0.200)	(0.209)
Level of Democracy (Freedom House/Imputed Polity)		0.476***	0.490***	-0.346	-0.147		0.483***	0.493***	-0.223	-0.010
		(0.037)	(0.038)	(0.581)	(0.576)		(0.034)	(0.035)	(0.581)	(0.566)
ICRG Indicator of Quality of Government		10.933***	11.024***	19.876+	13.759		10.845***	11.037***	21.991+	12.647
		(0.703)	(0.721)	(11.252)	(11.379)		(0.634)	(0.649)	(11.518)	(11.404)
Log (Confirmed cases)		0.805***	0.777***	-10.201***	-9.817***		0.844***	0.813***	-10.091***	-9.512***
		(0.040)	(0.041)	(0.850)	(0.859)		(0.036)	(0.037)	(0.833)	(0.834)
Log (Real GDP per capita)		1.347***	1.390***	27.862***	28.077***		1.339***	1.375***	27.409***	27.272***
		(0.130)	(0.133)	(2.640)	(2.658)		(0.116)	(0.118)	(2.652)	(2.648)
Population density (people per sq. km of land area)		-0.001***	-0.001***	-0.033*	-0.033*		-0.001***	-0.001***	-0.033*	-0.033*
		(0.000)	(0.000)	(0.014)	(0.014)		(0.000)	(0.000)	(0.014)	(0.014)
Population ages 65 and above (% of total population)		-0.610***	-0.627***	6.161***	6.093***		-0.597***	-0.614***	6.420***	6.131***
		(0.028)	(0.028)	(0.824)	(0.838)		(0.024)	(0.024)	(0.840)	(0.843)
Trade (% of GDP)		0.015***	0.015***	-0.139***	-0.122***		0.016***	0.016***	-0.141***	-0.118***
		(0.002)	(0.002)	(0.024)	(0.025)		(0.002)	(0.002)	(0.024)	(0.024)
Hospital beds (per 1,000 people)		0.356***	0.375***	-18.096***	-18.196***		0.349***	0.361***	-18.318***	-17.933***
		(0.055)	(0.055)	(1.806)	(1.847)		(0.046)	(0.046)	(1.848)	(1.864)
SARS		-0.082***	-0.080***	1.816***	1.803***		-0.085***	-0.083***	1.809***	1.771***
		(0.009)	(0.009)	(0.126)	(0.127)		(0.008)	(0.008)	(0.126)	(0.125)
Log (Airports)		-0.419***	-0.423***	24.444***	24.326***		-0.443***	-0.442***	24.549***	23.927***
		(0.065)	(0.066)	(2.013)	(2.058)		(0.060)	(0.061)	(2.031)	(2.051)
Adoption density			0.081***		-0.666***			0.085***		-0.683***
			(0.007)		(0.056)			(0.006)		(0.069)
R-squared	0.050	0.634	0.637	0.480	0.479	0.037	0.672	0.676	0.481	0.482
N	19003	12176	11791	4881	4752	17783	12105	11720	4699	4570
Region fixed effects		✓	✓	✓	✓		✓	✓	✓	✓
Day fixed effects		✓	✓	✓	✓		✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). The full Table with the coefficients of the First-stage regressions are reported in the Appendix. $+p < .1, *p < .05, **p < .01, ***p < .001$.

Table A.18: Difference-in-Differences — Business vs. civil society

Dependent variables:	Ret. and Rec.	Groc. and Pharm.	Workplaces	Protests	Riots	Parks	Ret. and Rec. (7-day mov. avgs.)	Groc. and Pharm. (7-day mov. avgs.)	Workplaces (7-day mov. avgs.)	Protests (7-day mov. avgs.)	Riots (7-day mov. avgs.)	Parks (7-day mov. avgs.)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
Time to treatment	-0.107***	-0.125***	-0.105***	0.002***	0.000*	-0.197***	-0.105***	-0.119***	-0.101***	0.002***	0.000**	-0.197***
	(0.008)	(0.008)	(0.008)	(0.000)	(0.000)	(0.023)	(0.007)	(0.007)	(0.006)	(0.000)	(0.000)	(0.023)
Level of Democracy (Freedom House/Imputed Polity)	-0.737***	-0.250**	-0.808***	0.040***	0.005**	-0.736***	-0.736***	-0.265***	-0.805***	0.040***	0.005***	-0.736***
	(0.095)	(0.091)	(0.089)	(0.007)	(0.002)	(0.150)	(0.086)	(0.077)	(0.073)	(0.004)	(0.001)	(0.150)
ICRG Indicator of Quality of Government	-29.260***	-26.054***	-18.712***	2.042***	1.018***	-9.048**	-28.750***	-25.896***	-18.622***	1.971***	1.008***	-9.048**
	(1.802)	(1.796)	(1.677)	(0.295)	(0.119)	(3.367)	(1.619)	(1.481)	(1.363)	(0.185)	(0.072)	(3.367)
Log (Confirmed cases)	-3.070***	-1.472***	-2.147***	0.201***	0.026***	-4.793***	-3.163***	-1.522***	-2.190***	0.205***	0.029***	-4.793***
	(0.090)	(0.102)	(0.093)	(0.013)	(0.003)	(0.214)	(0.079)	(0.080)	(0.076)	(0.008)	(0.002)	(0.214)
Log (Real GDP per capita)	1.864***	2.122***	1.427***	-0.245***	-0.069***	1.571**	1.927***	2.144***	1.312***	-0.240***	-0.070***	1.571**
	(0.317)	(0.355)	(0.311)	(0.033)	(0.008)	(0.593)	(0.281)	(0.303)	(0.258)	(0.020)	(0.005)	(0.593)
Population density (people per sq. km of land area)	0.002**	0.004***	0.004***	-0.000	-0.000	0.008***	0.002***	0.004***	0.004***	-0.000	-0.000+	0.008***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Population ages 65 and above (% of total population)	0.809***	1.042***	0.965***	-0.053***	-0.013***	2.843***	0.792***	1.032***	0.932***	-0.052***	-0.013***	2.843***
	(0.072)	(0.076)	(0.066)	(0.006)	(0.002)	(0.238)	(0.063)	(0.058)	(0.052)	(0.004)	(0.001)	(0.238)
Trade (% of GDP)	0.003	-0.004	-0.005	0.006***	0.001***	-0.052***	0.001	-0.004	-0.006	0.006***	0.001***	-0.052***
	(0.005)	(0.005)	(0.005)	(0.001)	(0.000)	(0.013)	(0.004)	(0.004)	(0.004)	(0.000)	(0.000)	(0.013)
Hospital beds (per 1,000 people)	-1.241***	-0.499***	-0.999***	-0.071**	-0.019***	-3.941***	-1.207***	-0.470***	-0.958***	-0.069***	-0.019***	-3.941***
	(0.139)	(0.147)	(0.132)	(0.022)	(0.003)	(0.565)	(0.120)	(0.112)	(0.095)	(0.011)	(0.002)	(0.565)
SARS	0.061**	0.182***	0.343***	-0.000***	-0.000***	0.047	0.064***	0.180***	0.343***	-0.000***	-0.000***	0.047
	(0.020)	(0.021)	(0.024)	(0.000)	(0.000)	(0.039)	(0.018)	(0.018)	(0.017)	(0.000)	(0.000)	(0.039)
Log (Airports)	0.553***	2.048***	1.210***	0.396***	0.060***	1.636***	0.637***	2.057***	1.232***	0.384***	0.058***	1.636***
	(0.136)	(0.156)	(0.143)	(0.022)	(0.006)	(0.226)	(0.122)	(0.134)	(0.120)	(0.015)	(0.005)	(0.226)
Adoption density	-0.271***	-0.180***	-0.113***	0.004	0.007***	-0.499***	-0.274***	-0.184***	-0.113***	0.004**	0.007***	-0.499***
	(0.015)	(0.016)	(0.014)	(0.003)	(0.001)	(0.033)	(0.014)	(0.014)	(0.012)	(0.002)	(0.001)	(0.033)
R-squared	0.705	0.551	0.590	0.178	0.145	0.579	0.751	0.639	0.664	0.348	0.241	0.579
N	11743	11755	11790	13465	13465	11685	11639	11654	11718	13465	13465	11685
Region fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Day fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: All specifications include robust standard errors (in parenthesis). The full Table with the coefficients of the First-stage regressions are reported in the Appendix. $+p < .1, *p < .05, **p < .01, ***p < .001$.

Variable name	Definition	Source
Dependent variables		
Stringency Index	A composite index between 0 and 100, where a higher score indicates more stringent government responses to COVID-19. The index is created based on the ordinal values of OxCGRT policy variables C1–C8 and H1. The score is rescaled for each measure by their maximum value to create a score between 0 and 100, with a missing value contributing 0. The composite Stringency Index is the average of these nine re-scaled scores	Hale et al. (2020)
Independent variables		
Residential mobility	Visits and length of stay at residential places, compared to a baseline, calculated using aggregate data from Google Maps. Google records wait times and visit durations for users who opted in to Google Location History. The baseline is the median value, for the corresponding day of the week, during the 5-week period of 6 January – 6 February, 2020.	Google LLC (2020)
Walking	The relative volume of direction requests in Apple Maps per country, compared to a baseline volume on 13 January 2020. Data is collected on a daily basis and records requests when 'walking' is selected as transportation type in Apple Maps.	Apple (2020)
Retail and recreation	Visits and length of stay at retail and recreation locations, compared to a baseline, calculated using aggregate data from Google Maps. Google records wait times and visit durations for users who opted in to Google Location History. The baseline is the median value, for the corresponding day of the week, during the 5-week period of 6 January – 6 February, 2020.	Google LLC (2020)
Grocery and pharmacy	Visits and length of stay at groceries and pharmacies, compared to a baseline, calculated using aggregate data from Google Maps. Google records wait times and visit durations for users who opted in to Google Location History. The baseline is the median value, for the corresponding day of the week, during the 5-week period of 6 January – 6 February, 2020.	Google LLC (2020)
Protests	Non-violent demonstrations as recorded by the Armed Conflict Location & Event Data Project (ACLED) at the country-level, updated daily, which might involve unorganized action by members of society, and might have been met by (excessive) force from governments' side. Besides all protests, we also use a curated subset of the data, containing protests directly related to the coronavirus pandemic, obtained from ACLED's COVID-19 Disorder Tracker.	Raleigh et al. (2010)

Variable name	Definition	Source
Independent variables		
Riots	Violent demonstrations recorded by the Armed Conflict Location & Event Data Project (ACLED) at the country-level, updated daily. The variable might capture spontaneous action by unorganized, unaffiliated members of society; clashes between protesters and police, as well as mob violence. Besides all riots, we also use a curated subset of the data, containing riots directly related to the coronavirus pandemic, obtained from ACLED's COVID-19 Disorder Tracker.	Raleigh et al. (2010)
Instrumental variables		
Rainfall	Precipitation amount (in .01 inches), measured daily, as recorded in the Global Surface Summary of the Day (GSOD) database. We add observations from all weather stations within a country, take the mean value, and compute their 7-day-moving averages for each country. Alternative operationalizations (presented in the Appendix), such as	National Oceanic and Atmospheric Administration (2020)
Control variables		
Level of Democracy	Level of democracy on a scale from 0-10, where 0 is least democratic and 10 most democratic. Average of Freedom House (fh_pr and fh_cl) is transformed to a scale 0-10 and Polity (p_polity2) is transformed to a scale 0-10. These variables are averaged into fh_polity2. The are imputed values for countries where data on Polity is missing by regressing Polity on the average Freedom House measure (Teorell et al., 2020).	From Teorell et al. (2020), based on Freedom House (2019) and Marshall, Gurr and Jaggers (2019)
Quality of Government	The ICRG Indicator of Quality of Government, scaled 0–1. Computed as the mean value of International Country Risk Guide (ICRG) subcategories *Corruption*, *Law and Order* and *Bureaucracy Quality*; originally composed of 22 variables.	From PRS (2019), retrieved from Teorell et al. (2020)
Confirmed cases	Total number of confirmed COVID-19 cases, updated daily between 22 January 2020 – 31 August 2020	From Hale et al. (2020)
Real GDP per capita	Real GDP per capita in 2011 US dollars, multiple benchmarks.	From Bolt et al. (2018) retrieved from Teorell et al. (2020)
Population density	People per sq. km of land area. Population counts all residents regardless of legal status or citizenship. (Year 2016)	From World Bank (2016), retrieved from Teorell et al. (2020)

Variable name	Definition	Source
Control variables		
Population ages 65 and above	Population ages 65 and above as a percentage of the total population. Population counts all residents regardless of legal status or citizenship. (Year 2016)	From World Bank (2016), retrieved from Teorell et al. (2020)
Trade (% of GDP)	The sum of exports and imports of goods and services measured as a share of gross domestic product.	From World Bank (2016), retrieved from Teorell et al. (2020)
Hospital beds (per 1,000)	Number of hospital beds per 1,000 people, from most recent year available since 2010; data collected by Roser et al. (2020) from OECD, Eurostat, World Bank, national government records and other sources.	From Roser et al. (2020)
SARS	The number of confirmed SARS cases in the country in 2002-2003	Based on WHO (2003)
Number of airports	The total number of airports or airfields recognizable from the air. The runway(s) may be paved or unpaved and may include closed or abandoned installations.	From The World Factbook (2020)
Adoption density	A measure capturing prior adoption of policies (as recorded by OxCGRT) among spatially proximate countries. We calculate a neighborhood average of the Stringency Index, borrowing the approach of Sebhatu et al. (2020).	Hale et al. (2020), based on Sebhatu et al. (2020)
Electoral democracy index	The Electoral Democracy Index (EDI) is derived from expert surveys, where the Varieties of Democracy (V-Dem) project asked scholars to rate countries along each of the 43 indicators measuring institutions of democracy. It ranges from 0 to 100, where 100 indicates that democracy is "achieved in its fullest sense", whereas 0 stands for pure dictatorship.	Coppedge et al. (2020)
Tax revenue (% of GDP)	The share of compulsory transfers to the central government, according to IMF, World Bank and Government Finance Statistics Yearbook; OECD estimates for GDP.	From World Bank (2016), retrieved from Teorell et al. (2020)
Gini index	Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution on a scale from 0 to 100, where 0 represents perfect equality and 100 implies perfect inequality.	From World Bank (2016), retrieved from Teorell et al. (2020)
Urban population	Share of the total population (in %) living in urban areas, as recorded by United Nations Population Division.	From World Bank (2016), retrieved from Teorell et al. (2020)
Death rate per 100,000	Computed from OxCGRT dataset's *confirmed deaths* variable, divided by 100,000.	From Hale et al. (2020)