Did Lockdown Work? An Economist's Cross-Country Comparison

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Abstract: I explore the association between the severity of lockdown policies in the first half of 2020 and mortality rates. Using two indices from the Blavatnik Centre's Covid 19 policy measures and comparing weekly mortality rates from 24 European countries in the first halves of 2017-2020, and addressing policy endogeneity in two different ways, I find no clear association between lockdown policies and mortality development.

Keywords: epidemic, Covid 19, policy responses

1. Introduction

The spread of a new corona virus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that causes coronavirus disease 2019 (Covid 19), came as a genuine surprise in most countries. Governments the world over decided to lock down their economies in order to suppress the virus, as it was believed that limiting social contacts would contain its spread, protect health care from reaching capacity limits, and limit its death toll. However, whether economic lockdowns work in the sense of suppressing the virus remains an open question.

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Epidemiologists have tried to answer it, indicating that thousands and perhaps millions have been saved. These first answers have nevertheless been exclusively based on forecasts derived from empirically untested models (cf., Flaxman et al., 2020). Conversely, Chaudhry et al. (2020), in an exploratory analysis of data on Covid 19-related deaths across 50 countries, find no association between the degree of lockdown and death rates. Similarly, in the only empirical assessment of its kind to date that takes the endogeneity of policy responses into account, Born et al. (2020) use a synthetic control method to suggest that Sweden's decision not to lock down society did not contribute to its death toll. They thus question the widely held political belief that lockdowns must have suppressed the spread of the virus.

In this paper, I instead approach the question using a standard approach and standard econometric tools used in economics and political science instead of epidemiological modelling or single-case studies. I compare weekly general mortality rates in the first half of the year in 2017, 2018, 2019 and 2020 in 24 European countries that took very different policy measures against the virus at different points in time. Estimating the effects of these policy measures as captured by the Blavatnik Centre's Covid 19 policy indices and taking the endogeneity of policy responses into account, the results suggest that stricter lockdown policies have not been associated with lower mortality.

2. Data and empirical strategy

The main data consist of weekly mortality numbers from 24 European covered by Eurostat (2020), which capture mortality for all reasons. As the United Kingdom only has reported data to Eurostat for 2020, I instead use weekly mortality for England and Wales as reported by ONS (2020). The reason for using weekly mortality data instead of official data on Covid 19-related deaths is the way these deaths are measured. While weekly mortality counts all actual deaths in the country, Covid 19-related deaths are counted as deaths where the deceased tested positive for the virus but where the death is not necessarily caused by the virus. Country-specific differences in reporting approach and reporting behaviour would therefore bias the results when using official measures of Covid 19-related deaths.

As a measure of the severity of lockdown policies, I use two indices developed at Oxford University's Blavatnik Centre by Hale et al. (2020). As documented in Petherick et al. (2020), the full government response index includes 13 elements: School closing, workplace closing, cancellation of public events, restrictions on gatherings, closing public transport, stay at home requirements, restrictions on internal movement, international travel controls, income support, debt and contract relief for households, public information campaigns, testing policies, and contact tracing. I therefore use the containment and health index, which does not include the two economic elements of income support and debt relief that are irrelevant for virus spread. Alternatively, as a robustness test I use the stringency measure that in addition excludes the final three measures. These indices are the main variables that I use to explore the association between mortality dynamics and policy responses to the new virus.

The specification in which I estimate this association includes three-way fixed effects capturing country-, year- and week-specific differences, which implies that all effects are identified as week-specific changes in mortality relative to mortality rates in the same week in previous years, and relative to changes in other countries in the same year and week. As such, all approximately time-invariant factors in a four-year perspective such as geography, population density and demography, welfare state and health care type, institutional quality etc. are therefore controlled for. This effectively reduces the risk of omitted variable bias.

A main problem with estimating effects of policy changes on the mortality rate is that effects are far from contemporaneous. The incubation period of SARS-CoV-2 – the time from a person is exposed to the virus and until she develops symptoms in case that happens at all – is reported to vary between 2 to 14 days with a typical period around one week. If these symptoms develop further, she will typically be hospitalized after an additional seven days (Garg et al., 2020). Although there is relatively little knowledge of how rapidly Covid 19 results in deaths, Flaxman et al. (2020) implicitly assume a time lag of 2-3 weeks between infection and death, which appears to be the minimum typical time from infection to death. In the following, I therefore report results using time lags varying from one to four weeks.

The second identification problem is the potential endogeneity of the association, which derives from the nature of political reactions to the virus that could rely on the reported number of infections. If an increase in the reported infection rate leads government to introduce lockdown policies, and if a declining reported infection rate subsequently leads them to ease the lockdown, the estimated association between policy stringency and mortality is biased.

A first solution the identification problem relies on the timing of changes in lockdown policies and mortality rates. Although one might think that policy-making reacts quickly to changing mortality during an emergency, exploring the determinants of changes in the stringency indices reveals that an increase in the contemporaneous mortality or an increase in the reported number of SARS-CoV-2 cases was is associated with stricter lockdown measures. Lagging these indicators for the severity of the health crisis reveals that mortality changes become significant predictors of stricter measures when lagged three weeks. As such, it is highly unlikely that there is a substantial endogeneity problem in the following as mortality changes only affect policy changes with a three-week lag, and as policy changes cannot affect the mortality rate before another two to three weeks have past. As such, any bias may be small and practically negligible.

However, endogeneity or simultaneity bias may still be a problem if, for example, omitted political factors are important. Another standard way of alleviating the endogeneity bias is to find instrumental variables that provide identification of changes in policy stringency while not being associated with mortality dynamics. Although valid and sufficiently strong instrumental variables are often difficult to find in fixed effects settings, it is possible to identify variables that determine the policy indices and that may be plausibly exogenous. In the following, I use the logarithm to the number of days since the first SARS-CoV-2 case was identified in the country and its square, which I interact with the Benefit INEP measure developed by Bjørnskov and Voigt (2018), an index that essentially captures the degree to which the executive gains additional discretionary powers during a state of emergency.[1] As indicated by previous research, policy responses to emergencies are often informed more by the promise of additional, unchecked power than the severity of the emergency (Bjørnskov and Voigt, 2020). The interaction with the time since the first case thus allows identification of the policy development even though the INEP itself is time-invariant during the four-year period covered by the data.[2]

All data are summarized in the appendix Table A1. However, before turning to the estimates, it may be worthwhile to provide a sense of the dynamics of mortality rates in 2020 and previous years. Figure 1 illustrates the development of weekly mortality (the full lines), relative to the average development in the same weeks in 2017-2019 (the dotted lines). The black line represents the average development in the 12 countries with an average containment and health index in 2020 above the median of all 24 countries while the grey line represents the same development in countries with below-median indices. As such, the figure shows how mortality changed from week to week for the first half of the years.

Insert Figure 1 about here

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[1] Bjørnskov and Voigt (2018) develop two INEP measures: one that captures how difficult it is to declare a state of emergency, and another that captures which additional powers the executive gains during an emergency. The Benefit INEP is the second of these indices, and is composed of three basic elements: 1) whether the executive can dissolve parliament, how many basic rights can be derogated, and if the executive can expropriate private property and restrict the freedom of expression during emergencies.

[2] Underidentification is not likely to be a problem as the first stage f statistics in the instrumental variables estimates in the following vary between 113 and 177. Likewise, overidentification is not a substantial problem as the time since the first identified case is collinear with the week numbers and therefore is unlikely to bias the estimates.

Exploring these data, a first interesting detail is that comparing 2020 to the previous years, it is clear that the average European country had negative excess mortality in the first ten weeks of the year. On average, the 24 countries suffered 200 *fewer* deaths per million inhabitants (8.7 percent) in the first ten weeks of 2020, compared to their averages in 2017-2019. From week 11 to 22, the 24 countries experienced an accumulated excess mortality of 248 deaths per million inhabitants (10.7 percent). However, as illustrated in Figure 2, the 'hard lockdown' group experienced 372 additional deaths per million while the other group only experienced excess mortality of 123 deaths. This simple pattern may indicate that lockdowns have been directly counterproductive but may also indicate a severe endogeneity problem.

3. Results

Table 1 reports the results of estimating the effects of the containment and health index while Table 2 employs the policy stringency index. In both tables, the goodness of fit statistics show that the simple specification does a good job explaining the actual development: year- and week-fixed effects along with a lagged dependent variable explain approximately 70 percent of the within-country variation. The results in both tables also clearly document the persistence and relatively slow development of mortality, as reflected in the lagged dependent variable.

Insert Table 1 about here

Insert Table 2 about here

The main results in the tables show that the estimated effects of lockdown policies are all positive and significant when policy changes are lagged one or two weeks. However, when the lag length extends to three or fourth weeks, i.e. the length that is reasonable from the perspective of the virology of SARS-CoV-2, the estimates become very small and insignificant.

The following panels in both tables separate the period in which the mortality rates increased and the subsequent decline. Although these estimates may arguably suffer from bias if lockdown policies significantly move the turning point of mortality development, which would be the case if the association is negative, they provide information about potentially asymmetric effects of the policies. However, the results clearly indicate that lockdown policies are positively associated with mortality development before the mortality rate peaks although the association again tend to break down with lag length. Conversely, there is no clear or significant relation between lockdown stringency and mortality after the virus has peaked.

Finally, the instrumental variables estimates in the bottom panels confirm the overall pattern and therefore do not indicate any substantial endogeneity bias. Only one of the eight estimates is significant at conventional levels, and again with a positive sign. Given the validity of the instruments, these estimates do not provide evidence suggesting that lockdown policies worked as intended.

4. Conclusions

The lockdowns in most Western countries have thrown the world into the most severe recession since World War II and the most rapidly developing recession ever seen in mature market economies. They have also caused an erosion of fundamental rights and the separation of powers in large part of the world as both democratic and autocratic regimes have misused their emergency powers and ignored constitutional limits to policy-making (Bjørnskov and Voigt, 2020). It is therefore important to evaluate whether and to which extent the lockdowns have worked as officially intended: to suppress the spread of the SARS-CoV-2 virus and prevent deaths associated with it. Comparing weekly mortality in 24 European countries, the findings in this paper suggest that more severe lockdown policies have not been associated with lower mortality. In other words, the lockdowns have not worked as intended.

These general findings are consistent with the results of a previous paper using a synthetic control method to test the effects of Sweden's absence of a lockdown (Born et al., 2020). Although much has been claimed about Sweden's relatively high mortality rate, compared to the other Nordic countries, the present data show that the country experienced 161 fewer deaths per million in the first ten weeks, and 464 more deaths in weeks 11-22. In total, Swedish mortality rates are 14 percent higher than in the preceding three years, which is slightly more than France, but considerably fewer than Italy, Spain and the United Kingdom that all implemented much stricter policies.

The problem at hand is therefore that evidence from Sweden as well as the evidence presented here does not suggest that lockdowns have significantly affected the development of mortality in Europe. It has nevertheless wreaked economic havoc in most societies and may lead to a substantial number of additional deaths for other reasons. A British government report from April for example assessed that a limited lockdown could cause 185,000 excess deaths over the next years (DHSC, 2020). Evaluated as a whole, at a first glance, the lockdown policies of the Spring of 2020 therefore appear to be substantial long-run government failures.

Appendix

Insert Table A1 about here

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Table 1. Results, containment and health

Lag length	One week	Two weeks	Three weeks	Four weeks
Lagged dependent	.605**	.617**	.633**	.644**
	(.089)	(.071)	(.072)	(.071)
Containment and	.097**	.069**	.038	.013
health index	(.021)	(.021)	(.021)	(.018)
Observations	2907	2907	2907	2907
R squared	.695	.692	.689	.688
F statistic	190.34	187.55	185.41	184.54
		Only data prior to turning point		
Containment and	.179**	.169**	.146**	.139*
health index	(.038)	(.042)	(.046)	(.056)
		Only data after turning point		
Containment and	.122	.075	.031	-.141
health index	(.106)	(.097)	(.096)	(.086)
		Instrumental variables estimates		
Containment and	.366	.220*	.027	-.004
health index	(.214)	(.098)	(.055)	(.051)

Note: ** (**) denote significance at p<.001 (p<.05).

Table 2. Results, policy stringency

Lag length	One week	Two weeks	Three weeks	Four weeks
Lagged dependent	.599**	.616**	.635**	.647**
	(.069)	(.071)	(.073)	(.071)
Policy stringency	.097**	.064**	.029	.002
index	(.022)	(.021)	(.021)	(.018)
Observations	2907	2907	2907	2907
R squared	.695	.691	.689	.688
F statistic	191.04	187.46	185.07	184.42
		Only data prior to turning point		
Policy stringency	.166**	.148**	.111**	.089
index	(.037)	(.039)	(.040)	(.047)
		Only data after turning point		
Policy stringency	.166	.129	.089	-.080
index	(.100)	(.097)	(.102)	(.092)
		Instrumental variables estimates		
Policy stringency	.335	.198	.013	-.055
index	(.233)	(.108)	(.057)	(.055)

Note: ** (**) denote significance at p<.001 (p<.05).

Table A1. Descriptive statistics

	Mean	Standard deviation	Observations
Weekly mortality	3775.495	4898.592	2935
Policy stringency index	9.499	23.043	3078
Containment and health index	9.335	22.630	3078
Benefit INEP	.497	.211	3192

Figure 1. Mortality development in 2020, two groups