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## The Delta variant will cost many lives and some GDP

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# The Delta variant will cost many lives and some GDP

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# **The Delta Variant Will Cost Many Lives and Some GDP**

Steve Kamin and John Kearns

September 13, 2021

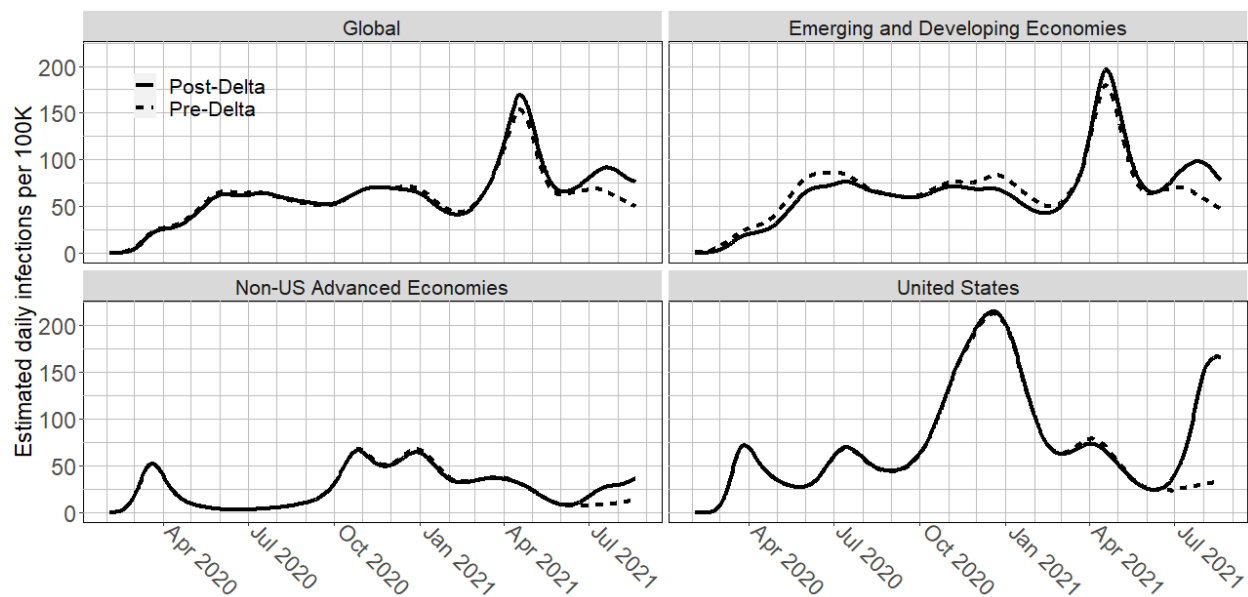
## **Abstract**

In this note, we gauge the likely impact of the Delta variant on global GDP growth in the second half of this year. To do so, we use the methodology described in Kamin and Kearns (2021), “Pandemic Prospects and the Global Economic Recovery,” to compare projections for global GDP based on the IHME’s recent forecast of pandemic deaths to GDP projections based on IHME’s forecast released before the full eruption of the Delta variant – the difference between them is a rough measure of the economic impact of the Delta variant. Our estimates suggest that although the Delta variant may cost more than 900,000 lives around the world, the impact on global GDP will be a more modest \$200 billion, or less than 0.2 percent of GDP. Most of the lives lost to the Delta variant in the second half of this year will be in the emerging market and developing economies (EMDEs), but this reflects their much larger population; adjusted for population, the advanced economies stand to be hit much harder. In fact, much of the human and economic costs of the Delta variant are concentrated in the United States: the country stands to lose 120,000 additional lives and \$70 billion in GDP, a testament to the damage being done by vaccine hesitancy. Finally, despite the EMDEs being hit less hard than the AEs by the Delta variant, the pandemic will still cost them nearly 1½ million lives and \$190 billion in lost GDP in the second half of this year. Thus, the need to provide vaccines to these countries remains as urgent as ever.

## Introduction

Since June, there has been a worrisome surge in COVID-19 infections around the world, as indicated in the Figure 1 below, driven in large part by the Delta variant. The panels compare actual infection rates as reported by the Institute for Health Metrics and Evaluation (IHME), labeled ‘post-Delta,’ to those projected by the IHME before June 28, labeled ‘pre-Delta,’ when the Delta variant was limited to relatively few countries. (Most notably, it exploded in India in the spring and then subsided.) The surge in cases has been global, but most pronounced in the advanced economies and especially in the United States, where they are nearing the levels last seen in January.

Figure 1: Estimated COVID-19 infections per 100,000 population

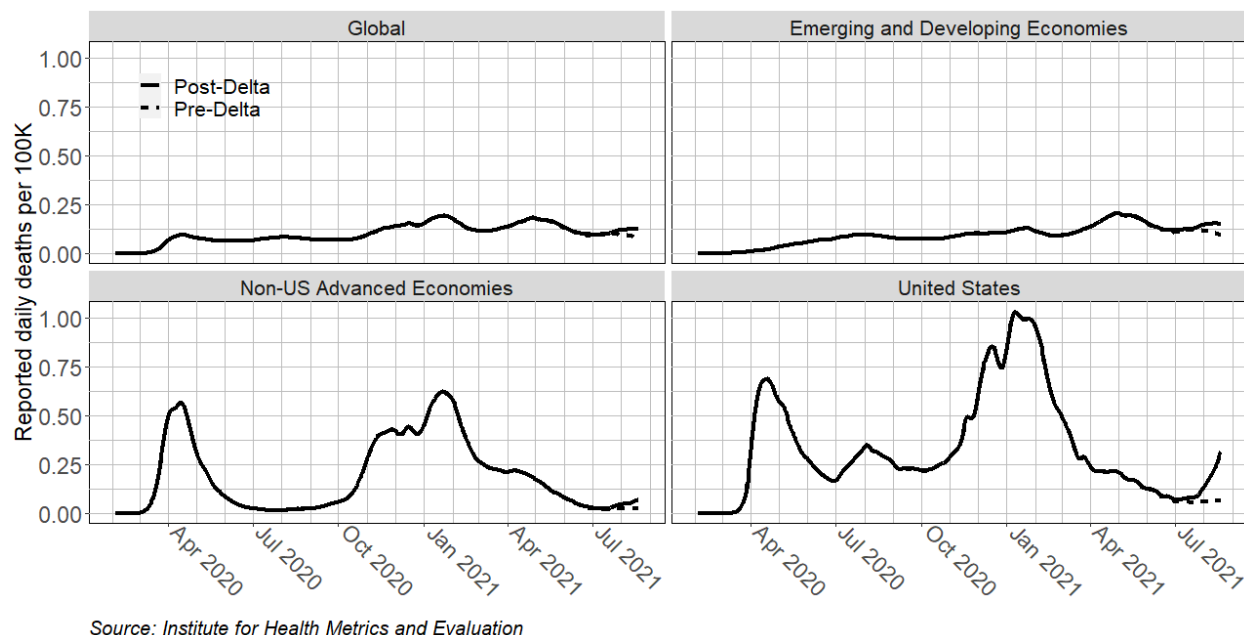


Source: Institute for Health Metrics and Evaluation

Figure 2 presents the analogous data for COVID-19 deaths. Notably, the upticks in deaths have been much smaller than that for cases. First, because deaths tend to follow cases with a lag of several weeks, we have yet to see the full effect on deaths of the uptick in cases. Second, with much of the advanced-economy population vaccinated, and with much of the cases affecting younger people, the impact on mortality of the latest COVID-19 surge has been more limited.

The surge of the Delta variant is worrisome for several reasons. First and most obviously, it represents further loss of lives. Second, the continued spread of the virus poses the threat of still more, and possibly more deadly, variants of COVID-19. And, finally, despite the somewhat more limited scale of the Delta surge in deaths compared with previous waves, it is still leading to re-impositions of lockdown restrictions, reductions in measured mobility, and softenings of spending plans that will result in losses of economic activity.

Figure 2: Reported COVID-19 deaths per 100,000 population



In this note, we gauge the likely impact of the Delta variant on global GDP growth in the second half of this year. To do so, we apply the methodology described in Kamin and Kearns (2021), “Pandemic Prospects and the Global Economic Recovery,” to map the evolution of the pandemic into outcomes for GDP. In particular, we compare projections for global GDP based on the IHME’s recent forecasts of the pandemic to GDP projections based on IHME’s projections released before the full eruption of the Delta variant, and use the difference between them as a rough measure of the economic impact of the Delta variant.

The main results of our analysis are as follows:

First, we estimate that in the second half of 2021 alone, the Delta variant will add an additional 920,000 to the pandemic’s death toll. It will reduce the annualized rate of growth by about  $\frac{1}{2}$  percentage point and lower overall 2021 GDP by about \$200 billion. (This does not count the impact of the Delta variant on some countries, such as India, where the surge occurred in the first half of the year.) \$200 billion is a lot of money, of course, but it represents less than 0.2 percent of global GDP.

Second, most of the lives lost to the Delta variant in the second half of this year will be in the emerging market and developing economies (EMDEs): 638,000 in the EMDEs compared with 284,000 in the advanced economies (AEs). However, this largely reflects the much larger population in the EMDEs – 6.5 billion people compared with about 1.3 billion in the AEs. Adjusted for population, the Delta surge is far more pronounced in the AEs, and in consequence is projected to cost \$132 billion this year compared with only \$72 billion in the EMDEs.

Much of the human and economic costs of the Delta variant are concentrated in the United States. As deaths are projected to rise to over 0.4 daily deaths per 100,000 people, the country stands to lose 120,000 additional lives and \$70 billion in GDP. With vaccinations widely available in the United States, and

deaths from breakthrough cases relatively rare, these figures can be interpreted as the costs of vaccine hesitancy among large swaths of the U.S. population. By comparison, in the rest of the advanced economies, which amount to more than twice the size of the United States in both population and the economy, the death rate never crests above 0.25 per 100,000, total additional deaths are 164,000, and GDP falls by only \$62 billion.

Finally, insofar as the EMDEs are much more poorly positioned to take an economic hit than their richer AE neighbors, the greater damage to AE than to EMDE GDP is a very slight silver lining in the otherwise very dark cloud of the Delta variant. But even with the smaller Delta surge, the pandemic is still causing egregious damage to EMDEs: we project that relative to a counterfactual scenario where COVID-19 deaths drop to zero, the actual path of the pandemic will cost EMDEs nearly 1½ million lives and about \$190 billion in lost GDP in the second half of this year. Thus, the need to provide vaccines to these countries remains as urgent as ever.

## Methodology

To gauge the effect of the Delta variant on global GDP, we take the following steps:

First, as a rough measure of the contribution of the Delta variant to the overall trajectory of the pandemic, we use the difference in the IHME's pandemic projections for COVID-19 deaths between June 28 and August 20. Before June 28<sup>th</sup> (the date of release of what we call the 'pre-Delta' projections), the Delta variant was relatively limited, but by August 20<sup>th</sup> (the 'post-Delta' projection release) it had become the global dominant strain.

We then extrapolate the IHME's pre- and post-Delta projections for COVID-19 deaths from their end-September level through the end of 2021.<sup>1</sup> As in the methodology of Kamin and Kearns (2021), this extrapolation is based on the late-September projections of COVID-19 infections for the first two weeks in October, and then we assume death rates decline at a pace similar to that experienced globally in April and May of this year. The two projected trajectories of COVID-19 deaths are shown in Figure 3 below.

To assess the impact of pandemic variables on GDP, we use a panel regression model applied to 93 economies that have published quarterly GDP data at least through the first quarter of 2021. (In a few cases, we use data through the second quarter.) The quarter-to-quarter percent change in real GDP is regressed on the number of deaths in that quarter (which is believed to influence the extent of voluntary social distancing), a measure of lockdown restrictions (the Oxford Stringency Index, or OSI), and lagged GDP growth. See the appendix and Kamin and Kearns (2021) for additional detail on our estimation procedure.

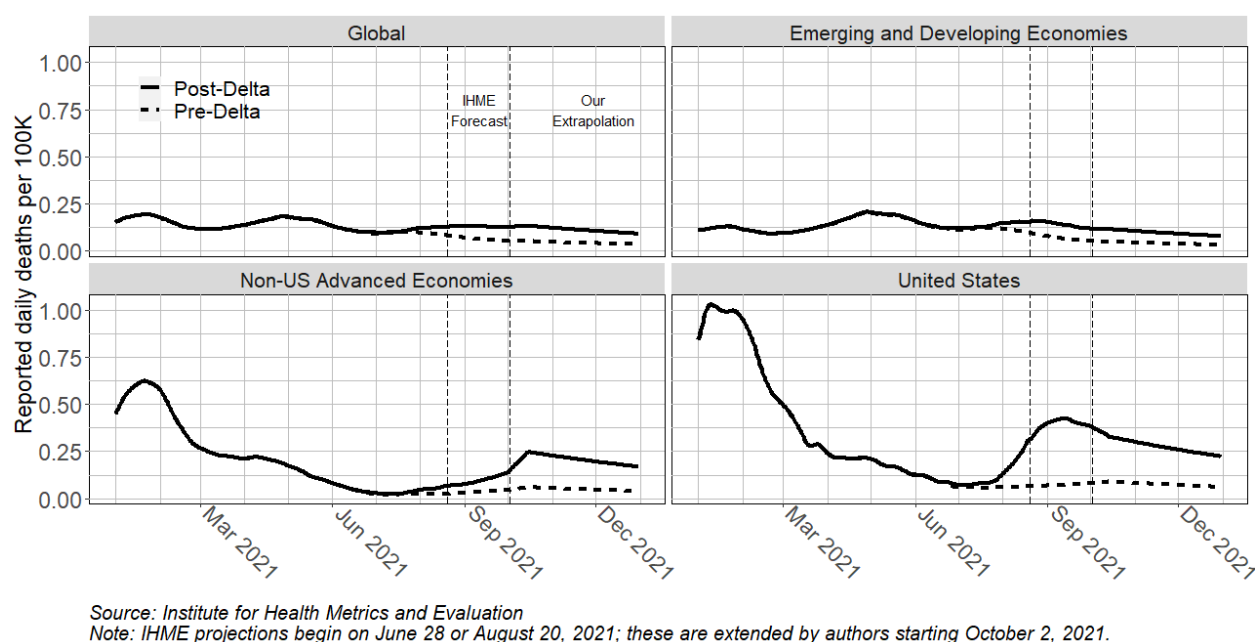
Table 1 in the appendix to this note presents the estimation results. Note that the coefficients in the regression estimated over the entirety of the sample (column 1) and over the first half year of the pandemic (column 2) are much larger than those estimated over the last four quarters of the sample (column 3). This probably reflects that in the initial outbreak of the pandemic, social distancing reacted very strongly to even small COVID-19 death counts and lockdown restrictions were crudely and indiscriminately applied. As households, workers, and businesses learned to adjust to the new environment, and as lockdown restrictions were more carefully administered, the effect of deaths and lockdowns on economic activity diminished. Accordingly, we use the estimates based on data from 2020

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<sup>1</sup> The August 20 IHME projections extend through end-October. However, the June 28 IHME projection extends only through end-September. Therefore, in order to do a proper "apples to apples" comparison of the economic implications of the two projections, we extend both projections using our own methodology starting at the beginning of October.

Q3 through 2021 Q2 (subject to data availability), to gauge the effect of the Delta variant on economic activity. Note that in the estimates of the model for this time period (column 3), the coefficient on lockdown restrictions (OSI) becomes statistically insignificant. Therefore, to project GDP, we use a model that excludes OSI as an explanatory variable – as shown in column 4, this entails almost no loss in explanatory power.<sup>2</sup>

Figure 3: Projected COVID-19 deaths per 100,000 population



## Results

Recall that we have two projections for pandemic variables: the pre-Delta and post-Delta paths. We apply the coefficients of the model, based on the estimation shown in column 4 of Appendix Table 1, to each of our two projections for pandemic deaths, using each country's GDP in 2021 Q1 or Q2, depending on data availability, as the jumping-off point for the projections. Values of the lagged dependent variable (GDP) in subsequent quarters are calculated endogenously in this dynamic simulation. The difference in GDP in 2021 H2 between the pre- and post-Delta projections represents our rough estimate of the effect of the Delta variant.

The results are summarized in the table below. The impact of the Delta variant is substantial. Before the Delta shock, as shown in the first row, the IHME (with our extension) projected 3.2 million deaths from COVID-19 globally in 2021. With the new information (the second row), the model now projects over four million deaths, an increase of 922,000 (the third row).

Economically, the differences are material but not overwhelming. In the pre-Delta projection, the decline in pandemic deaths was projected to boost global 2021 H2 growth by an annual rate by 0.3 percentage

<sup>2</sup> Besides the lack of statistical significance of the coefficient on OSI, an additional consideration was the difficulty of forecasting OSI. Our regression analysis (not shown) indicates a very loose relationship between pandemic deaths and the stringency of lockdown restrictions. Indeed, as shown in Appendix Figure 1, even as pandemic deaths around the world started to rise in June, OSI continued to decline or merely flattened out.

point.<sup>3</sup> In the post-Delta projection, the predicted effect of the path of the pandemic on economic growth turns to negative 0.3 percentage point. In dollar terms, this amounts to \$204 billion in lost economic output. This sum, while not negligible, represents less than 0.2 percent of projected global GDP this year, reflecting that 922,000 lost lives, while tragic, represents a comparably small share of global population.<sup>4</sup>

There are substantial differences in prospects across regions, however. The emerging and developing economies (EMDEs) are slated to suffer an additional 638,000 deaths as a result of the Delta variant, far more than the 284,000 increase in deaths in the advanced economies (AEs). But because the EMDE population far exceeds that of the AEs, the rise in deaths per 100,000 is far greater in the AEs, as evident in Figure 3. Accordingly, while the Delta variant costs the AEs \$132 billion in GDP this year, the impact on EMDEs is only \$72 billion.

Much of the impact of the Delta variant in the AEs is concentrated in the United States. Pandemic deaths in 2021 H2 rise by 120,000 relative to their pre-Delta projection, while GDP falls by \$70 billion. Compared with the United States, the non-U.S. AEs experience a smaller impact on pandemic deaths per capita (Figure 3) as well as a smaller loss of GDP, despite having a much larger population and economy.

To put the impact of the Delta variant in perspective, the fourth row of the table below (labelled Zero-COVID) computes the effect on H2 GDP growth, full-year GDP, and full-year deaths of a counterfactual scenario where pandemic deaths dropped to zero in the second half of this year. The final row of the table compares these calculations with those associated with the current Delta variant, the second row – in essence, the final row represents the full cost of the pandemic as it now stands, as opposed to just the incremental cost of the Delta variant. It indicates that the continuation of the pandemic into the second half of this year will cost the world roughly 1.8 million lives and \$500 billion. In the EMDEs, the cost is 1.4 million lives and \$192 billion. It is also substantial in the advanced economies.

These estimates make clear that ensuring the rapid expansion of vaccinations to the EMDEs, and making inroads with the remaining holdouts in advanced economies, continues to be the world's highest near-term priority. Such a program may not only save lives, reduce economic costs, and limit Delta, but it may also prevent future outbreaks, potentially even more dangerous than the Delta variant. And given the huge economic price tag associated with the pandemic, accelerating the production and distributions of vaccines will easily pay for itself. (See Gagnon and Kamin, 2021.)

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<sup>3</sup> Note that this calculation refers only to the effect of the easing of pandemic deaths on GDP. It does not encompass the broad array of other factors – monetary and fiscal policy, trade developments, underlying or potential growth, etc.—that also will affect growth this year. Finally, the 0.3 percentage point boost indicated by the pre-Delta path is so small because much of the global economy received the lion's share of this boost in the preceding quarters, and there is a small negative coefficient on lagged GDP growth in the model.

<sup>4</sup> Of course, this accounts only for the value of lost production, not the value of lost lives. Some estimates place the value of a lost life in the United States at \$10 million. At that rate, the economic value of the human toll of the Delta variant comes to be an extra \$1.2 trillion in the U.S. alone.



Table 1: Impact of the Delta variant on global GDP

	Global			Emerging and Developing Economies			Non-U.S. Advanced Economies			United States		
	H2 2021 Growth <sup>1</sup>	2021 GDP <sup>2</sup>	2021 Deaths <sup>3</sup>	H2 2021 Growth <sup>1</sup>	2021 GDP <sup>2</sup>	2021 Deaths <sup>3</sup>	H2 2021 Growth <sup>1</sup>	2021 GDP <sup>2</sup>	2021 Deaths <sup>3</sup>	H2 2021 Growth <sup>1</sup>	2021 GDP <sup>2</sup>	2021 Deaths <sup>3</sup>
Pre-Delta	0.3%	141,962	3,238	0.7%	82,079	2,429	-0.2%	37,208	515	-0.4%	22,675	294
Post-Delta	-0.3%	141,758	4,160	0.4%	82,006	3,067	-1.3%	37,146	679	-1.4%	22,605	414
Difference	-0.6%	-204	+922	-0.3%	-72	+638	-1.1%	-62	+164	-1.0%	-70	+120
Zero-COVID	0.8%	142,256	2,346	0.9%	82,198	1,646	0.6%	37,299	449	0.8%	22,758	251
Difference with Post-Delta	+1.1%	+498	-1,814	+0.5%	+192	-1,421	+1.9%	+153	-230	+2.2%	+153	-163

<sup>1</sup> The annualized real GDP growth rate as implied by the estimated quarterly real GDP growth rates for Q3 and Q4 2021.

<sup>2</sup> Pre-Delta GDP is the 2021 Nominal GDP (PPP) in billions international dollars from the IMF April 2021 WEO. Post-Delta GDP is the Pre-Delta IMF estimate scaled by the ratio between the Post-Delta and Pre-Delta 2021 year-average GDP levels as forecasted by our model. Zero-COVID GDP is the Pre-Delta IMF estimate scaled by the ratio between the Zero-COVID counterfactual and Pre-Delta 2021 year-average GDP levels as forecasted by our model.

<sup>3</sup> Predicted total COVID-19 deaths in 2021 in thousands

## References

Kamin, Steven and John Kearns (2021), “Pandemic Prospects and the Global Economic Recovery,” American Enterprise Institute Working Paper, June 2.

Gagnon, Joseph E. and Steven Kamin (2021), “The G7 Should Go Full-Throttle on its Vaccine Agenda: It Will Save Lives and Pay for Itself,” Peterson Institute for International Economics Op-Ed, June 21.

Hale, Thomas, Sam Webster, Anna Petherick, Toby Phillips, and Beatriz Kira (2020). Oxford COVID-19 Government Response Tracker, Blavatnik School of Government. <https://github.com/OxCGRT/covid-policy-tracker>

Institute for Health Metrics and Evaluation (IHME). COVID-19 Projections. Seattle, WA: IHME, University of Washington, 2020. Available from <https://covid19.healthdata.org/projections>.

## Appendix

We estimate a panel regression model linking the quarter-to-quarter growth rate of real GDP for 93 countries to the change in the number of deaths per capita, the change in the stringency of lockdown restrictions (OSI), a lagged dependent variable, and fixed country and time effects. One issue we had to address is the likely endogeneity of deaths and lockdown restrictions. To address this concern, we use a two-stage least squares (2SLS) procedure: In the first stage regression, COVID-19 deaths and OSI are regressed on contemporaneous COVID-19 infections; in the second stage, the residuals from these regressions—that is, the variation in deaths and OSI not directly related to contemporaneous cases—are substituted for actual deaths and OSI.

Another issue is that officially reported COVID-19 deaths are believed to be widely under-estimated, especially in poorer countries. To address this concern, we applied our regression analysis to two different estimates of deaths, besides the officially reported figures: the Economist estimate of excess deaths and

the IHME estimate of total deaths.<sup>5</sup> Despite the higher levels of these estimates, the use of their quarterly changes in our estimations did not result in model estimates that were substantially different, or had greater explanatory power, than those based on officially reported data. Accordingly, we used the official data for our analysis.

The results of our estimation are shown below.

Appendix Table 1: Panel Regressions for Real GDP

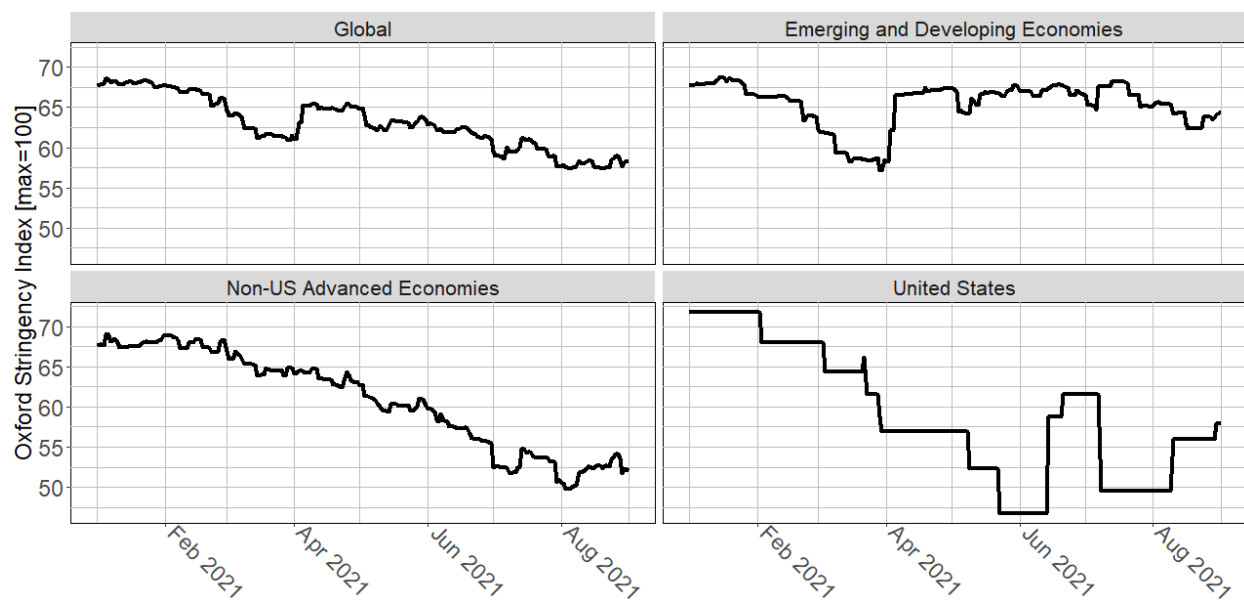
	Q1 2020 – Q2 2021	H1 2020	Q3 2020-Q2 2021	Q3 2020-Q2 2021
	(1)	(2)	(3)	(4)
(Intercept)	-0.0075 (0.0073)	-0.0580*** (0.0054)	0.0619*** (0.0106)	0.0625*** (0.0110)
Δ Quarterly Deaths per 100K	-0.0450*** (0.0117)	-0.0604*** (0.0198)	-0.0357*** (0.0084)	-0.0383*** (0.0084)
Δ Quarterly OSI	-0.0009*** (0.0002)	-0.0012*** (0.0003)	-0.0002 (0.0002)	
Lagged Dependent Variable	-0.3357*** (0.0605)	-0.7033*** (0.2266)	-0.3847*** (0.0341)	-0.3900*** (0.0345)
R <sup>2</sup>	0.7702	0.8215	0.8230	0.8209
Time and country fixed effects?	Y	Y	Y	Y
Num. obs.	461	192	269	269
RMSE	0.0364	0.0342	0.0243	0.0244

\* p < 0.10; \*\* p < 0.05; \*\*\* p < 0.01

Note: Real GDP growth by country is current as of Q1 or Q2 2021. For the select number countries with Q2 2021 GDP data available, the latest observations are included.

<sup>5</sup> Details on the Economist's excess mortality model can be found at [www.economist.com/graphic-detail/coronavirus-excess-deaths-tracker](http://www.economist.com/graphic-detail/coronavirus-excess-deaths-tracker).

*Appendix Figure 1: Evolution of the Oxford Stringency Index*



Source: Oxford University; Author Calculations