NBER WORKING PAPER SERIES

COVID-19 AND GLOBAL INCOME INEQUALITY

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Working Paper 28392
http://www.nber.org/papers/w28392

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 2021

I am grateful to Anne Case and to Branko Milanovic for comments and assistance. Errors are my own. I acknowledge financial support from the National Institute of Aging through NBER, Award Number P01AG05842 The views expressed herein are those of the author and do not necessarily reflect the views of the National Bureau of Economic Research.

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JEL No. F01,I14,O11

ABSTRACT

There is a widespread belief that the COVID-19 pandemic has increased global income inequality, reducing per capita incomes by more in poor countries than in rich. This supposition is reasonable but false. Rich countries have experienced more deaths per head than have poor countries; their better health systems, higher incomes, more capable governments and better preparedness notwithstanding. The US did worse than some rich countries, but better than several others. Countries with more deaths saw larger declines in income. There was thus not only no trade-off between lives and income; fewer deaths meant more income. As a result, per capita incomes fell by more in higher-income countries. Country by country, international income inequality decreased. When countries are weighted by population, international income inequality increased, not because the poorest countries diverged from the richest countries, but because China—no longer a poor country—had few deaths and positive economic growth, pulling it away from poor countries. That these findings are a result of the pandemic is supported by comparing global inequality using IMF forecasts in October 2019 and October 2020.

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0. Introduction

The COVID-19 pandemic has threatened the lives and livelihoods of less-educated and less-well paid people more than those of more educated and better paid, many of whom can stay safely at home and continue to work. The increase in domestic income inequality has been counteracted by large scale government income support programs in the US and in many other countries.

International income inequality is another matter, and there seems to be a widespread belief that the pandemic has or will increase inequalities in income between countries. In one of many such examples, Goldin and Muggah (2020), writing for the World Economic Forum say "inequality is increasing both within and between countries." UNDP (2020) writes "The virus is ruthlessly exposing the gaps between the haves and the have nots, both within and between countries." Stiglitz (2020) lays out the rationale: "COVID-19 has exposed and exacerbated inequalities between countries just as it has within countries. The least developed economies have poorer health conditions, health systems that are less prepared to deal with the pandemic, and people living in conditions that make them more vulnerable to contagion, and they simply do not have the resources that advanced economies have to respond to the economic aftermath."

This argument seems compelling, but it is good to check out the data, which is what I do in this paper. I demonstrate that global inequality—defined as the dispersion of per capita income between countries taking each country as a unit—has not increased but *decreased*, and that it has done so *because* of the pandemic. Alternatively, if global inequality is measured with each country weighted by its population, between-country income inequality has *increased*, not because poor countries have seen more rapidly falling incomes than rich countries, but because China has done so well. The rapid growth of China has, for decades, decreased population-weighted between-country inequality, because it has lifted more than billion people up from the bottom of the world income distribution. But China is no longer a poor country in global terms, so that when it grows more rapidly than other

countries, as it did in 2020 during the pandemic, it no longer decreases global inequality, but increases it.

For reasons that are only partially understood, and may include measurement error, poorer countries have so far suffered fewer COVID deaths per capita than have richer countries. Moreover, each country's loss in per capita national income between 2019 and 2020 was strongly related to its per capita COVID death count. These two facts together mean that per capita incomes have, on average, fallen more in countries with higher per capita incomes in 2019; poorer countries have done relatively well. As a matter of logic, this need not narrow international income inequality, but it has in fact done so. Country by country, per capita incomes are closer to one another now than in 2019.

China (but not India) had few deaths and experienced positive economic growth in 2020. Before the pandemic, China's rapid growth had lifted more than a billion people up from the bottom of the global income distribution, and has long been responsible for a reduction in global income inequality when each country is weighted by its population. But this effect has been attenuating as China's income has risen. Today, out of the world's population of 7.8 billion, 4.4 billion live in countries whose per capita income is lower than China, while only 2.0 billion live in countries whose per capita income is higher than China. That the negative effect of Chinese growth on weighted global inequality would eventually turn positive was predicted by Deaton (2013, 262) and Milanovic (2018, 174–5). During the pandemic, the Chinese economy grew while most other economies shrank, the reversal happened, and population-weighted global inequality increased.

Contrary to pre-existing trends, the pandemic *reduced* global unweighted inequality, and *increased* global population-weighted inequality. That my findings are consequences of the pandemic is supported by comparing inequality measures using IMF income estimates pre- and post-pandemic.

It is important to be clear about what I am and am not claiming here. My results say nothing about whether the degree of suffering has been larger or smaller in poor countries; in particular, they are consistent with the pandemic increasing poverty around the world, in particular with estimates that between 88 and 115 million people will be pushed into poverty, World Bank (2020). Even if all countries had the same decline in per capita income, the poorer countries would have had larger increases in poverty because they have many more people near the global poverty line. As it is, we know from Decerf et al (2020) that, compared with richer countries, the suffering from the pandemic has hit poor countries more in terms of poverty, and less in terms of mortality.

My findings may be temporary. The pandemic is not done, there are more deaths to come, and they may fall more heavily on poorer countries. Indeed, given that the pandemic started along trade-routes, and affected urban before rural areas, it is plausible that current patterns will continue to change. It is also possible that deaths are severely understated in poor countries, some of whom do not have regular vital statistics systems that comprehensively report deaths in normal times. My conclusions use data up to the end of 2020, before vaccines had any chance to affect outcomes, and they say nothing about the how vaccines will be distributed between countries.

My results concern two distinct measures of international income inequality, the dispersion of per capita income between countries, with each country as a unit of observation, and the dispersion of per capita income between countries, but where each country is weighted by population. Milanovic (2011, Chapters 1 and 2) has usefully labeled these inequality measures as Concept 1 and Concept 2 respectively. Concept 1 treats each country as an individual and calculates inequality between those individuals. Concept 2 pretends that each person in the world has their country's per capita income, and then calculates inequality among all these persons. Both Concept 1 and Concept 2 are *between* country measures and both ignore *within* country inequality. The distribution of income between all persons in the world, which Milanovic calls Concept 3 inequality,

starts from Concept 2, but then adds in the distribution of income within countries which is also changing because of the pandemic and the policy responses to it.

It is entirely possible for the global distribution of income among all persons in the world to have widened while one or both of the between country measures have been decreasing. In recent years, largely because of the rapid growth in per capita incomes in India and China, population-weighted between-country inequality (Concept 2) has fallen, while unweighted inequality (Concept 1), which rose until around 2000, has fallen since then, Milanovic (2016, Figure 4.1). At the same time, before the pandemic, the fall in weighted between-country inequality has been accompanied by rising inequality within many countries, with the net effect that the global distribution of income between all the people in the world has become more equal, see again Milanovic (2016, Figure 3.1) and Deaton (2013, 262). But the enrichment of China has diminished the size of the contribution that its high growth (and large population) has made to narrowing the global distribution of income among all persons.

1. Income, income growth, and deaths from COVID-19

I use data on total deaths per million from Our World in Data, as of December 31st, 2020 (except for Hong Kong where the last date is December 15th, 2020). Data on real national income per capita, expressed in 2017 international (PPP) dollars are taken from the IMF World Economic Outlook of October 2020, from the World Bank's Global Economic Outlook of January 2021, and from the World Development Indicators database.

Figure 1 shows the scatterplot across countries of the logarithm of deaths per million against the logarithm of income per head in 2019. The areas of the circles are proportional to population. The circles are shown in black for the OECD countries and in red for the countries not in the

OECD. The population-weighted regression line is shown as a dashed line; its slope is 0.83 (t=4.9). The unweighted regression line is somewhat steeper, 0.99 (8.6).

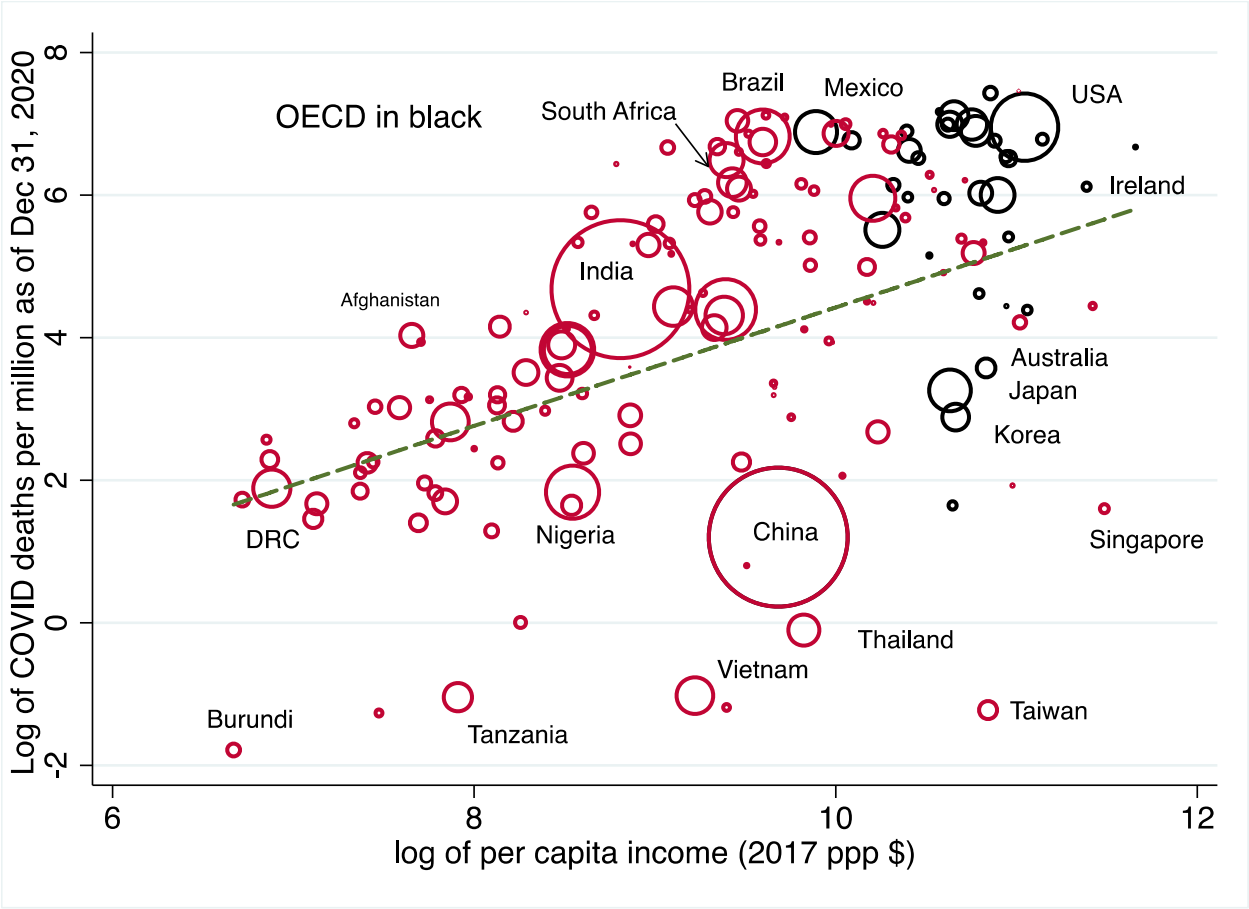

Figure 1: COVID-19 deaths per million and per capita income in 2019: broken line is the population-weighted regression line, areas of circles proportional to population

There is no relationship between per capita income and COVID deaths per million *within* the OECD, weighted or unweighted, so the positive relationship is dominated by the relationship between OECD and non-OECD countries, as well as by the relationship within the non-OECD itself. Among the latter, much depends on India and China. Ignoring population size, the country-by-country relationship in the non-OECD is close to that for all countries. Weighted by population size, the relation also exists within the non-OECD if China is excluded; China's low death toll is an outlier, and its population is the largest in the world, so its inclusion annuls the relationship.

My main purpose here is measurement, but Figure 1 raises a number of important issues, if only because it contradicts so many pre-suppositions. Studies of global health and global income, ever since Preston's famous 1975 paper, have universally found that higher income countries have better health; they have better public and private health systems—both of which cost money—and usually have governments that are more effective at protecting their population's health. Such is the basis for Stiglitz' argument above. More formally, there is a comprehensive 2019 study of global health security[1] by Johns Hopkins, the Nuclear Threat Initiative and the Economist Intelligence Unit. That study published a set of global health indexes for each country in the world based on 140 questions that measure country capacity in six dimensions, including, (*i*) prevention of the emergence and release of pathogens, (*ii*) early detection and reporting for pandemics of potential international concern, (*iii*) rapid response and mitigation of the spread of a pandemic, (*iv*) sufficiency and robustness of the health system to treat the sick and protect health workers, as well as an overall index aggregated over the six dimensions, GHS (2020, 6).

In line with the "health is wealth" presupposition, the overall index correlates at 0.65 with the logarithm of purchasing power parity per capita income over 166 countries; for the four subindexes listed above the correlations are 0.62, 0.48, 0.48, and 0.64. They are also *positively* correlated with deaths per million, 0.47 for the overall index, and 0.47, 0.41, 0.31, and 0.48. In spite of being designed to be helpful for "high consequence pandemic threats, such as a fast-spreading respiratory disease agent that could have a geographic scope, severity, or societal impact and could overwhelm national or international capacity to manage it," (p 7), and in spite of the evident care and thoroughness of the report, countries that did better on the indexes experienced *more* deaths than those that did worse. It seems that no one had any ability to predict the international patterns

[1] I am grateful to Branko Milanovich bringing this report to my attention.

of deaths in the pandemic, at least through the end of 2020, nor is it clear that *any* country could have been adequately prepared for what happened.

The Figure shows the small number of deaths in China, as well as in other East Asian countries, whether in the OECD or not. The very low numbers of deaths in Burundi and Tanzania are most likely due to undercounts. Misreporting aside, the low number of deaths in poor countries surely owes something to their much younger populations, though it is also true that many children in poor countries suffer from ill-health—diarrheal disease, respiratory infections, undernutrition—that could raise the risk of death conditional on infection. Poor countries are also warmer countries, where much activity takes place outside, and there are relatively few large cities with elevators and mass transit. It has also been argued that Africa's long-standing experience with infectious epidemics stood it in good stead during this one. Countries with more developed economies have higher degrees of intermediation and a higher fraction of services, both of which might predispose to infection. But such *ex post* stories are worth little without more serious analysis, and again, the serious and thorough analysis in the GHS index report predicted just the opposite.

Perhaps the most surprising result in the figure is the relatively high number of deaths among the highest-income countries. There is a great deal of (well-deserved) condemnation of the Trump administration's handling of the epidemic, but deaths per million in the US are no worse than in several other rich countries and not much worse than predicted from the global pattern. Statements about the disproportion of deaths and population (the US has only four percent of the world's population but twenty percent of the deaths, or that the US has more than 30 times as many deaths as Pakistan) are consequences of the pattern in the figure, including the small number of deaths in China, and tell us little about how well or badly the pandemic was handled in the US or elsewhere. Deaths in the US are above the regression line of logarithm of deaths per million on the logarithm of income per capita, but by that measure the US did about as well as Sweden, and better

than Hungary, Spain, Poland, Portugal, Italy, the United Kingdom, and France. (Belgium is the worst of all, likely because of its more comprehensive measure of COVID-19 deaths.) Troesken (2015) argues that the US has long been prone to infectious disease; in 1900, after a safe and effective vaccine had been available for more than a century, and in spite of already being the world's richest country, the US did worse than other rich countries in preventing smallpox deaths. Troesken argues (p 176) that this was "not *despite* being rich and free, but precisely *because* it was rich and free."

For my purposes here, there is no need to try to disentangle causes. Large scale misreporting is another matter, and again I note that, even with perfect reporting, the dynamics of the pandemic will almost certainly change patterns over time.

The second part of the story is the relationship between pandemic deaths and growth in per capita GDP in 2020. Here, I rely on forecast data, two sets of which are available, one from the IMF in October 2020, and one from the World Bank in early 2021. I use the earlier IMF numbers here; the World Bank numbers are close, and the cross-country correlations between the two sets of estimates is 0.945. An obvious concern is that the Bank and the Fund used the death counts to forecast the change in income. But forecasts constructed in October and in January undoubtedly have a large component of actual, as opposed to forecast, data. We should also worry if data on the pandemic were *not* incorporated into the forecasts. Again, the most serious concern is about misreporting, and about bad GDP forecasts that are based on bad data on deaths.

Figure 2 shows the IMF's predicted growth rates from 2019 to 2020 plotted against deaths per million. China, with few deaths, shows positive growth; the US, with many deaths, shows negative predicted growth. There are many cases that are not on the line, at least some of which have nothing to do with COVID, but, as would be expected, there are similarly sloped scatters of countries overall and both in and out of the OECD. Weighted by population, the regression—

shown as the dotted line—has a slope of −1.5 (t=11), so that predicted growth decreases by one and a half percentage points for every unit increase in the logarithm of deaths per million; the slope of the unweighted regression is −0.94 (t=5.7).

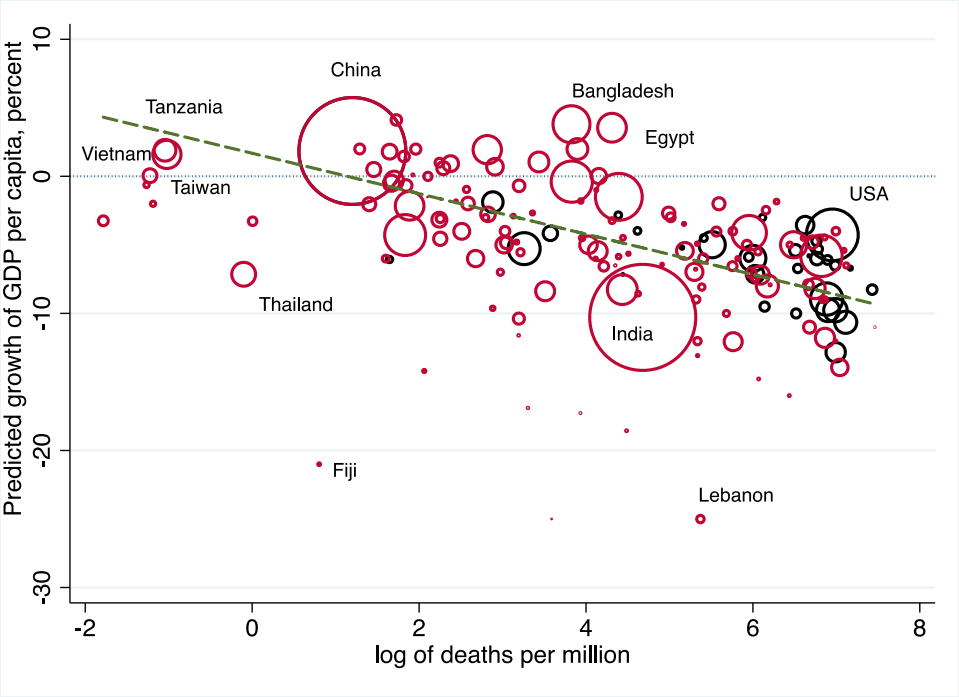

Figure 2: Predicted growth of per capita income 2019-20 and deaths per million: population weighted regression shown as broken line, areas of circles proportional to population

It is perhaps not surprising that deaths from COVID-19 should bring economic destruction, nor that the relationship should be much tighter than the relationship between deaths and income in 2019. But, once again, that there should be this relationship was not obvious before the pandemic. Indeed, in the early days, there was much discussion of the value of life and about a supposed trade-off between deaths and income, that lockdowns would save lives but destroy economies. As previous noted by Wolf (2020) for the advanced countries plus India and China, there is no evidence in these data for the existence of any such trade-off. Instead, the route to growth lies through stopping deaths. It is not a matter of your money or your life, but your money *and* your life.

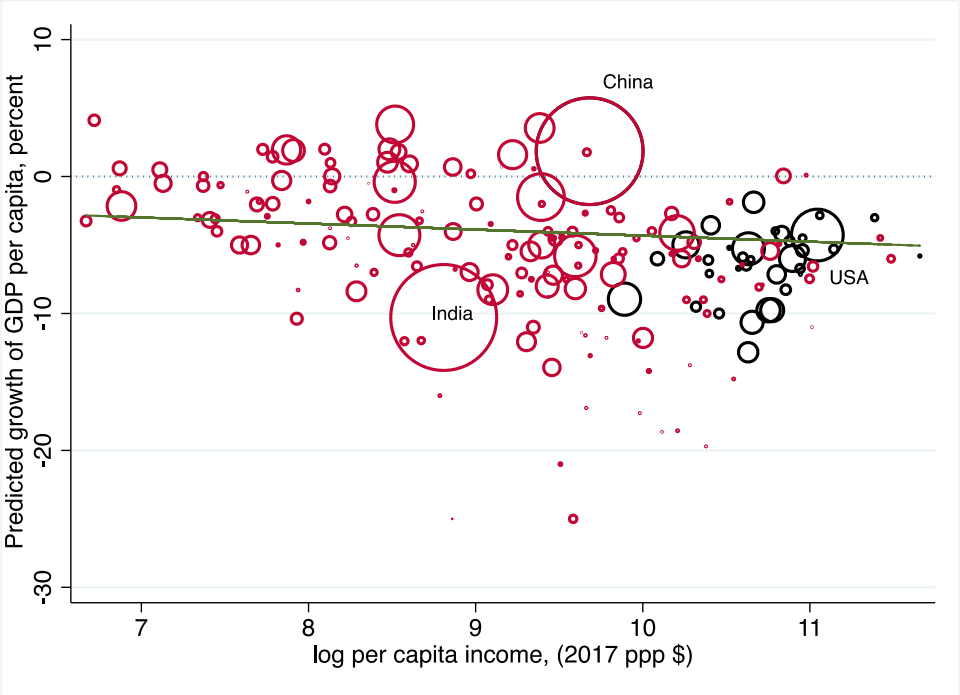

Figure 3: Growth of per capita income, 2019-20, and per capita income in 2019: line is weighted regression line, areas of circles proportional to population

Figure 3 closes the circle. It plots the income changes from Figure 2 against the 2019 levels of income in Figure 1; it shows that richer countries had slower (or more negative) growth in 2020 than did poorer countries. The slope of the weighted regression line in the Figure is −0.44 (t=1.1), and is larger without population weights, −1.6 (t=5.3); both to be expected given the disparate experience of the two largest countries. China is growing because, in spite of its relatively high income, it has seen few deaths while India, with more deaths per million than other countries at its income level, shows a 10.2 percent decline in income. Each country is an outlier, but in opposite directions.

Ignoring population size, the negative relationship between growth in 2020 and income in 2019 exists for the world as a whole, and within the non-OECD countries. Within the OECD, the better off countries grew *faster* in 2020, but the regression coefficient is not significantly different from zero, as is clear from the figure.

That higher income countries experience the largest decreases in income *on average* does not, in and of itself, imply that there was a decrease in inequality in per capita incomes between countries; the relationship in Figure 3 is not exact, and deviations from the line also affect inequality.

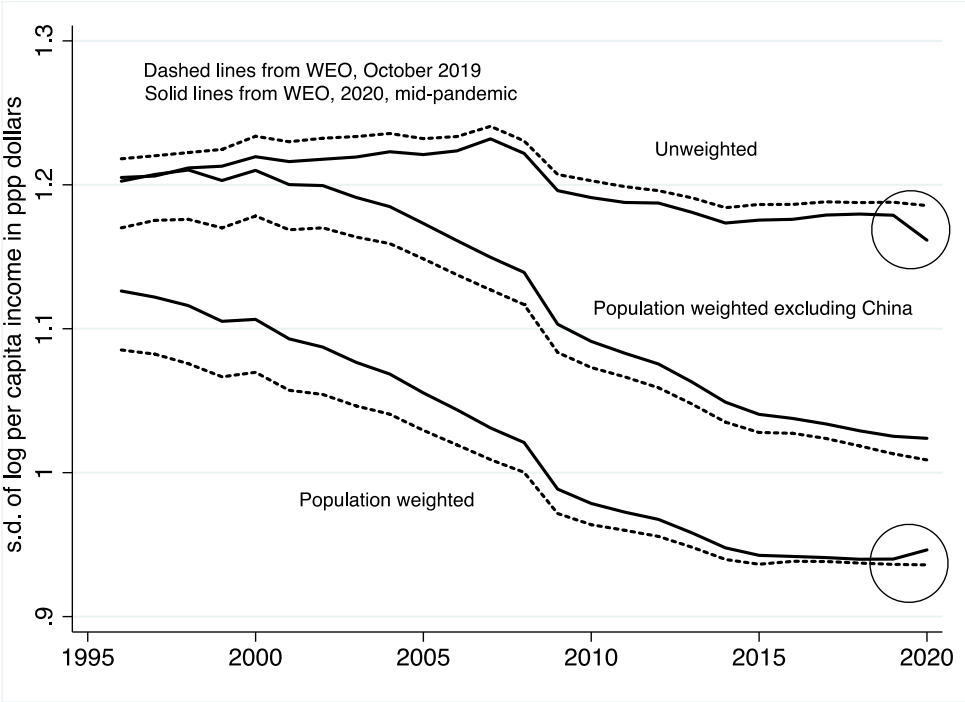

Figure 4: Standard deviation of log income per capita, unweighted, weighted by population, with and without China. Broken lines use pre-pandemic data.

Figure 4 shows three different measures of between-country income inequality, here the standard deviation of logarithms, all taken from the IMF data. The graph is almost identical if I use data from the World Bank's *World Development Indicators* in place of the IMF data from the 2020 *WEO*, and nothing in the discussion below depends on the source. I use the IMF data in the figure so that I can treat the forecast for 2020 as if it were a continuation of earlier years, making this figure consistent with the previous ones. The broken lines are taken from the IMF's October 2019 *World Economic Outlook*, which also has numbers for 2020, but prepared before the pandemic, indeed before COVID-19 existed. The broken and solid lines differ, not only by vintage of data, but also because, in 2020, the IMF data moved to 2017 purchasing power parity exchange rates; compared

with the previous (2011) round of PPPs, the new figures make the world somewhat more equal without weights (Concept 1) and somewhat less equal with population weights (Concept 2).

The top lines, marked "unweighted", show the standard deviation of the logarithm of national per capita incomes, adjusted for purchasing power, with no account taken of population (Concept 1). In this calculation, each country counts as a unit, no matter what its size, and inequality is calculated as if each country were a person. This measure has a slight upward trend until its peak in 2007, and has declined since then, with a plateau from 2014 to 2019, and then falls in 2020. The broken line, my proxy for world inequality in 2020 without the pandemic, has a barely perceptible decline from 2019 to 2020; the difference between it and the solid line, circled in Figure 4, is the effect of the pandemic. These top lines for Concept 1 inequality, which are the simplest way of examining whether countries are being driven apart by the pandemic, shows exactly the opposite, a *reduction* in inequality between countries.

The bottom line, marked "population weighted", is the standard deviation of the logarithm of national per capita income, adjusted for purchasing power—all as in the top line—but with each country weighted by its population. This is Concept 2, the measure of inequality for the world where each person in the world is assigned the per capita income of the country in which they live. This measure has been falling for many years, largely because the world's two largest countries, China and India, have grown rapidly, bringing more than two billion of the world's population up from near the bottom of the global income distribution to near its middle, where we can see them today in Figures 1 and 3.

This population weighted measure of global inequality *rose* very slightly between 2019 and 2020, in accord with the story that the pandemic is driving countries apart. Again, the counterfactual is supplied by the broken line from the 2019 forecasts. That the effect can be attributed to the pandemic can be seen from the fact that the pre-pandemic forecast has no such upward tick, again

see the circle on the bottom right. But this increase has nothing to do with the idea that the pandemic is widening (Concept 2) inequality because it is impoverishing poor countries by more than the better-protected rich countries. Population weighted inequality is rising entirely because of China. China's 1.4 billion people experienced few deaths and a growth in per capita income, which takes *them* further away from most of the people in the world and increases global inequality. China's exceptional positive growth in 2020 actually contributed to an *increase* in global inequality because China is so rich relative to most of the world. When I recalculate the weighted inequality measure without China, shown by the middle lines, there is no increase in inequality from 2019 to 2020.

3. Conclusion

The pandemic has made (most) countries worse off, and there has almost certainly been an increase in global poverty. But that implies nothing about global inequality.

Per capita income losses were generally larger for the countries that were better off in 2019, because they saw more deaths per unit of population. This has brought countries closer together, not further apart. When countries are weighted by their population, there was a slight increase in inequality in 2020, but this is not because poor countries are falling further behind rich countries because of the pandemic, but because China saw few deaths and experienced positive growth. One (more or less accurate) way of saying this is that the pandemic increased global inequality, because it pulled 1.4 billion (richer) Chinese further ahead of 1.4 billion (poorer) Indians. Because 4.4 billion of the world's 7.8 billion population now live in countries poorer than China, when China grows faster, it increases population-weighted global income inequality, rather than decreasing it, as has been the case for the last 40 years. In global terms, China is not a poor country, and as it grows faster than other countries, it will make the world more unequal. This is what happened during the pandemic.

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