Appendix – alternative specifications and assumptions

Factors motivating the timing of COVID-19 shelter in place orders by U.S. Governors

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Summary

The models below evaluate how robust our modeling strategy is to a number of alternative choices:

- different thresholds for action (1 case per 10,000 population, 100,000 and 500,000)
- different model specifications for the measures of state politics
- different distributions to approximate the hazard function

The models use the same set of controls:

- percentage of the state population living in urban areas
- percentage of the state population age 65 and over
- tax revenue per capita (in dollars)
- state population (in millions)

The political environment is measured simply with the party affiliation of the governor and the majority party in the upper chamber of the state legislature.

Tables 1 and 2 report estimates of he two durations of interest using three different case thresholds.

Table 3 reports three different approximations for the hazard function.

Table 4 reports three alternative ways to measure the political environment.

Table 1. Time to particular case levels – 1 in 10,000; 1 in 100,000; 1 in 500,000

With two exceptions, the sign and significance levels of the variables are not sensitive to choice of threshold.

Exceptions include population – higher population states reached 1:500,000 (rare incidence) faster or earlier. States with a Democratic Governor and Republican Senate (Michigan, for instance) reached 1:10,000 (wider community spread) at the same time as states with a Republican Governor and Senate.

	Time from WHO annoucement until cases:		
	1:10,000	1:100,000	1:500,000
	(1)	(2)	(3)
Dem. governor only	-0.02	-0.03***	-0.05***
	(0.01)	(0.01)	(0.01)
Rep. governor only	-0.05**	-0.05***	-0.08***
	(0.02)	(0.02)	(0.02)
Dem. governor and senate	-0.03**	-0.04***	-0.07***
	(0.01)	(0.01)	(0.01)
Urban	-0.001	-0.0003	-0.0005
	(0.001)	(0.0004)	(0.0004)
Elderly	-0.003	0.002	0.001
	(0.003)	(0.002)	(0.002)
Tax revenue per capita	0.0001	-0.0001	0.0002
	(0.0003)	(0.0003)	(0.0002)
Population	-0.0005	-0.0003	-0.002**
	(0.001)	(0.001)	(0.001)
Constant	4.52***	4.31***	4.28***
	(0.08)	(0.05)	(0.06)
N	50	50	50
Log Likelihood	-112.07	-93.18	-91.83
chi2 (df = 7)	16.73**	32.86***	49.84***

*p < .1; **p < .05; ***p < .01

Table 2. Time from case levels to SIPO for three levels of cases.

The principal findings are very robust to choice of threshold. The only variable that changes sign or significance is proportion elderly – the time between high levels of cases (1:10,000) and action is only marginally shorter for states with an elderly population. The smaller coefficients for party control variables reflect the shorter duration from threshold to action (accounting for the span of time between reaching 1:100,000 and 1:500,000).

	Time to SIPO		
	1:10,000	1:100,000	1:500,000
Dem. governor only	-1.44***	-1.44***	-1.24***
	(0.27)	(0.26)	(0.22)
Rep. governor only	-2.01***	-1.72***	-1.41***
	(0.42)	(0.40)	(0.33)
Dem. governor and senate	-1.81***	-1.58***	-1.27***
	(0.29)	(0.27)	(0.23)
Urban	-0.003	-0.01	-0.01
	(0.01)	(0.01)	(0.01)
Elderly	-0.06	-0.10*	-0.10**
	(0.05)	(0.05)	(0.05)
Tax revenue per capita	0.01**	0.01**	0.01*
	(0.01)	(0.01)	(0.01)
Population	-0.06***	-0.05***	-0.03***
	(0.02)	(0.01)	(0.01)
Constant	4.31***	5.21***	5.51***
	(1.32)	(1.29)	(1.13)
N	50	50	50
Log Likelihood	-151.10	-154.28	-162.04
chi2 (df = 7)	49.90***	47.81***	45.93***

*p < .1; **p < .05; ***p < .01

Table 3. Approximating the hazard function with different distributions

The findings are not all sensitive to the distribution used to approximate the hazard function. The Weibull distribution is the best fit for this data based on the log-likelihood. All models reported in the paper use the Weibull distribution. Each model below uses the 1:100,000 threshold.

	Time to SIPO		
	Weibull	Loglogistic	Expontential
Dem. governor only	-1.44***	-1.00***	-1.53***
	(0.26)	(0.31)	(0.44)
Rep. governor only	-1.72***	-1.11**	-1.86***
	(0.40)	(0.45)	(0.67)
Dem. governor and senate	-1.58***	-1.12***	-1.71***
	(0.27)	(0.35)	(0.46)
Urban	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)
Elderly	-0.10*	-0.10	-0.12
	(0.05)	(0.07)	(0.09)
Tax revenue per capita	0.01**	0.01*	0.02
	(0.01)	(0.01)	(0.01)
Population	-0.05***	-0.04**	-0.05**
	(0.01)	(0.02)	(0.02)
Constant	5.21***	4.82***	5.53**
	(1.29)	(1.65)	(2.15)
N	50	50	50
Log Likelihood	-154.28	-156.39	-160.73
chi2 (df = 7)	47.81***	20.22***	35.52***

*p < .1; **p < .05; ***p < .01

Table 4. Three measures of Republican control or influence

We considered several alternative ways to measure political influence. The margin of Donald Trump's victory (a percentage, Trump vote minus Clinton vote divided by total vote for Clinton and Trump), the percentage of the state congressional delegation affiliated with the Democrats, the political party of the Governor, and the majority party in the upper chamber of the state legislature. Taken individually, each of these measures has some predictive power. When all of the measures are introduced in one model, the standard errors for each coefficient increase substantially, reflecting the correlation between the measures. If Trump's margin and percentage congressional Democrats are both included, the effects of state governor and senate control would have been in the same direction, but weaker, to the point that Republican Governor only is not statistically different than Republican Governor and Republican State Senate. We think this is due more to the inefficiency introduced when highly correlated measures are introduced, and chose to drop Trump's margin and the congressional delegation measures since they were insignificant in the full model.

	Time to SIPO			
	All	Party	Congress	Trump
Dem. governor only	-1.18***	-1.44***		
	(0.28)	(0.26)		
Rep. governor only	-0.74	-1.72***		
	(0.63)	(0.40)		
Dem. governor and senate	-0.85*	-1.58***		
	(0.45)	(0.27)		
Congress	-0.004		-0.02***	
	(0.01)		(0.005)	
Trump margin	0.02			0.04***
	(0.01)			(0.01)
Urban	0.001	-0.01	0.001	0.002
	(0.01)	(0.01)	(0.01)	(0.01)
Elderly	-0.04	-0.10*	-0.05	-0.05
	(0.06)	(0.05)	(0.06)	(0.06)
Tax revenue per capita	0.02**	0.01**	0.01	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)
Population	-0.03**	-0.05***	-0.05***	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)
Constant	3.00*	5.21***	4.23***	2.15
	(1.63)	(1.29)	(1.58)	(1.70)
N	50	50	50	50
Log Likelihood	-152.24	-154.28	-161.43	-159.43
chi2	51.88***	47.81***	33.51***	37.49***

*p < .1; **p < .05; ***p < .01

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