Pandemic divergence

A short note on COVID-19 and global income inequality

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Abstract

In this paper we provide an initial assessment of the economic losses related to the COVID-19 pandemic in two ways: As output contractions in 2020-2021 and as growth revisions (the estimated cumulative output loss in 2020-2030 based on growth forecasts before and after COVID-19). We find that, whereas the immediate GDP impact seems to favor poorer countries that were less intensely hit by the virus, the long-term economic cost correlates negatively with the country´s initial per capita GDP, worsening global income inequality. The note identifies empirically some of the key drivers of these country differences (e.g., informality, tourism dependence, fiscal space) and provides broader estimates of COVID-related economic loss that incorporate the costs associated with fiscal stimuli, excess deaths, and education lockdowns.

Introduction

The impact of the COVID-19 pandemic on global output was, and still is, massive. In 2020, more than 90 percent of the global economy experienced contraction in per capita GDP. According to the latest IMF´s World Economic Outlook (WEO) report from October 2021, the recession is the deepest since the end of World War II, with a -3.2 percent output contraction in 2020, which represented a -6.6 percent loss relative to the IMF´s +3.4 percent growth forecast back in October 2019. More importantly, we have not yet seen it all: The consequences of the shock will likely be long-lasting.

Now that the Great Lockdown[1] seems to be largely behind—the most recent WEO update from October 2021 estimates a 5.8 percent global rebound in 2021—it seems a good time to estimate its costs and, particularly, how they affected global inequality through their differential effect on individual countries. In this paper, we provide an initial assessment of the short- and long-term economic losses related to the COVID-19 pandemic: We find it to be in the order of one to two global GDPs. Furthermore, we find that while a casual inspection of the 2020 landscape may have given the impression of an equalizing impact, in that richer countries faced on average larger COVID shocks and greater immediate output contractions, once we control for the size of the shock and more importantly, broaden the time window to include 2021 or recent 10-year projections, the final economic toll of the crisis correlates negatively with the country´s initial per capita income: Based on the latest data and forecast, the developing world was more severely and persistently affected by the pandemic.

In a recent piece, Deaton (2021) highlighted something of a "silver lining"[2]: For all the relevance of superior initial conditions (including broader state capacity and limited labor formality) to cope with the COVID shock in advanced economies, the output loss, measured as the difference in 2020 growth projections prepared before and after COVID-19, was larger in the developed world than elsewhere. Specifically, the paper showed COVID-related growth downgrades to be negatively correlated with the initial per capita GDP. Deaton´s exercise focused on the 2020 downturn to measure the relative cost, and left aside differences in the recoveries and more generally, the fact that COVID-related costs will most likely be long lasting. For instance, the IMF projects the world GDP to be 3 percent lower in 2024 relative to the no-COVID scenario, but the

[1] The IMF coined the term to denote the synchronized lockdown implemented during 2020 across the globe.
[2] https://democracyparadox.com/2021/12/28/angus-deaton-on-deaths-of-despair-and-the-future-of-capitalism/

number doubles to 6 percent for the developing world. To be sure, long-term costs are still uncertain and will likely be revised many times in the future; moreover, many of these costs are contingent, differed in time, and hard to quantify. Our aim in this paper is more modest: We use current estimated recovery paths to assess the expected cumulative output loss by country and estimate the relation between these estimated costs with initial income. We find that developing economies will ultimately suffer the most despite the shock, as measured by the COVID-related deaths, having been more muted in low-income economies. Additionally, we document that this correlation is driven by some of the key factors often cited in the analysis of COVID costs, such as labor informality, tourism intensity, and the stringency of non-pharmaceutical interventions, most notably lockdowns. Finally, we show that the fiscal response, while predictably stronger in countries with deeper contractions, played a significant role in buffering the COVID shock.

In the next section, we revisit Deaton´s results using the latest IMF growth projections, compute the cumulative loss based on longer-term versions of these projections, document that the losses correlate negatively and significantly with initial per capita income, and explore how initial conditions influenced the link between the COVID shock and the output loss. In the last section, we discuss additional hard-to-measure items that should be taken and added to the COVID bill, particularly when measuring the incidence of the pandemic on global inequality.

Measuring economic losses

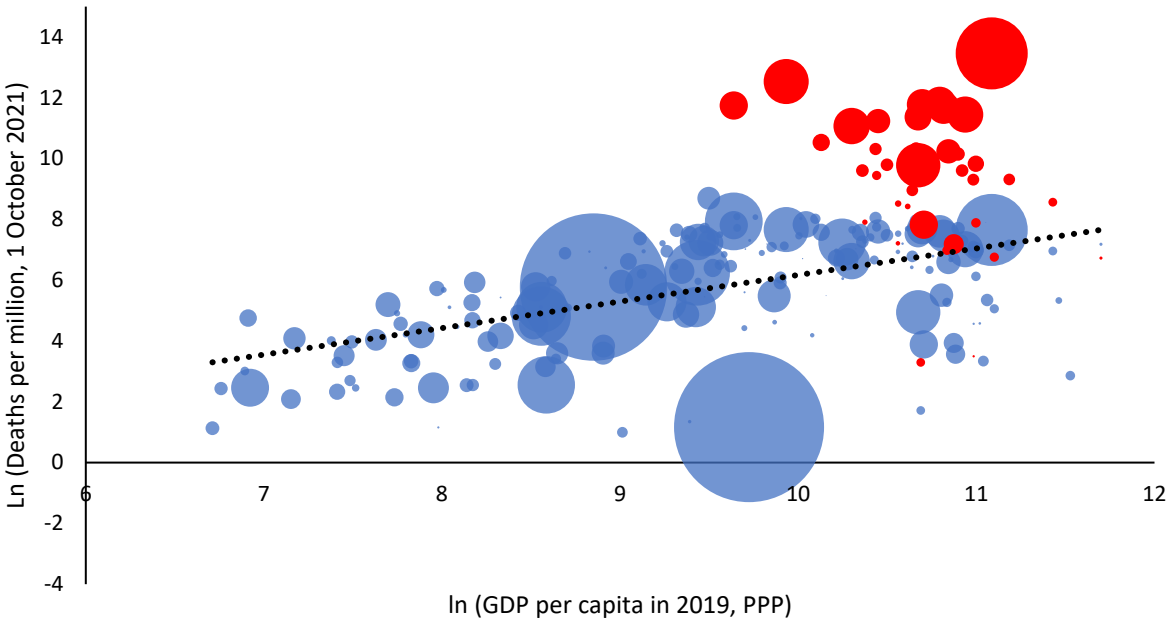
Following what has become standard in the literature, we measure the COVID-related output loss as the difference between real GDP projections for 2020 published right before the pandemic and the latest ones available. Specifically, for the short-term version, we compare the GDP paths outlined in the IMF's WEO reports published in October 2020 and October 2021and use data on total deaths per million (as of November 1, 2021) from Our World in Data to measure the magnitude of the COVID shock. Our sample covers 175 countries.

While the impact of the pandemic has been heterogenous across countries, the death toll has been on average larger for high income countries as of November 2021. Several reasons help explain this fact, including higher international integration, the fact that most northern hemisphere countries went through two winters (and two or more COVID waves), and from a demographic point of view, the prevalence of obesity, the higher population age, and the high density of large urban center (Goldberg and Reed, 2020).

Figure 1 shows the scatterplot of the log of COVID-related deaths per million against the log of initial (2019) per capita GDP for 175 countries with values of both variables. The size of the circles is proportional to the country´s population; circles in red are OECD countries. Population-weighted regression lines are shown in dotted lines; the black line depicts the regression line for the whole sample. The slope of the population-weighted regression for the whole sample is 0.65, while excluding China, it goes up to 1.03 (t = 8.36).

This pattern generates a positive unconditional correlation between income and the COVID shock: Richer countries suffered larger shocks. The finding is largely due to the higher circulation of COVID-19 in advanced economies, as illustrated by the comparison between OECD countries, among which the correlation disappears or reverses, and non-OECD countries. Note also that the positive relationship does not depend on China or India: While the country-by-country relationship in non-OECD countries is close to that for all countries, when weighted by population size, the relationship strengthens within the non-OECD countries if China is excluded as China's low death toll is clearly an outlier.

Figure 1. COVID-19 deaths, per capita income, and population (areas of circles)

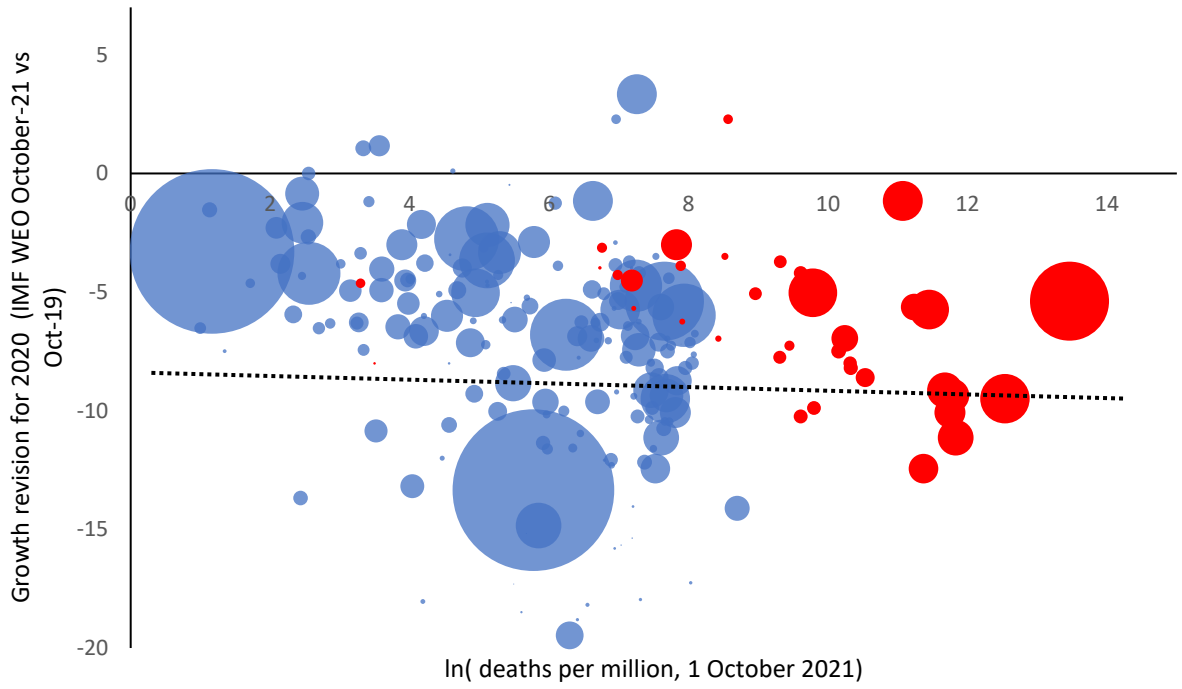


Sources: Authors' calculation based on Our World in Data and IMF WEO Database Oct-2021. The circles are shown in red for the OECD countries and in blue for the countries not in the OECD.

The impact of the COVID-19 pandemic on the 2020 World GDP growth was massive and synchronized. The shock propagated through three key channels: (i) the disruption of global value chains; (ii) restrictions to international mobility, affecting economies and activities differently depending on their exposure and preparedness; and (iii) the reduction of remittances.

Figure 2 shows a scatterplot of growth revisions for our sample of 175 countries, measured as the difference between the forecasts for 2020 GDP growth reported by the IMF´s WEO in October 2019 and October 2021, when most countries have already published closed GDP figures, against the log of COVID deaths per million. Again, the size of the circles is proportional to population. Regression is shown in dashed lines; the slope of the unweighted regression for the whole sample is -0.87.

Figure 2. Growth revision, COVID-19 deaths, and population (areas of circles)

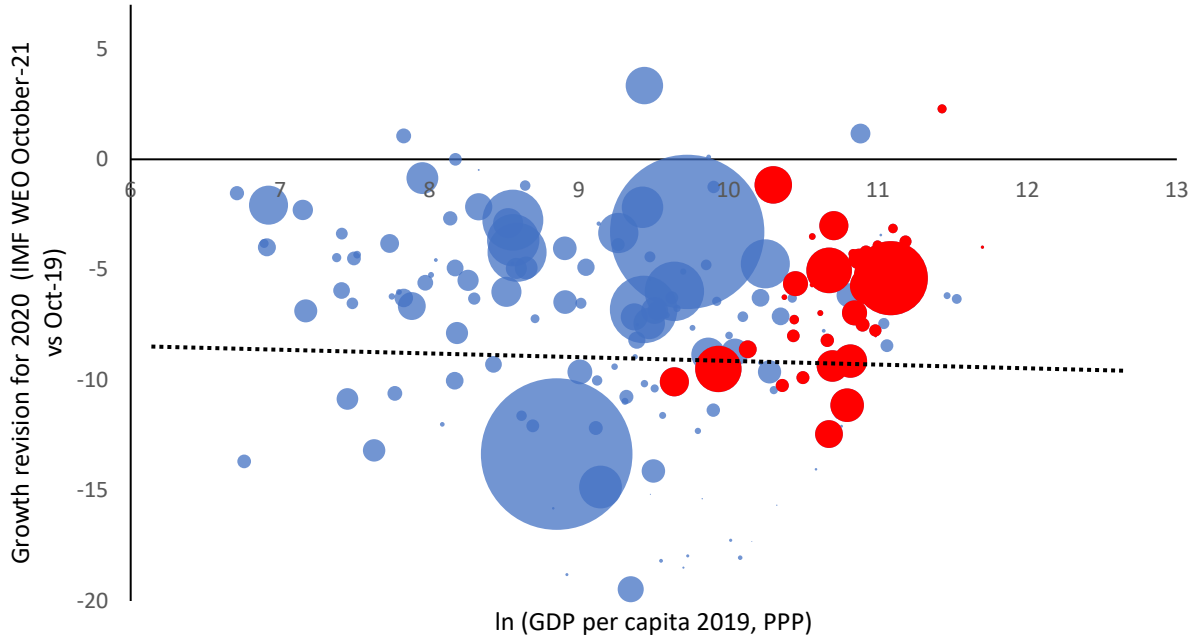


Sources: Authors' calculation based on IMF WEO Database Oct-2019 and Oct-2021. Deaths per million are measured as of October 1, 2021. The circles are shown in red for the OECD countries and in blue for the countries not in the OECD.

As a result of the previous two correlations, the output loss in 2020, captured by the post-COVID 2020 growth revisions, is positively correlated with per capita income; COVID-19 reduced global (cross-country) income inequality as highlighted by Deaton (2021).

Figure 3 shows a scatterplot of growth revisions in 2020 against real per capita income. The negative correlation weakened somewhat with the latest growth revision by the IMF (October 2021), which upgraded the recovery in some developed economies, but the finding is still there, and as shown below in **Table 1**, the slope is statistically significant.

Figure 3. Growth revision, per capita income, and population (areas of circles)



Sources: Authors' calculation based on IMF WEO Database Oct-2019 and Oct-2021. The circles are shown in red for the OECD countries and in blue for the countries not in the OECD.

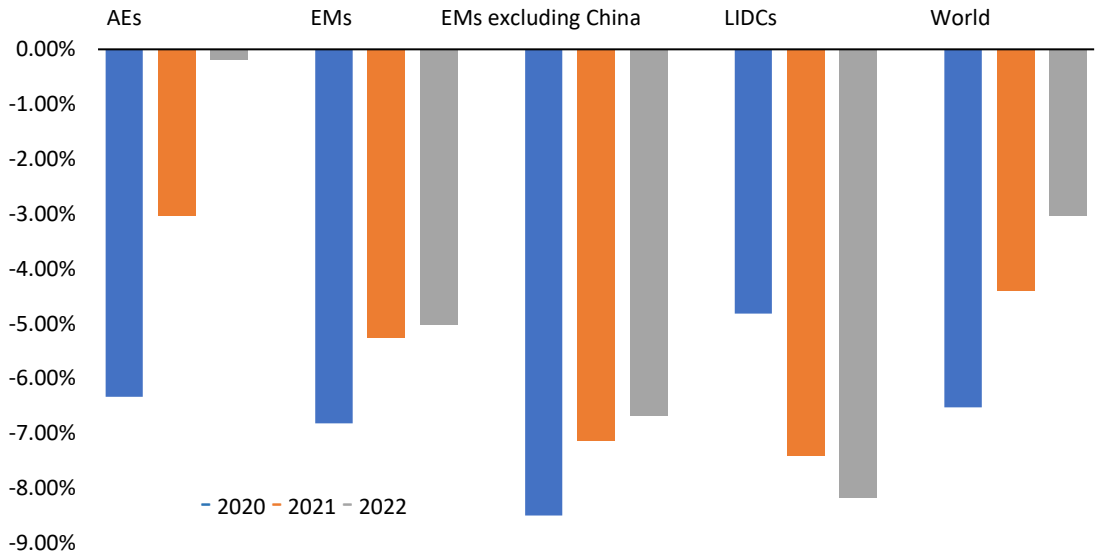
However, taking into account a somewhat longer three-year window to compare expected output losses in the short-term, the ranking already changes significantly, as richer economies are recovering (and will likely continue to recover) better and faster in the near term.

Figure 4 displays the cumulative GDP losses measured by the difference in the real GDP forecasts for 2020-2022 (from the WEOs published in January 2020 and October 2021). As can be seen, the

downward revisions to growth in 2021 and 2022 clearly favored the global North, more than offsetting their slightly worse score in 2020 (Figure 3).

Figure 4. Medium-term GDP losses relative to pre–COVID-19

(Revisions to per capita GDP levels between Jan-2020 vs. Oct-2021 WEO forecasts, percentage points)



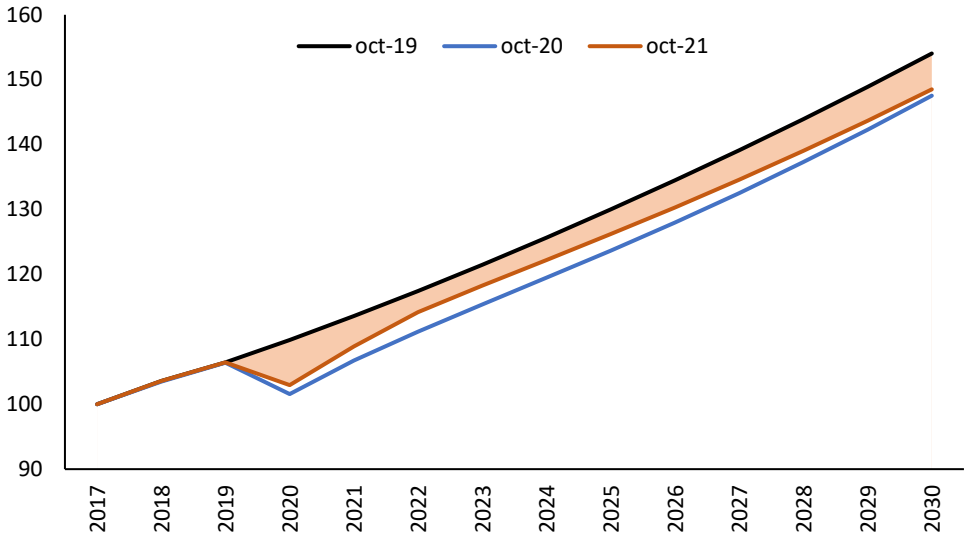
Sources: Authors' calculation based on IMF WEO Oct-2021

Initial conditions matter to explain the highly heterogenous impact, response and future outlook across countries. The pandemic, besides highlighting the traditional problem of the advanced economies´ substantially larger fiscal space to cope with the crisis via fiscal stimuli, revealed two other equally critical aspects: (i) the capacity of governments to adapt and strengthen the health system and buffer the economic effects of the crisis by prioritizing and relocating scarce resources efficiently and (ii) the crucial role played by the labor market structure—where segmentation, informality, and precariousness increase with domestic income—in frustrating the

government effort to attenuate the impact (ILO, 2020; Levy Yeyati & Filippini, 2021; Levy Yeyati & Valdes, 2020).[3]

At any rate, to compute the cumulative, long-term output loss as a result of the COVID-19 pandemic, we need to go further in time to account for losses (in real output, fiscal resources, human capital, among other aspects) that are expected to last more than a few years. To do that, we extend the period of the previous comparison: We sum, for each country, the differences between the output paths for 2020-2030 projected before and after the pandemic (the shaded area in **Figure 5** illustrates for the case of global output) and estimate its present value discounting at a 0 percent real interest rate, a reasonably conservative assumption in a context where real rates are, and are expected to remain, negative for most developed countries. This yields a total global loss of about 54 percent of a world GDP (only 12 percent of which comes from the contraction in 2020).

Figure 5. Global GDP projections (in constant PPP, index 2017=100)



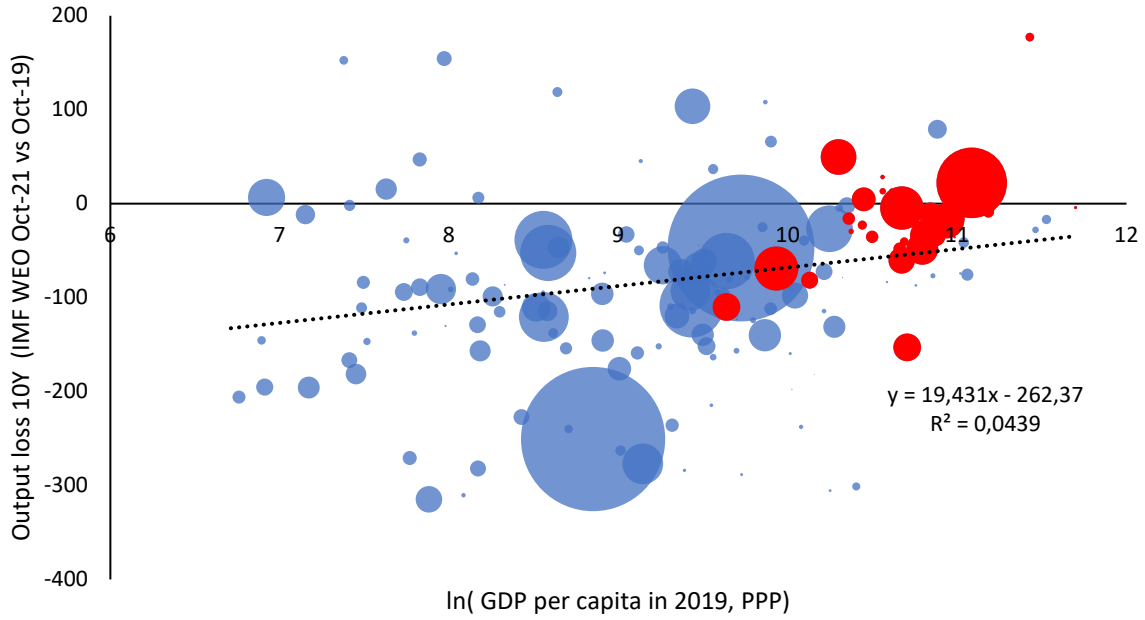
Sources: Authors' calculation based on Our World in Data and IMF WEO Database Oct-2021, Oct-2020 and Oct-2019

[3] Much of this effort was channelled through job and firm support that target formal workers and financially integrated companies, excluding a major part of the informal and self-employed workforce and most SMEs.

The negative relation between the country´s income and COVID losses changes sign when we use the longer 10-year window; both globally and within rich OECD countries, poorer countries fare worse.

Figure 6, which replicates **Figure 3** using the long-term estimate of output losses for our sample of 167 countries, shows how the sign of the relationship per capita income-COVID loss becomes positive, reversing the results based on the 2020 numbers, as the coefficient between the output loss and the real per capita income goes from -0.57 (t= -2.16) to 13.43 (t= 2.00). All results are reinforced when weighted by population (Table 1).[4]

Figure 6. Growth revision, per capita income, and population (areas of circles)



Sources: Authors' calculation based on IMF WEO Database Oct-2020 and Oct-2021

To test these insights in a more structured way, we run regressions of the 2020, 2020-2021, and 2020-2030 estimated output loss against the log real per capita income by end 2019.[5] The first four columns reports the main results: A simple regression shows initial GDP to be negatively

[4] Interestingly, the link within OECD countries is also positive (and the fit tighter) than in Figure 3.
[5] See Appendix I for a list of variable definitions and sources.

correlated with the output downgrade (column 1), but the sign changes once we control for the size of the COVID shock (column 2), and the interaction takes the expected positive sign, with richer countries better equipped to buffer the effect of the shock (column 3), particularly once we weigh the regression by country size (population). The same pattern is apparent when we regress output revisions for 2020-2021 (columns 5 and 6) and for the longer term.[6]

Table 1. Short- and long-term economic impact of the COVID-shock

	2020				2020-2021		2020-2030	
Ln per capita GDP	-0.403*	0.562**	-1.004	-2.542**	-1.273	-1.894**	-43.43**	-89.17***
	(-1.56)	(1.88)	(-1.28)	(-1.95)	(-1.36)	(-1.81)	(-1.77)	(-2.99)
Ln dpm		-1.086***	-4.191***	-8.154***	-6.860***	-10.17***	-145.5***	-297.9***
		(-5.29)	(-2.74)	(-2.12)	(-3.83)	(-3.91)	(-3.00)	(-3.84)
Ln dpm*GDP			0.330***	0.738**	0.646***	0.947***	14.80***	29.38***
			(2.09)	(1.97)	(3.45)	(3.72)	(2.99)	(3.85)
constant	-3.510	-6.428***	7.904	22.69**	9.032	17.81**	348.6*	831.5***
	(-1.44)	(-2.76)	(1.10)	(1.76)	(1.10)	(1.74)	(1.52)	(2.84)
N	161	161	161	161	159	159	156	156
r2	0.0104	0.132	0.150	0.320	0.148	0.410	0.121	0.423
Population-weighted				Y		Y		Y

Sources: Authors' calculation based on ILO, OWiD and IMF WEO Database Oct-2019 and Oct-2021. t statistics in parentheses.

** p<0.15, ** p<0.1, *** p<0.05*

In turn, **Table 2** tests some of the channels identified in the literature to explain the differential economic impact of the COVID shock. As can be seen, the explanatory power of initial income is largely replaced by labor informality (columns 1 to 4). Tourism intensity is also significantly related to COVID losses when countries are taken individually but not when the regression is weighted by population reducing the incidence of small, tourism-dependent economies (columns 5 and 6). As expected, lockdown stringency adds to the shock (columns 7 and 8). Finally, while fiscal stimuli are predictably larger in economies facing deeper contractions, the positive

[6] Results do not change when we eliminate China from the sample.

interaction with our shock measure (COVID deaths per million) indicates that they help mitigate the impact of the shock, which given that stimuli were larger in developed economies (**Figure 7**), is another factor that contributed to widening the cross-country growth divergence.

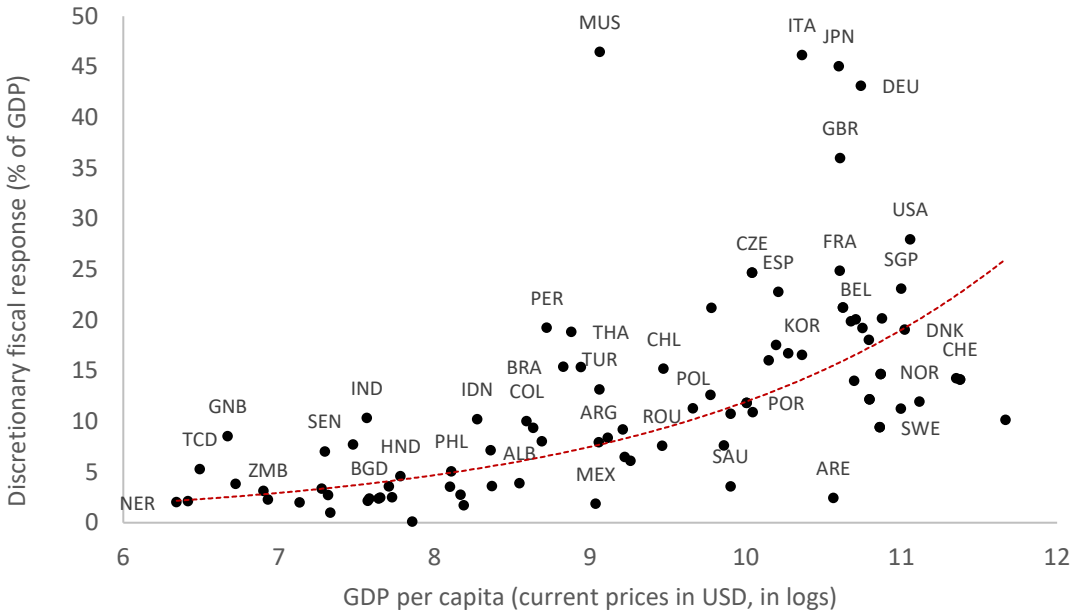
Table 2. Short- and long-term economic impact of the COVID-shock: Drivers

	2020		2020-2021	2020-2030	2020				2020-2021		2020-2030	
Ln per capita GDP	-0.895	2.221	-1.932	-68.20	0.552	4.198	3.953*	8.598***	-0.338	3.895	82.55	193.0***
	(-0.47)	(1.10)	(-0.80)	(-1.33)	(0.21)	(1.41)	(1.47)	(3.07)	(-0.11)	(1.09)	(1.15)	(2.60)
Ln dpm	1.436	3.461	-7.009	-174.1	4.132	5.859	6.177	7.020	-6.648	-3.031	-11.12	-26.30
	(0.43)	(0.72)	(-1.32)	(-1.26)	(0.92)	(0.87)	(1.20)	(1.29)	(-1.25)	(-0.50)	(-0.09)	(-0.18)
Ln dpm*GDP	-0.194	-0.417	0.771	19.37	-0.480	-0.714	-0.787	-1.063**	0.588	0.0878	-2.382	-6.651
	(-0.52)	(-0.84)	(1.38)	(1.37)	(-0.97)	(-1.03)	(-1.39)	(-1.91)	(1.00)	(0.13)	(-0.18)	(-0.45)
Ln dpm*informality	-0.00867**	-0.0306***	-0.0215***	-0.522***	-0.0122***	-0.0267***	-0.00979**	-0.0169**	-0.00204	-0.0115*	-0.103	0.0324
	(-1.83)	(-2.65)	(-2.89)	(-2.45)	(-2.42)	(-2.36)	(-1.91)	(-1.87)	(-0.36)	(-1.52)	(-1.01)	(0.17)
Tourism intensity					-0.184***	-0.0692	-0.146***	0.00795	-0.145***	-0.0999	-0.414	0.902
					(-3.37)	(-0.97)	(-2.97)	(0.12)	(-2.62)	(-1.37)	(-0.42)	(0.49)
Lockdown stringency					-0.0143	-0.0876**	-0.0533*	-0.0654**	-0.121***	-0.125***	-3.185***	-4.953***
					(-0.33)	(-1.73)	(-1.47)	(-1.82)	(-2.43)	(-2.17)	(-2.49)	(-3.56)
Fiscal stimulus							-0.521***	-1.952***	-0.676***	-1.223***	-17.21***	-37.25***
							(-2.45)	(-3.42)	(-2.59)	(-2.54)	(-2.55)	(-3.52)
Ln dpm*fiscal stimulus							0.0592*	0.254***	0.100***	0.180***	2.424***	5.475***
							(1.47)	(3.06)	(2.08)	(2.88)	(2.13)	(3.84)
constant	4.790	-13.43	18.61	675.1*	-3.781	-25.69	-28.03	-56.50***	11.72	-16.29	-453.8	-1100.0**
	(0.33)	(-0.81)	(0.97)	(1.55)	(-0.18)	(-1.08)	(-1.32)	(-2.65)	(0.49)	(-0.58)	(-0.81)	(-1.82)
N	80	80	79	79	62	62	58	58	58	58	58	58
r2	0.222	0.440	0.417	0.374	0.448	0.493	0.529	0.676	0.460	0.638	0.353	0.688
Population-weighted		Y	Y	Y		Y		Y		Y		Y

Sources: Authors' calculation based on ILO, OWiD and IMF WEO Database Oct-2019 and Oct-2021. t statistics in parentheses. *

*p<0.15, ** p<0.1, *** p<0.05*

Figure 7. Discretionary fiscal response to the COVID-19 crisis (% of GDP)



Sources: Authors' calculation based on IMF's Database of Country Fiscal Measures in Response to the COVID-19 Pandemic and WEO Database Oct-2021

A broader view of the economic losses from the pandemic

There are several complex, non-linear channels influencing the realized and future output losses that, if anything, are only partially incorporated in GDP forecasts.

For starters, there is the question of whether the unwinding of the global fiscal stimulus (equivalent to 16.4 percent of GDP, according to the IMF fiscal monitor)—without which the output loss in 2020 would have been much steeper—is properly accounted for in the revised growth projections, particularly since a big part of the stimulus (6.2 percent out of the 16.4 percent) was below the line (loans, equity stakes, guarantees) with a cost that is contingent to the speed and composition of economic recovery in each country.[7] If fiscal stimuli are ignored, and given that they were generally more generous in high-income economies, we may be understating the losses

[7] The economic impact of fiscal stimuli is also hard to appraise, since it depends on the ineffable fiscal multiplier, which in turn varies with the nature of the economic depression and the quality and composition of the package. However, for the purpose of our cost calculation, we can ignore the counterfactual (output losses in the absence of fiscal stimulus).

and, more to the point of this paper, overstating the difference in favor of rich countries. Additionally, a proper account of economic losses would need to address the value of the excess in deaths due directly or indirectly (through health externalities) to COVID-19. Whereas there is no simple way to put a value on a human life, for the sake of argument, we follow Cutler and Summers (2020) and adopt the "statistical lives" approach that measures how much people value a reduction in mortality or morbidity risk. Although no single number is universally accepted, the value of a statistical life for the U.S. ranges between $7 million and $10 million per life. If we take a considerably more conservative figure, $5 million per life, acknowledging that the statistical value may vary across countries, the cost related to the global cumulative deaths registered so far equals 16.9 percent of the global GDP.

Moreover, the pandemic brought significant education losses. Crucially, school closures posed a serious risk to human capital accumulation across the world, both in terms of effective hours of schooling and of retention ratios (increase in the share of dropouts). This cost is highly regressive, as richer countries and households were better equipped to cope with distancing restrictions and sacrificed fewer hours of school classes (OECD, 2020). At a global scale, school closures affected 1.6 billion students at the peak of the pandemic (World Bank 2020). On average, students missed 69 days of instruction in 2020 in low-income countries (LICs), compared with 46 days in emerging market economies and 15 days in advanced economies. Azevedo et al. (2020) estimate the lifetime loss in labor earnings for the affected cohort at $10 trillion—around 12 percent of global GDP—with a wide and highly regressive cross-country differences.[8]

Table 3 reports, for different per capita income groups, the estimated economic costs when all the aforementioned loss sources are added to the count.[9]

There are many other, even harder-to-quantify factors that should be added to this account. For instance, the job and firm destruction (with its concomitant loss of job-specific human capital

[8] This is a broad estimate, as education losses have persistent consequences that will only be apparent in the long term. For example, Hanushek and Woessmann (2020) estimated the cost equivalent to a half academic year loss to be a 2.2% lower annual GDP for the remainder of the century, which depending on the discount rate could yield a larger total than the one we use in our exercise.

[9] We lack detailed data for estimate the cost due to education losses at the individual country level. With that caveat, country estimates for the cost of the pandemic are available on request.

and the firms´ social capital and know how), the cost of untreated/un-diagnosticated illnesses, or the psychological loss of social distancing, which can be only conjectured.[10]

In sum, the data indicates that the estimated global cost of the pandemic (roughly 100 percent of GDP) reported in **Table 3** is probably a lower bound, and that the negative correlation with the country´s per capita income highlighted in this note is likely to be stronger than the one suggested and documented here.

[10] To complicate things further, each of these individual losses has feedback effects and externalities, both economic, social and political, that are nearly impossible to model quantitatively and simultaneously in a general equilibrium setting. A special note is due to the inflation pickup in developed economies, which may be seen as an indirect cost of the pandemic to the extent that it was in part driven by COVID-related fiscal stimuli and dislocations in supply dynamics –a topic that deserves a careful consideration once we get a clearer picture of its nature and its drivers.

Table 3. Economic cost of COVID-19 (as % of 2019 GDP)					
	World	**AEs**	**EMEs**	**LIDCs**	**LatAm**
Lost 2020 Global GDP from COVID-19	6,5%	6,3%	6,8%	4,8%	8,5%
Lost 2021-30 Global GDP from COVID-19 discounted at 0%	40,1%	-3,6%	77,2%	101,4%	68,8%
Total GDP loss 2020-30 (discounted at 0%)	**46,6%**	**2,7%**	**84,0%**	**106,2%**	**77,2%**
Global fiscal impulse (IMF Fiscal Monitor Oct-2021)					
Above the line	10,18%	11,69%	5,67%	3,20%	5,61%
Below the line	6,19%	11,38%	4,24%	0,85%	3,73%
Total fiscal impulse	**16,4%**	**23,1%**	**9,9%**	**4,0%**	**9,3%**
Output + Fiscal	**63,02%**	**25,80%**	**93,88%**	**110,22%**	**86,54%**
Statistical value of deaths related to COVID-19					
Total deaths related to COVID-19	4.793.391	1.508.576	3.092.851	174.132	1.483.728
Deaths per million	615	1.399	603	117	2.304
Statistical value of a life (lower bound, in mm USD)	5,0	7,0	3,0	3,0	3,0
Total value of deaths related to the pandemic	**27,4%**	**20,3%**	**26,2%**	**24,1%**	**85,6%**
Education and human capital loss					
Average missed days of instruction in 2020	48	15	46	69	174
Lifetime loss in labor earnings for the affected cohort	12,0%	-	-	-	-
Total	**102,4%**	**-**	**-**	**-**	**-**

Sources: Author's calculations based on IMF(2019), IMF(2021), ILO, and Ourworldindata.org.

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Appendix I

Below we detailed the variables used in the different charts and regressions.

- **COVID-related deaths per million** is downloaded from OurWorldInData.org and data was collected from the COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University.
- **GDP per capita in 2019** based on purchasing-power-parity (PPP) comes from the IMF WEO October 2021 database.
- **Population** data comes from the World Bank WDI database for 2019.
- **Growth revisions** for 2020 is computed as the difference between the 2020 GDP growth reported by the IMF´s WEO in October 2019 and October 2021. For example, the IMF projected in October 2019 a 2.0 percent growth rate for the U.S. for 2020. In October 2021, the IMF revised this figure downward to -3.4 percent. In this case, the growth revision is -5.4 percent.
- **GDP losses** relative to the pre-COVID path computes the difference between the GDP per capita in PPP for different years between the WEO forecast published in October 2021 and October 2019. The GDP losses over several years at discount using 0 percent interest rate.
- **Informality** measures the share of informal workers in the working force. Data comes from the International Labour Organization.
- **Tourism intensity** measures the share of tourism revenues to GDP. Data comes from the World Development Organization from the World Bank.
- **Lockdown stringency** is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). Data comes from OxCGRT.
- **Fiscal stimulus** measures all the COVID-19 government related measures since January 2020 and covers measures for implementation in 2020, 2021, and beyond, including all types of fiscal support (above-the-line and below-the line measures, and contingent liabilities). Data comes from the IMF Database of Country Fiscal Measures in Response to the COVID-19 Pandemic.
- **Average missed days of instruction in 2020** comes from the IMF WEO April 2021 and the CEPAL.

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