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The Effects of the Coronavirus Pandemic in Emerging Market and Developing Economies: An Optimistic Preliminary Account

ABSTRACT Early in 2020, the general expectation was that the coronavirus pandemic's effects would be more severe in developing countries than in advanced economies, on both the public health and economic fronts. Preliminary evidence as of July 2020 supports a more optimistic assessment. To date, most low- and middle-income countries have a significantly lower death toll per capita than richer countries, a pattern that can be partially explained by younger populations and limited obesity. On the economic front, emerging market and developing economies (EMDEs) have seen massive capital outflows and large price declines for certain commodities, especially oil and nonprecious metals, but net capital outflows are in line with earlier commodity price shocks. While there is considerable heterogeneity in how specific countries will be affected in the short and medium run, we are cautiously optimistic that financial markets in the largest EMDEs, especially those not reliant on energy and metal exports, could recover quickly—assuming the disease burden is ultimately not as dire in these countries. In the long run, the highest costs may be due to the indirect effects of virus containment

Conflict of Interest Disclosure: The authors did not receive financial support from any firm or person for this paper or from any firm or person with a financial or political interest in this paper. Pinelopi Goldberg was chief economist of the World Bank Group until March 2020, received compensation from the World Bank in that capacity, and is currently a nonresident senior fellow at the Peterson Institute for International Economics. Tristan Reed is an economist for the World Bank. They are currently not officers, directors, or board members of any organization with an interest in this paper. No outside party had the right to review this paper before circulation. The views expressed in this paper are those of the authors and do not necessarily reflect those of the World Bank or Yale University.

policies on poverty, health, and education as well as the effects of accelerating deglobalization on EMDEs. An important caveat is that there is still considerable uncertainty about the future course of the pandemic and the consequences of new waves of infections.

As the COVID-19 health crisis spread throughout the world to reach low- and middle-income countries in South Asia, sub-Saharan Africa, and Latin America, the international community became increasingly anxious about potentially catastrophic effects of the crisis there. In the early months of 2020, the consensus was that such countries would be hit much harder than advanced economies on both the public health and economic fronts. The managing director of the International Monetary Fund (IMF), Kristalina Georgieva, noted in an IMF podcast on April 9: “Just as the health crisis hits vulnerable people hardest, the economic crisis is expected to hit vulnerable countries hardest” (Georgieva 2020). The president of the World Bank Group, David Malpass, estimated that the COVID-19 crisis would push 60 million people in developing countries into extreme poverty (World Bank 2020a). And in a recent poll of Chicago Booth IGM’s Economic Experts Panel, the majority of polled economists (including one of the coauthors of this study) agreed that the “economic damage from the virus and lockdowns will ultimately fall disproportionately hard on low- and middle-income countries.”¹ Against this backdrop, the message of this paper is cautiously optimistic: we find that, to date, developing countries have fared relatively well in terms of public health outcomes. And even on the economic front, while it is premature to make any predictions regarding the medium- and long-term economic effects of the crisis, there are encouraging signs. As a caveat to our optimism, we acknowledge that the health crisis has not yet played out and there is still considerable uncertainty about the future course of the pandemic and the likelihood of future infection waves. Our optimism regarding the short run is counterbalanced by our concern regarding the long-run impact of the crisis arising from the indirect effects of containment policies, especially the disruption of health and education services and increase in extreme poverty, as well as from the acceleration of the deglobalization trend with its trade and immigration policy implications.

The paper provides preliminary evidence on the public health and short-run economic effects of the COVID-19 crisis in developing countries

1. Chicago Booth Initiative on Global Markets, “COVID-19 and the World Economy,” May 5. www.igmchicago.org/surveys/covid-19-and-the-world-economy-2/.

along with some speculation about the long run. The term *developing countries* will be used throughout the paper to include all emerging market and developing economies (EMDEs). We start with an important qualifier: EMDEs include an enormously diverse set of societies and economies. In the context of the COVID-19 crisis in particular, it is useful to keep in mind that the set contains countries such as Vietnam, which as of July 15, 2020, reports zero deaths due to COVID-19 and has generally been minimally affected by the crisis; Brazil, which as of July 15 reports 75,523 deaths; and Zimbabwe, which has just five intensive care unit (ICU) beds (Murthy, Leligdowicz, and Adhikari 2015), yet as of July 15, reports only twenty deaths due to COVID-19.² Nevertheless, what these countries have in common, both from a public health and an economic standpoint, seems in the context of the current crisis more important than how they differ. On the public health front, a distinct characteristic of many EMDEs is the low capacity of the health care sector as proxied by number of hospital beds, amount of medical equipment, and number of medical personnel. On the economic front, the very term *developing* countries signifies vulnerabilities that make these countries potentially more susceptible to economic contraction following a health crisis. Further, while adverse economic effects in advanced economies are due to these countries' (justified) efforts to contain the virus, adverse economic effects in EMDEs are to be expected due to spillovers from advanced economies' policies, independent of EMDEs' own policies. EMDEs' own health and economic policies can amplify or reduce these spillover effects, but they cannot avoid them.

Our analysis is structured in two parts corresponding to the public health and economic effects respectively. We start by examining how well countries have fared in the current crisis from a public health perspective. Our measure of COVID-19 outcomes is deaths per million. We chose this measure both because it is widely available and because—measurement challenges notwithstanding—it is less susceptible to concerns regarding biases that plague statistics on positive case counts or hospitalizations. We document a robust positive association between per capita income and deaths per million: the higher the per capita income, the higher the number of deaths per million.

An immediate concern is that this pattern could reflect measurement error, specifically the capacity to correctly identify cause of death, or data manipulation that is correlated with income. However, the

2. "Coronavirus Pandemic (COVID-19)," Our World in Data, <https://ourworldindata.org/coronavirus>.

differences between advanced and developing countries are too large to be driven by (mis)measurement alone. Some specific examples illustrate the contrast: as of July 15, 2020, the United States had 423 deaths per 1 million people; the United Kingdom had 664; France, 461; Brazil, 355; Mexico, 282; South Africa, 75; Nigeria, 4; India, 18; Indonesia, 14; Philippines, 15; and Vietnam, zero.³ Such big differences across countries make it unlikely that the positive relationship between per capita deaths and per capita income reflects mismeasurement alone or data manipulation. While there is strongly suggestive evidence, based on anecdotes and periodic adjustments to official death statistics, that deaths are undercounted, there is no evidence that this undercounting is systematically correlated with per capita income or the stage of development more generally. Arguments could go either way. On one hand, developing countries tend to have lower statistical capacity (though the death statistics are generally considered reliable), and some of them have limited resources for testing (a precondition for correctly identifying the cause of death), although—as we show in the next section—on average, low-income countries have more comprehensive testing programs than the rest of the world. On the other hand, a consistent source of mismeasurement in the case of COVID-19 has been the omission of deaths in nursing homes and long-term care facilities for the elderly. Such facilities tend to be less prevalent in developing countries, making this source of mismeasurement less relevant to them. Therefore, on net, it is not clear that mismeasurement is systematically correlated with development. Similarly, while deliberate data manipulation, especially in countries with no free press, is a concern, it is less clear that it is correlated with stage of development.⁴

The global cross-country comparison exhibits the exact opposite pattern from what has been widely documented within countries at specific locations: at the global level, the COVID-19 burden seems to fall disproportionately on richer countries; within municipalities, however, it is the socioeconomically disadvantaged groups who suffer the most.⁵ The spatial pattern of coronavirus mortality is interesting as it may provide insight

3. “Coronavirus Pandemic (COVID-19),” Our World in Data, <https://ourworldindata.org/coronavirus>.

4. A potential approach for dealing with death undercounting would be to look at excess deaths. We discuss the problems with this approach in the next section (I.A).

5. The spatial pattern of COVID-19 mortality within countries exhibits the same pattern. For example, in Italy, it was Lombardy, one of the wealthiest regions of the country, that had the highest death toll. Similarly, in the United States, New York State, New York City in particular, had one of the highest deaths per capita rates in the country; but within New York City, it was the socioeconomically disadvantaged who were affected the most.

both into the political economy of policy responses (and resistance to them) and into appropriate policies going forward. Our analysis demonstrates that a large part (but not all) of this positive correlation between countries' per capita income and deaths per million can be explained through demographics (age) and obesity. Whatever the source of this pattern, it gives a ray of hope to governments with fewer resources: it suggests that tragic as the loss of life may have been, it was not as large as anticipated. This is positive, both because lives were spared and because it means that—to the extent that this pattern does not change in the future—countries may be able to ease containment measures and focus on the economic fallout that has been significant.

Next, we examine the short-run economic effects. We focus on financial data, since financial markets reacted immediately to the COVID-19 news and available data reflect this reaction; in contrast, data on macroeconomic variables become available with a delay and currently exist for only a handful of countries. Early March saw unprecedented portfolio outflows from EMDEs accompanied by sharp depreciations of several currencies, an increase in bond spreads, and a collapse of commodity prices and, with them, of revenues from commodity exports. These developments raised serious concerns about the solvency and general economic prospects of several EMDEs. However, data from subsequent months present a more optimistic picture. Based on estimates of broader measures of capital we show that while capital outflows have been severe, net flows are within the range observed during earlier commodity price crises, for instance, the collapse in the oil price beginning in 2014. Solvency issues have been temporarily addressed through a debt service standstill, spreads have come down, commodity prices have increased, and financial markets seem calmer and more confident than in March. Aggressive central bank operations in the United States and Europe have reassured markets and may keep EMDE borrowing costs at bay in the future. Overall, the picture that emerges from available financial data is that while the current situation facing developing countries is grim, it may not be fundamentally different from past crises. To date, the most adverse economic impacts have been due to the collapse of oil prices, and it is the countries most exposed to oil price exports that have been most affected. The oil price collapse was itself the result of two shocks, the demand collapse due to the health crisis and the price war between Russia and Saudi Arabia (which may in turn have been triggered by anticipation of the demand collapse, although tensions with Russia predate the COVID-19 crisis). At any rate, the insight that reliance on commodity exports makes certain resource-rich developing

countries particularly vulnerable to external crises is neither novel nor specific to the current public health crisis.

There is substantial uncertainty regarding the medium- and long-run effects of COVID-19 on developing countries, but we offer some thoughts in the last part of the paper. Particularly for small economies, these effects will depend on how soon advanced economies recover. In addition, they will depend on EMDEs' own policies, which will be disproportionately important in larger economies. Most EMDEs have adopted lockdowns and mobility restrictions similar to those in advanced economies in order to contain the spread of the virus. While such policies have adverse economic effects in all countries, their long-term impacts in developing countries may prove substantially more severe if they lead to lower school attendance among some groups of their populations, especially girls, fewer vaccinations (e.g., for measles) among children, and higher child and maternal mortality due to the disruption of health care services. The severity of these effects will depend on the extent and duration of current lockdown measures. Preliminary evidence based on phone surveys suggests substantial loss in employment and income and cutbacks in food consumption in countries with few cases and deaths relative to other parts of the world. Hence, in the poorest countries, the indirect impact of the coronavirus pandemic may prove substantially more severe than its direct death toll. Finally, the economic future of developing countries will depend also on how trade and immigration policies evolve in advanced economies in the coming years. If developed countries turn inward and borders remain closed, EMDEs will have to rely on themselves more than ever. Overall, it seems that, to date, EMDEs have weathered the COVID-19 crisis better than expected. But the biggest challenges may await them post-crisis, necessitating a process of structural adjustment and the rethinking of their development strategies in a world with less international integration.

We caution that the results presented in the paper are as of July 15. The health crisis started later in South Asia, Africa, and Latin America than in Europe and North America. Accordingly, it has not yet played out in the EMDEs in these parts of the world, and it is possible, indeed likely, that our estimates could change in the coming months as several countries in Latin America, especially Brazil and Mexico, have seen an acceleration in new infections and deaths during May and June. Furthermore, several developing countries—for example, India and South Africa—have experienced a spike in infections in the first two weeks of July. Nevertheless, the death rates in India and South Africa, as well as in the overwhelming

majority of countries in Asia and Africa, remain substantially lower than those in the average advanced economy, by orders of magnitude. Therefore, and for reasons we explain in the next section, we are cautiously optimistic that our main conclusions may not be reversed; for this to happen, infections and deaths in EMDEs would have to accelerate at an extremely fast pace in the next months or continue for a very long time. Such rapid acceleration has not been observed so far, but the coronavirus has repeatedly surprised us, and there is no guarantee that it will not happen in the future. Were this to happen, the message of this paper would not only be reversed, it would be devastating. For it would mean that the costly containment strategies developing countries followed so far would have failed to contain the virus. Developing countries would have paid the cost of mobility restrictions, school closures, and so on, only to find themselves in the same place as advanced economies with a delay of a few months. The human and economic cost of such a scenario is unfathomable.

I. The Public Health Crisis and Response

The first part of our analysis describes how the public health crisis and response so far has played out differently across countries. We first review the hypotheses proposed at the onset of the crisis before turning to an econometric analysis of the data.

I.A. Initial Hypotheses

Initially, there was uncertainty about how the health crisis would play out in EMDEs. The prevailing view was that the disease burden would be much higher in countries with fewer resources to fight the virus. However, there were also reasons for optimism that the effects could be milder than in advanced economies.

First, low connectivity of some countries might allow for earlier containment. International air travel seeded national outbreaks, with some of the first cases in Europe imported in January by a tour group from Wuhan, China (Olsen and others 2020), and a resident of France who had traveled to the city for business (Stoecklin and others 2020); the majority of cases in New York City in early March are thought to have originated in Europe (Gonzalez-Reiche and others 2020). Early modeling of importation risk to sub-Saharan Africa from certain Chinese provinces suggested risk would be less in low-income and lower-middle-income economies

compared to upper-middle-income economies, given fewer flights (Gilbert and others 2020).⁶

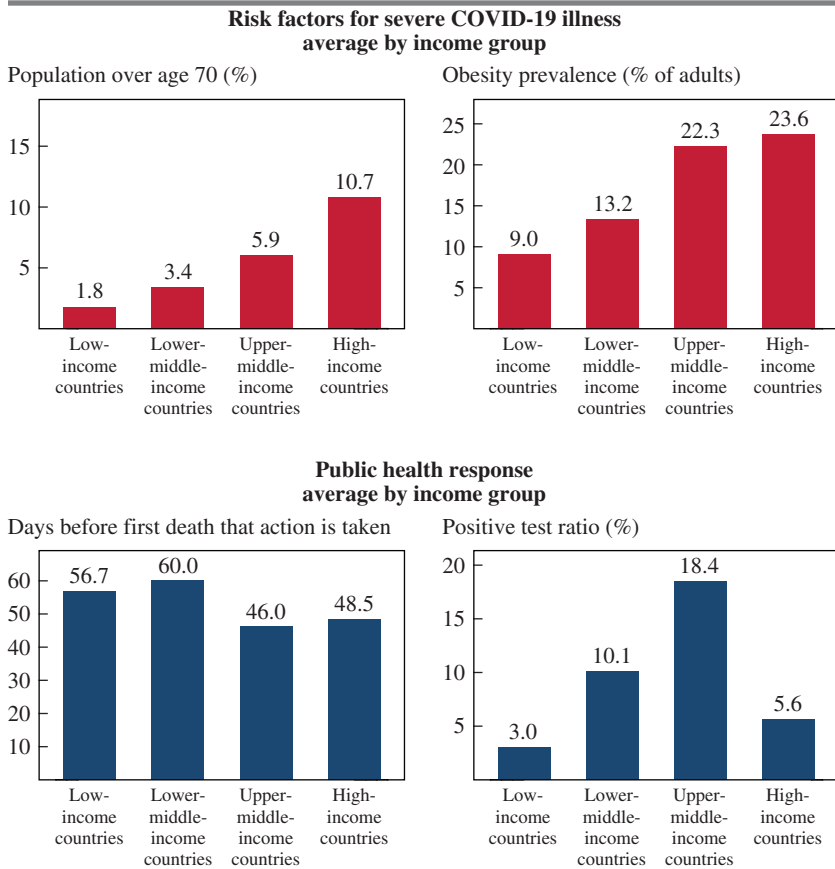
Second, the observation that the outbreak was initially concentrated in the cooler regions of Europe, the United States, and China has led some to argue that the SARS-CoV-2 virus may be transmitted more slowly in warmer climates (Araujo and Naimi 2020; Sajadi and others 2020). During the 2003 outbreak of the preceding coronavirus SARS-CoV-1 only three cases were ever detected in India and only one case was ever detected in sub-Saharan Africa, in South Africa.⁷ The conclusion that climate may protect tropical and subtropical countries is highly speculative however; even if warmer climate does slow transmission, there is no evidence it will do so enough to suppress the outbreak in the absence of other measures such as social distancing (Kissler and others 2020).

Third, developing countries have substantially younger populations. According to the United Nations Population Division (2019), while 17.5 percent of the Italian population is over age 70, that number is 5.6 percent for Peru and 2.2 percent for Ethiopia. Advanced age has been documented extensively as a leading risk factor for severe COVID-19 illness and mortality (Zhou and others 2020; Jordan, Adab, and Cheng 2020; Zheng and others 2020), suggesting that lower-income countries may ultimately face a lower disease burden. Modeling by epidemiologists also appears to reflect this hypothesis. Barnett-Howell and Mobarak (2020) analyze the disease burden predicted by Walker and others (2020), who account for differences in the age distribution, and show that predicted rates of mortality are substantially higher among Organization for Economic Cooperation and Development (OECD) countries compared to EMDEs.

Fourth, obesity, the prevalence of which increases with income, is another risk factor for severe illness (Simonnet and others 2020; Lighter and others 2020; Sattar, McInnes, and McMurray 2020). According to the most recent age-standardized estimates from the World Health Organization (WHO), in the United States 36.2 percent of adults are obese (i.e., have a body mass index ≥ 30). In Mexico, this number is 28.9 percent;

6. Despite China being the focus of this initial work, Skrip and others (2020) find that the majority of imported cases across forty countries in sub-Saharan Africa were individuals who had recently traveled from Europe (66.1 percent of imported cases) rather than Asia (19.7 percent) or the Americas (7.2 percent).

7. "Summary of Probable SARS Cases," World Health Organization, https://www.who.int/csr/sars/country/table2004_04_21/en/.

Figure 1. Risk Factors for Severe COVID-19 Illness and the Public Health Response

Sources: UN Population Prospects; World Health Organization; Blavatnik School of Government, University of Oxford, <https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker>; Our World in Data, <https://ourworldindata.org/coronavirus>.

in Ghana, it is 10.9 percent; and in Vietnam, it is 2.1 percent.⁸ Figure 1 shows the average values of the share of the population over age 70 and obesity prevalence across countries within each of the World Bank's four groupings of countries by national income: low income, lower-middle income, upper-middle income, and high income. For both factors there is a clear positive relationship with income. For obesity, though average prevalence

8. "Global Health Observatory Data Repository," World Health Organization, <https://apps.who.int/gho/data/node.main.A900A?lang=en>.

increases monotonically with income group, upper-middle-income countries have similar prevalence to high-income countries (i.e., 22.3 percent versus 23.6 percent, respectively).

Fifth, the virus arrived in many EMDEs with a delay of one to two months, allowing the authorities to draw on lessons from other countries, and in some cases take earlier action. A key insight from epidemiology is that more lives are saved if suppression measures (those that force the effective reproduction number (R_t) below one, so that the virus will die out) are taken earlier, when there have been fewer deaths (Walker and others 2020). Using the Oxford COVID-19 Government Response Tracker and deaths reported on the website Our World in Data, it is possible to calculate how early in each national epidemic first action was taken.⁹ For instance, Kenya began screening international air passengers for temperature and symptoms on January 20, sixty-seven days before the first death on March 27, and well in advance of its first confirmed case on March 14. France, on the other hand, took its first action on January 23, also by screening international air passengers, but this was only twenty-three days before its first death on February 15, and only two days before its first confirmed case on January 25.

The lower left-hand panel of figure 1 shows the average days before first death that action is taken across the four national income groups, where action is defined as the “containment and health response” index rising above zero for the first time, typically due to information campaigns or screening of international passengers. To avoid dropping countries with zero confirmed deaths from the sample, which would bias these averages downward, for such countries we set the date of first death equal to the most recent date deaths are observed (July 15). Uganda, for example, has no deaths as of this writing and took its first action on January 20, so we record the days before first death action is taken as 152, the number of days between their first action and July 15.

The delay in arrival of the virus may have given countries more time to prepare infrastructure for COVID-19 testing. The challenge is daunting. Test, trace, and isolate (TTI) programs, which the WHO recommends as part of a comprehensive response to the virus, are estimated to require one

9. Blavatnik School of Government, University of Oxford, COVID-19 Government Response Tracker, <https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker>; “Coronavirus Pandemic (COVID-19),” Our World in Data, <https://ourworldindata.org/coronavirus>. All values of infections and deaths reported in this paper are from Our World in Data.

contact tracer for every 1,000 people (Association of State and Territorial Health Officials 2020). In Nigeria, this implies that about 200,000 tracers would be needed to implement TTI nationally, as well as technological systems for recording and sharing information and a budget for their salaries, personal protective equipment, transportation, and tests. While many countries, including Nigeria, do have experience with large-scale public health initiatives such as immunization campaigns—for example, Burkina Faso was able to inoculate 11 million people or 96 percent of the population age 1–29 against meningitis in only ten days (Djingarey and others 2015)—such initiatives require substantial resources and planning.

A useful proxy for testing capacity is the positive test rate, that is, the share of tests which come back positive. Jha, Tsai, and Jacobson (2020) suggest authorities should seek to achieve a positive test rate of less than 10 percent. If too many tests come back positive, it is likely that many cases are being missed. If only a small share of tests are returned positive, it seems reasonable to conclude that testing is sufficient for the case load (unless one has been testing people who are less likely to be infected, for example, if only people with means could afford to be tested). For context, using again the data from Our World in Data as of July 15, 2020, the ratio of confirmed cases to total tests in Sweden is 13.3 percent and 8.5 percent in the United States. In South Korea and New Zealand, two advanced economies noted for highly effective test and trace programs, the ratio is 1.06 percent and 0.35 percent respectively. The lower right-hand panel of figure 1 shows that the average value of the ratio is actually lowest in low-income countries, at 3.0 percent, compared to 5.6 percent in high-income countries. While far fewer tests have been completed in low-income countries, by this measure, which corrects for the number of cases, low-income countries have the most comprehensive testing programs in the world. Zimbabwe, for instance, has a test positive rate of 1.5 percent. Vietnam, a lower-middle-income country, has the lowest test positive rate at 0.10 percent and, as of July 15, zero confirmed deaths. Nigeria, also a lower-middle-income country, raises the average for its group with a much higher test positive rate of 17.0 percent. Upper-middle-income countries have the highest average positive test rate, at 18.4 percent, driven specifically by certain Latin American countries such as Brazil, which has a 90.4 percent test positive rate, and Ecuador, which has a 50.7 percent rate. Testing in these countries is clearly insufficient for the case load.

Ironically, though low connectivity and a younger population have often been described as challenges for developing countries, here they may turn out to be a blessing. Unfortunately, there are also compelling reasons

for pessimism: the effects of the pandemic could be more severe than in advanced economies.

First and foremost is the lower to nonexistent capacity of the health care system. Available data suggest Zambia and Zimbabwe each have just five ICU beds available to treat severely ill patients (Murthy, Leligdowicz, and Adhikari 2015). Looking at the most recent values of the broader measure of all hospital beds, most of which will not be equipped for intensive care, the Philippines has one bed per thousand people while Japan has 13.4, according to the World Bank World Development Indicators (WDI). Assuming for the moment equal prevalence of illness across populations, this implies if Japan were able to “flatten the curve” and avoid overwhelming the health care system, the Philippines would need to reduce the rate of new infections by a further 92.5 percent to avoid overwhelming its own system.¹⁰

Second, many of the policies that have been tried with relative success in advanced countries may be harder to implement in developing countries. Lockdowns and social distancing may be less effective in settings with high population density and high poverty (e.g., urban slums) or in multi-generational or polygamous households. Further, as noted by Ravallion (2020), the world’s poor are highly dependent on casual day labor for survival and have little in the form of savings or food stocks, implying they will have stronger incentives to leave their homes, even when governments ask them not to.

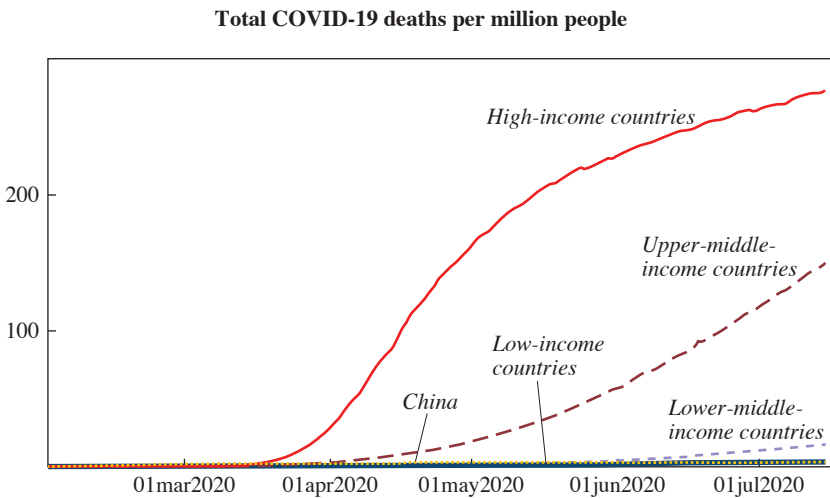
Taken as a whole, this discussion suggests there was substantial uncertainty initially as to whether the direct health impacts of COVID-19 would be worse in developing countries. In the rest of this section, we investigate the various hypotheses described above more rigorously using a linear regression. Specifically, we estimate the following equation:

$$(1) \quad \ln(\text{deaths per million})_i = \beta_0 + \rho \ln(\text{GDP per capita})_i + f(\text{time since 1st death})_i + X'_i \beta + \varepsilon_i,$$

where i indexes countries, X'_i is a vector of explanatory variables, and ε_i is an error term.

Given that the pandemic is ongoing, one concern is whether the effects we document are due to countries being earlier or later on the curve. Mechanically, countries accumulate deaths as times passes, so countries

10. The calculation is $92.5 = (1 - 1/13.4) \times 100$.

Figure 2. Reported COVID-19 Deaths per Capita

Source: Our World in Data, <https://ourworldindata.org/coronavirus>.

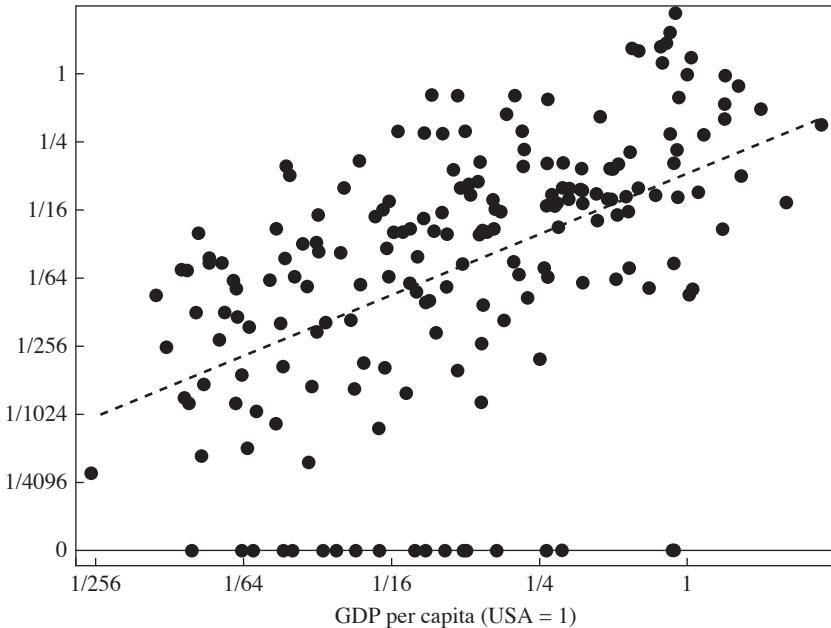
that started having cases and deaths earlier in the year will have a larger death toll. To account for this mechanical effect, we control for the time since the first death was observed in each country through a square root function. This functional form is motivated by the pattern observed in several countries that seem to be toward the end of their infection and death curves (e.g., European countries).¹¹ This approach seems adequate at present but would have to be revisited if countries faced a second wave of infections. One day, when the pandemic is over, the above regression should be run without controlling for this mechanical effect.

Before reviewing the data and regression estimates, we graph the COVID-19 deaths per million people in figure 2 by World Bank income group classification. To date, the picture in EMDEs seems to vindicate the optimists. Middle- and low-income countries seem to be on a very different curve than high-income countries. The graph clearly shows the earlier outbreak of the health crisis in high-income countries. But even accounting for this difference in timing, deaths in EMDEs are growing much more slowly over time. This is especially true for low-income and lower-middle-income countries. The curve for upper-middle-income countries rises more steeply starting in May, reflecting the rising deaths in Latin America,

11. We also experimented with a linear function with no significant impact on the results.

Figure 3. National Income and COVID-19 Deaths per Million

COVID-19 deaths per million people (USA = 1)



Sources: Our World in Data, <https://ourworldindata.org/coronavirus>; World Bank World Development Indicators.

Note: Ordinary least squares fit shown as dashed line.

especially in Brazil. That curve excludes China, which is shown separately, as the very low death rate in China would dominate the graph, obfuscating the recent deaths in Latin America. Even taking this rise into account, it seems unlikely that middle- and low-income countries will catch up to high-income countries.

A different way to assess the raw differences between advanced and developing economies is shown in figure 3, which displays the raw correlation between deaths per million and national income as of July 15. Deaths per million is strongly and positively correlated with per capita income. At present, the numbers across advanced and developing economies differ by orders of magnitude. Almost every country with per capita income one-sixteenth of the United States has one-sixteenth the deaths per million of the United States *or fewer*. While infections and deaths in Brazil and Mexico are rising fast, so that the death rates in these countries may

catch up to the United States eventually, for the rest of the countries, it would take a fast acceleration of deaths over a prolonged period of time for the pattern we document to be reversed. India and South Africa, for example, have experienced a spike in infections in the first two weeks of July. However, the death rates in these countries remain orders of magnitude smaller than in advanced countries, at about 18 deaths per million and 75 deaths per million respectively (as of July 15). Of course, there is always the possibility of new waves, especially as countries are gradually opening up.

As we discussed above, the large differences between high- and low-income countries make it unlikely that these patterns are driven by death undercounting in low-income countries. Figure 2 reinforces this message as it shows that advanced and developing countries differ not only in terms of death rate levels; their respective curves also look very different, with developing countries, especially lower-middle-income and lower-income countries, exhibiting much flatter curves. This pattern is intriguing from an epidemiological perspective as it may indicate different transmission patterns—heterogeneous basic reproduction numbers, R_0 —across countries. At any rate, it is hard to reconcile with the hypothesis that the differences we document are due to data manipulation or systematic undercounting in lower-income countries.

A potential approach for dealing with death undercounting would be to look at excess deaths over a certain period of time, as was done, for example, in the *Economist* (2020) or by Wu and others (2020) in the *New York Times* for selected cities and countries. Excess death data provide support for the view that COVID-19 deaths are undercounted in both advanced and developing countries. However, due to the lack of mortality times series, excess deaths cannot be computed for most developing countries. In addition, the interpretation of excess deaths is not clear: such deaths capture both the direct mortality effects of COVID-19 and the indirect effects due, for example, to the disruption of non-COVID-19 health care services, the pandemic's effects on mental disease and suicides, the increase (or decrease) of violence, the increase (or decrease) of car accidents, and so on. This may explain why South Africa, for instance, exhibits zero excess deaths as of July 9, 2020, while official statistics report 3,720 cumulative deaths attributed to COVID-19 as of that date (Wu and others 2020).

A final note is that our regression makes no statement about indirect human costs of the pandemic because of lockdowns. Ray and Subramanian (2020) write eloquently on this topic in the context of India, stating: “Lives

lost through violence, starvation, indebtedness and extreme stress, are invisible, in the sense that they will diffuse through category and time” (13). These deaths are not accounted for in our measure of COVID-19 deaths per million. One attempt to capture them would be to look at the aforementioned excess deaths relative to previous monthly averages and to ask how many of them can be explained by confirmed cases and how many reflect the indirect death toll of the pandemic. Unfortunately, as noted earlier, the mortality time series required for this analysis are not available systematically for EMDEs. Moreover, given existing concerns regarding mismeasurement, it is not clear whether excess deaths that go beyond confirmed cases capture undercounting of COVID-19 deaths or the indirect death toll of the pandemic.

1.B. Data

Here we briefly review the data used, summary statistics of which are presented in table 1. COVID-19 deaths per million are from the COVID-19 data set on Our World in Data and are compiled based on statistics released by the European Centre for Disease Prevention and Control (ECDC). As noted earlier, our regressions include a function of days since first death to account for the mechanical fact that countries accumulate more deaths with time. This variable is set to zero for countries with no deaths to date. These data are also taken from Our World in Data.

The days since first death function is meant to capture the mechanical effect of time on deaths, but it may also be a proxy for a different channel. Late exposure to the virus may have been the result of developing countries’ lower connectivity to the rest of the world. The late arrival of the virus resulting from lower connectivity may have given developing countries extra time to prepare and to take measures to contain the spread of the disease. To separate this channel from the mechanical effect of time, we use three variables. First, we use two proxies for connectivity: the international flight arrivals per 1,000 people in December 2019 and January 2020 (also broken down by origin, i.e., flights from China and flights from Schengen Area) and the imports per capita in 2019. These measures are taken from Flightradar24 (a commercial flight tracking service) and from the United Nations Comtrade Database, respectively. We experimented with alternative measures (e.g., exports or the sum of imports and exports) with no difference in the results. Further, we use information on the timing of the first response based on the Oxford COVID-19 Government Response Tracker. Specifically, we use the time between the first time the government in a certain country acted related to COVID-19 and the first death in

that country to measure the speediness of response. Note that for several countries, this variable takes negative values as these countries acted before experiencing even a single death.

In addition to the timing of the first public health response, we also investigate the strength of the response, measured alternatively by the government response for containment and health response index reported in the Oxford COVID-19 Government Response Tracker, and reductions in time spent in the workplace and public transit, relative to the median value for the corresponding day of the week during the five-week period from January 3 to February 6, 2020, as reported by Google.¹² Further, we use a contract tracing comprehensiveness index, which is reported by Oxford University as part of their government health and containment response index; a value of zero indicates no contact tracing, a value of 2 indicates contacts of all cases are traced, and a value of 1 indicates limited tracing.

GDP per capita is measured in constant 2010 US dollars and taken from the World Bank WDI. The health variables—population over age 70, obesity, and smoking and diabetes prevalence—are from the WHO. PM2.5 air pollution and hospital beds per thousand people are from the World Bank WDI. Population density of largest urban center is as reported by the Global Human Settlement Layer Urban Centre Database.

We include various measures of institutional capacity. Data on testing come from Our World in Data. Finally, we also examine measures of the extent to which either autocracy or democracy is institutionalized in the country from the Polity IV Project database. According to these data, monarchies such as Saudi Arabia and Eswatini (previously Swaziland) have autocracy scores of 9 and 10, while China has a score of 7. Countries scoring 10 for democracy include Mongolia and Germany, while South Africa is 9 and the United States has a score of 8. All these countries are rated zero for the extent of institutionalized autocracy. The relationship between COVID-19 deaths and political and social features of the state is studied by Bosancianu and others (2020), though they do not include these indicators. We also include an index of statistical capacity developed by the World Bank, ranging from zero to 100, in order to test whether measurement specifically can account for deaths per million. For this index, which is not available for high-income countries, we set the value for all high-income countries equal to the maximum, 97, so that the index has the greatest possible potential to explain the association between income and deaths per million.

12. "COVID-19 Community Mobility Reports," accessed July 15, 2020; <https://www.google.com/covid19/mobility/2020>.

Table 1. Summary Statistics

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>
Confirmed COVID-19 deaths per million people	197	59	147	0	1,238
Days since first death (= 0 if no deaths)	197	76	32	0	161
Real GDP per capita (2010 USD)	189	17,699	26,542	211	195,880
Population over age 70 (%)	182	6.1	4.8	0.7	22
Obesity prevalence (% of adults)	177	18	8.9	2.1	38
Smoking prevalence (% of adults)	139	21	9.5	2	46
Diabetes prevalence (% of adults)	193	8.0	4.2	1	22
PM2.5 air pollution ($\mu\text{g}/\text{cm}^3$)	183	28	19	5.9	100
Hospital beds per thousand people	185	3.1	2.8	0.1	19
December and January international flight arrivals per 1,000 people	197	1.3	2.8	0.0002	18
December and January flight arrivals from China per 1,000 people	197	0.02	0.05	0.000005	0.3
December and January flight arrivals from Schengen Area per 1,000 people	197	0.3	1.0	0.00001	6.7
Imports per capita (USD)	162	5,983	8,775	71	65,708
Imports from China per capita (USD)	161	561	936	6.0	8,802
Imports from Schengen Area per capita (USD)	162	8,367	12,815	81	74,585
Days before first death that action is taken	169	53	34	-79	171
Containment and health response four weeks after first death (0–100)	151	75	14	17	100
Workplace mobility decline four weeks after first death (%)	121	-45	20	-90	5
Public transit mobility decline four weeks after first death (%)	121	-57	19	-93	-5
General cancellation of public events four weeks after first death (= 1)	152	0.9	0.3	0	1
Containment and health response ninety days after first death (0–100)	37	70	13	46	94

Population per km ² in largest urban center	173	6,511	3,397	1,172	19,843
Persons per household	144	3.9	1.4	2.1	8.7
COVID-19 tests per 1,000 people	83	42	50	0.5	267
Positive test ratio (%)	83	9.3	17	0.1	117
Contact tracing comprehensiveness index (0–2)	151	1.3	0.7	0	2
Statistical capacity (0–100)	195	75	19	27	97
Institutionalized democracy (0–10)	148	6.0	3.7	0	10
Institutionalized autocracy (0–10)	148	1.6	2.7	0	10
February precipitation (mm/day)	197	2.8	2.4	0.03	13
March precipitation (mm/day)	197	2.4	2.1	0.02	12
April precipitation (mm/day)	197	2.6	2.2	0.03	13
May precipitation (mm/day)	197	3.0	2.7	0.06	19
Nonimported cases of SARS-CoV-1 (= 1)	197	0.03	0.2	0	1
Nonimported cases of MERS-CoV (= 1)	197	0.05	0.2	0	1

Actual rainfall for February to May 2020 is measured using data from the National Oceanic and Atmospheric Administration. Precipitation for each country is measured in average millimeters per day using the Climate Prediction Center Merged Analysis of Precipitation data set, which reports values on a 2.5 by 2.5 degree grid obtained by combining satellite estimates and gauge data (Xie and Arkin 1997). Values on the grid are averaged within administrative boundaries.¹³ As an alternative to using data on temperature, we use distance to equator as a proxy for weather and climate; this variable is measured in degrees latitude from the centroid of the national administrative boundaries reported by Natural Earth.

Finally, it has been hypothesized that exposure to prior epidemics may have conferred to some developing countries “trained immunity.”¹⁴ To investigate this hypothesis, we use information on prior SARS-CoV-1 and MERS-CoV infections. Locations of nonimported SARS-CoV-1 are Canada, China, Mongolia, the Philippines, Singapore, and Vietnam, as reported by the WHO. Locations of nonimported MERS are Bahrain, Iran, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia, United Arab Emirates, and Yemen, as reported by the Centers for Disease Control and Prevention.

1.C. Regression Results

Table 2 reports the results of estimating several specifications of equation (1) using ordinary least squares. Additional specifications are reported in the online appendix. Before taking logs of deaths per million we have added 0.0219 to the value for twenty countries with zero confirmed deaths, so that they are not dropped from estimation, treating them as if they experienced 2.9 deaths per 100 million people. This number was selected so that these countries have exactly $1/(4 \times 4096)$ deaths per million of the United States, implying that the Y-axis tick on which they sit in figure 3 is evenly spaced from the others above it. The full sample includes 189 observations of deaths per million and GDP per capita.

13. Country values are calculated in two steps. First, inverse distance weighted interpolation is used to generate a 1 by 1 degree grid of monthly rainfall values; a power coefficient equal to 5 is applied to the distance measure, so that interpolated points reflect mainly the nearest values. This step is necessary because the boundaries of several small countries do not contain any point on the original 2.5 by 2.5 degree grid. Second, rainfall on all points within the 1 by 1 degree grid are averaged within the administrative boundaries of each country.

14. Netea and others (2020) define “trained immunity” as a biological process by which activation of the innate immune system can result in enhanced responsiveness to subsequent triggers—a de facto innate immune memory.

We present this regression with the important qualifier that the dependent variable (deaths per million) continually changes, and hence the results may change in the future. Column 1 reports the coefficient on the log of per capita income in the absence of any additional explanatory variables X_i . Here the coefficient $\rho = 0.891$ (SE = 0.102), suggests that for a 1 percent increase in income there is approximately a 0.9 percent increase in deaths per million, corresponding to the linear fit displayed graphically in figure 3. Further, the R^2 (which has been adjusted for the number of explanatory terms in the model) is 0.24, indicating that roughly one-fourth of the variation in deaths per million is explained by income.

We now add additional variables sequentially to unpack this relationship. In column 2 we add the square root of days since first death (which is set to zero for those twenty-one countries with zero confirmed deaths) to account for the mechanical effect that countries later in the pandemic will have accumulated more deaths. The adjusted R^2 rises to 0.628, suggesting timing of arrival explains a substantial part of the overall variation in deaths. The coefficient $\rho = 0.617$ (SE = 0.078) has fallen, consistent with the fact that EMDEs experienced their first death later but remains statistically significant below 1 percent and is sizable in magnitude.

In column 3 we add two risk factors for severe COVID-19 illness: the share of the population over age 70 and obesity prevalence. Notably, since accurate body mass index data are difficult to come by for representative samples of the confirmed cases within countries (Lighter and others 2020), our cross-country regression presents a novel opportunity to investigate the contribution of obesity to COVID-19 mortality. The element of β corresponding to the coefficient on the age variable is positive and significant, equal to 0.089 (SE = 0.029), suggesting that for a 1 percentage point increase in the population over 70, deaths per million increase by about 0.9 percent. The element of β corresponding to the coefficient on obesity is also positive and significant, equal to 0.052 (SE = 0.022), suggesting that for a 1 percentage point increase in obesity prevalence, deaths per million increase by about 0.5 percent. The coefficient $\rho = 0.216$ (SE = 0.126) falls substantially relative to the previous specifications, suggesting that the high initial correlation between income and deaths can be explained by just the two risk factors for severe illness (age and obesity) and the time of virus's arrival.

In table A2 of the online appendix, we explore specifications that include additional health covariates (smoking prevalence, diabetes prevalence, as well as a measure of particulate matter pollution since pollution may increase asthma prevalence). We consistently find no statistically

Table 2. Regression of (Log) COVID-19 Deaths per Million People on Country Covariates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ln(real GDP per capita)	0.891*** (0.102)	0.617*** (0.078)	0.216* (0.126)	0.706*** (0.090)	0.759*** (0.121)	0.221* (0.124)	0.422*** (0.158)	0.499* (0.280)	0.451*** (0.152)	0.246 (0.226)
Square root of since first death (= 0 if no deaths)		0.611*** (0.035)	0.538*** (0.039)	0.473*** (0.074)	0.139 (0.186)	0.417*** (0.067)	0.364*** (0.073)	0.204 (0.211)	0.362*** (0.078)	0.439*** (0.127)
Population over age 70 (%)			0.089*** (0.029)			0.109*** (0.029)	0.125*** (0.032)	0.091** (0.041)	0.072 (0.048)	0.154** (0.076)
Obesity prevalence (% of adults)			0.052** (0.022)			0.063*** (0.022)	0.068*** (0.022)	0.060* (0.031)	0.062*** (0.022)	0.146*** (0.023)
Days before first death that action is taken				-0.009* (0.005)	-0.012* (0.006)	-0.007 (0.005)	-0.005 (0.004)	-0.001 (0.005)	-0.007* (0.004)	0.022** (0.009)
Containment and health response four weeks after first death (0–100)					-0.012 (0.013)					
Workplace mobility decline four weeks after first death (%)					-0.040*** (0.013)					
Public transit mobility decline four weeks after first death (%)					0.016 (0.016)					
Ln(Population density in largest urban center)							1.124*** (0.354)	1.847*** (0.541)	1.224*** (0.359)	2.007*** (0.540)

significant effect of these variables on deaths per million, once age and obesity are controlled for. Moreover, they often have counterintuitive signs (column 1 in table A2). Health care capacity (as measured by hospital beds per 1,000 people) is also insignificant (column 2 in table A2), but with a negative sign, as expected. We also consider a specification that controls for the hypothesized “trained immunity” effect through dummies indicating countries had nonimported cases of SARS-CoV-1 and MERS-CoV (column 4 in table A2). We find a large, negative, and statistically significant effect of SARS-CoV-1 on deaths per million. The coefficient on MERS-CoV is negative, but not significant. Importantly, the inclusion of these covariates has no effect on the remaining coefficients, and on the income coefficient—hence, it does not help explain the positive correlation between deaths and income. The SARS-CoV-1 dummy acts as a proxy for countries in East Asia, which have much lower death rates, and may therefore also capture factors other than trained immunity. For this reason, we do not include it in other specifications. In general, we avoid using country dummies (or variables that effectively act as country dummies), since we estimate a cross-country regression, and country dummies wipe out relevant variation in our covariates.

In columns 4 and 5 of table 2, we omit the two risk factors (age and obesity) and control instead for the public health policy response. In column 4, we add just one variable that measures the days before first death that action is taken by the government on the public health response. Whereas before we had been controlling for when the virus arrived in the country (through days since first death), we are now also controlling for the time at which the government responded. As expected, the coefficient on this variable is negative, and it is statistically significant at the 10 percent level. The coefficient $\rho = 0.706$ ($SE = 0.090$) has risen and is again statistically significant. Conditional on the timing of first death and government action, there is still a strong positive correlation between income and deaths per million, meaning that while early action may help reduce deaths, it does not explain why developing countries have had lower death rates to date. In column 5, we examine whether the strength of lockdown measures mattered in addition to the timing of first action by adding both the value of the containment and health response index and observed changes in mobility from workplaces and on public transit. Note that because the mobility reports are not available for all countries in our sample, we lose some observations, and hence columns 4 and 5 are not directly comparable.

Nevertheless, the results in column 5 provide some useful insights. Both our proxy for early action and the decline in workplace mobility are

found to have a negative and significant impact on deaths per capita. However, the inclusion of mobility controls further increases the correlation between deaths per capita and income. A recent piece by Maire (2020) may explain why. Maire (2020) finds that low-income and lower-middle-income countries had lower compliance (i.e., decline in mobility) conditional on the policy stringency index than the rest of the countries. Hence, it does not appear that developing countries have contained the death toll because of lower mobility—in contrast, it seems that they have a lower death rate *despite* not reducing mobility.

In columns 6–10, we reintroduce the two risk factors, age and obesity, that were shown to have a significant impact on cross-country differences. Given that mobility reports are not available for all countries in our sample (and that they do not appear to explain why developing countries have lower death rates anyway), we omit mobility from these specifications but always include the early action control (timing of first policy response). The latter always has the expected negative sign but is significant only in column 9. Columns 7–10 introduce one additional variable, the population density in a country's largest urban center. This variable has a large positive and significant effect in all specifications as expected. Further, average household size does not significantly predict death rates conditional on the density of the largest urban center (column 3 in online appendix table A2). Interestingly, however, once population density is introduced, the correlation between deaths and income (which had become small once age and obesity were controlled for) reappears, though it is substantially lower than in the initial specifications that do not control for risk factors. This suggests that, once again, developing countries do not have fewer deaths because they have fewer dense cities; they have fewer deaths *despite* having some of the densest cities in the world.¹⁵

In column 8, we add the (log) number of tests per 1,000 and the contact tracing comprehensiveness index. Unfortunately, the number of observations drops to 82, so we cannot draw any definitive conclusions based on this specification. The coefficient on the contact tracing index is negative and significant, suggesting that this approach is effective in reducing the death rate. The coefficient on the testing measure is positive and significant. Given that testing is not random, the interpretation of this coefficient is not straightforward. On one hand, one could interpret the positive sign as

15. The top twenty urban centers by population density are in the Democratic Republic of the Congo, Ethiopia, India, Indonesia, Nigeria, Niger, and Pakistan (https://ghsl.jrc.ec.europa.eu/ghs_stat_ucdb2015mt_r2019a.php).

suggesting that when more tests are conducted, more COVID-19 deaths are detected. On the other hand, given that most countries faced testing capacity constraints, many of them rationed testing and made tests available only to those who were likely to be infected. In this case, higher infection and death rates would be the reason for more testing—a classic case of reverse causality. Despite this ambiguity in the interpretation of the testing coefficient, we note that the coefficients on the other covariates (age, obesity, and population density of the largest city) remain unaffected. The correlation with income persists ($\rho = 0.499$; $SE = 0.280$). For the reasons we mentioned above, we do not view the results in column 8 as conclusive. But if one were to take them at face value, they would suggest that the lower death rates in developing countries are attributable to several factors: younger populations, lower obesity, more contact tracing, possible mismeasurement. However, the puzzle of developing countries' lower death rates, as reflected in the positive correlation of the death rate with income, remains. Column 5 of table A2 in the online appendix reports an additional specification, in which one more covariate is added to those of column 8 in table 2: the positive test ratio. Interestingly, once the positive test rate is included, the coefficient on income drops and is no longer significantly different from zero. The coefficients on both testing measures are positive and significant. In both cases, a causal interpretation of these effects is not possible. But if one interpreted the test positive rate as a measure of the capacity of the testing system (rather than a measure of the infections rate), then the positive coefficient would support the view that higher testing capacity (reflected in a lower testing ratio) is associated with fewer deaths. As noted earlier, many low-income countries have some of the most comprehensive testing programs in the world, given their disease burden.

In columns 9 and 10, we add controls for weather and climate. The specifications in these two columns are identical, but column 10 reports population-weighted regressions. In column 9, precipitation in March enters with a positive sign and it is significant. This is likely because several South American countries with high death rates—namely, Brazil, Ecuador, and Peru—also experienced substantial precipitation in March. Distance to equator, which is a proxy for cooler temperature and lower humidity (among many other things), also has a positive and statistically significant effect on the death rate, providing some support for the hypothesis that warm climate might slow the virus or even suppress it. The population-weighted results are similar with two differences: the signs and statistical significance of the weather variables change; and, more interestingly,

the correlation with income is much smaller and statistically insignificant ($\rho = 0.246$; $SE = 0.226$). The coefficients on age and obesity, while qualitatively similar to those in previous specifications, now double in magnitude. These results are robust to excluding the two most populous countries in our sample, India and China.

The online appendix tables report additional robustness checks. The effects of age, obesity, and population density of the largest urban center remain robust. In table A1, we include various controls for connectivity. The controls are mostly insignificant, except for flight arrivals from China, which is a proxy for China (as this measure includes domestic flights in China). Not surprisingly, the associated coefficient is negative and significant as China has had a lower death rate. Similarly, in one specification in column 4, flight arrivals from the Schengen Area have a large (positive) impact on death, but this variable is a likely proxy for European countries, which have had a particularly high death toll. For the reasons given earlier, we avoid variables that act as country dummies. Notably, the inclusion of the connectivity measures does not significantly affect either the income or the time since first death variables. In table A2 we consider further covariates and specifications. Column 6 includes a control for statistical capacity. Although statistical capacity is not statistically significant, its inclusion reduces the coefficient on income to 0.323, providing some support for the hypothesis that some part of the positive correlation between income and death rate may be due to measurement (countries with higher statistical capacity report more deaths). Column 9 in table A2 includes controls for the regime type. Though the coefficient on democracy is positive, and the coefficient on autocracy is negative, suggesting democracy may have made controlling the disease harder, as some have speculated for instance in the context of the United States, these effects are not statistically significant.

In table A3, we explore additional specifications, several of which leave out the time since first death variable since this variable may be absorbing the effect of policy actions. It is interesting to note that if we include only the two risk factors (age and obesity) that have turned out to be most important in the majority of our specifications, we can explain approximately one-third of the variation in death rates (column 1). Controlling for these two factors alone reduces the correlation of death rates with GDP from 0.891 in the very first specification of table 2 to 0.335 in column 2 of table A3—hence almost two-thirds of the correlation between income and death rate we initially reported can be attributed to these two factors alone. But this correlation rises again once we control for population density in

the largest urban center (column 3). The finding that population density, while important, reinforces rather than solves the puzzle of lower death rates in developing countries, is one of the most robust findings of our analysis.

1.D. Tentative Conclusions

Between table 2 and the tables in the online appendix, we have explored thirty different specifications for regressions explaining cross-country variation in death rates. The three covariates that are consistently found to have a large and statistically significant impact on deaths per million are age, obesity, and population density in the largest urban center. The first two can explain a large part (almost two-thirds) of the positive correlation between income and deaths per million. In contrast, population density in the largest urban center tends to increase the correlation between income and death rate, deepening the puzzle of why developing countries have lower death rates; developing countries have a lower death toll despite having some of the world's densest cities.

Some of the specifications support the view that policy, especially early action and contact tracing, can explain cross-country differences, but the associated results are either based on few observations or not robust. Along the same lines, we find some support for the claim that death undercounting could partially explain lower death rates, but controlling for such undercounting through a measure of statistical capacity (or the more controversial tests per million measure) still does not significantly reduce the correlation between income and death rates.

We highlight two more robust findings. First, no matter what covariates one includes, the correlation between per capita income and deaths per million proves extremely robust; it always has a positive sign and is statistically significant in all but one specification. Hence, part of the lower death toll in developing countries to date remains a puzzle. Second, the other variable that has consistently had a large, statistically significant impact on the death rate is (the square root of) time since first death. As explained earlier, we feel compelled to include this variable in the regressions to control for the mechanical effect of time on the accumulation of deaths. But this variable also serves as a proxy for other relevant factors, for example, the transmission process. Figure 2 shows clearly that compared to high-income countries, the path of COVID-19 has been very different in middle- and low-income countries; not only do the latter have lower deaths per capita at any point in time, the entire curve of COVID-19 progression looks different (much flatter). This pattern is consistent with the hypothesis of heterogeneous R_0 's (see Ellison 2020)—in this case across country income

groups. In column 4 of table A3, we explore this hypothesis by allowing for different coefficients on the time since first death variable across different country income groups. The results support the premise of heterogeneous—across country groups—transmission processes, with low-income countries exhibiting the slowest and advanced economies exhibiting the fastest COVID-19 progression. However, it is not clear what accounts for these different patterns. It is possible that the demographic factors we identified as having high explanatory power for death rates affect death rates not only through case fatalities but also through transmission (this would be, for example, the case if younger people are not only less likely to die from COVID-19, but also less likely to transmit it because they don't exhibit severe symptoms). Alternatively, it is possible that different R_0 's across income groups reflect different policies, though given the heterogeneity of policy responses across the world, the exact mechanism behind this hypothesis is itself a puzzle. At any rate, we believe that the differences across country income groups we document are intriguing and may prove useful to epidemiologists in the future. For example, it would be interesting to calibrate a model with heterogeneous R_0 's to specifically investigate the question of what type of heterogeneity would lead to the patterns we document in this paper. We leave this undertaking to future research.

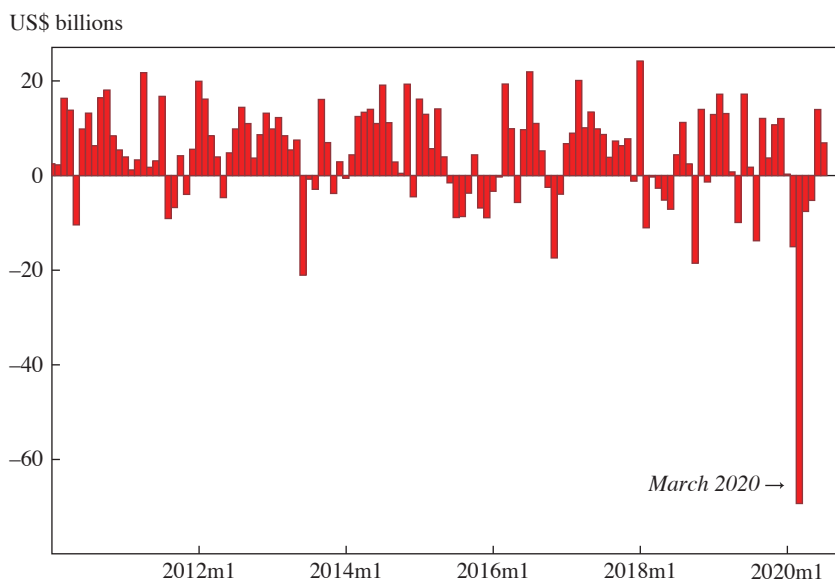
We conclude, tentatively, that to date, the public health care crisis in EMDEs has not been as severe as initially feared. No matter what the reason for this is, it is good news. It means that fewer lives were lost. It also means that—to the extent this pattern is not reversed in the future—developing countries may be able to focus on the economic situation, to which we turn in the next section.

II. The Economic Crisis

In the second part of this article, we turn to the economic crisis, drawing on the financial data available at this early moment.

II.A. Short and Medium Run

EMDEs could face years of economic hardship due both to suppression measures, the continued duration of which is uncertain, and to spillover effects from a global recession. In advanced economies, the hope was that once countries brought the public health crisis under control, they would manage the economic crisis. For smaller economies especially, the decline in commodity export revenues and remittances from migrants to advanced

Figure 4. Nonresident Purchases (Sales) of EM Stocks and Bonds

Source: Institute of International Finance.

economies implies that the economic effects could be grave, even if they manage to control the virus.

We structure the discussion of the short- and medium-run economic effects in three parts. We first discuss external vulnerabilities focusing on financial markets. Next, we discuss preliminary evidence on the effects of countries' own containment policies. Finally, we offer some thoughts on policy implications.

EXTERNAL VULNERABILITIES Given limited availability of data on macroeconomic variables at this early moment, we start by discussing financial data, which highlight how the external environment facing EMDEs has changed. We consider first international capital flows. Some sales of EMDEs' assets were expected, as is typical during periods of increased global risk aversion (Kalemli-Özcan 2019). The initial reaction of capital markets to COVID-19 news in March however was unprecedented. Figure 4 shows that in the month of March \$69.4 billion of emerging market stocks and bonds were sold by nonresidents, the largest monthly outflow of portfolio investment that has ever been recorded by the Institute of International Finance (IIF). Outflows of this so-called hot money can cause instability in the financial system, as they cause devaluations that increase the risk

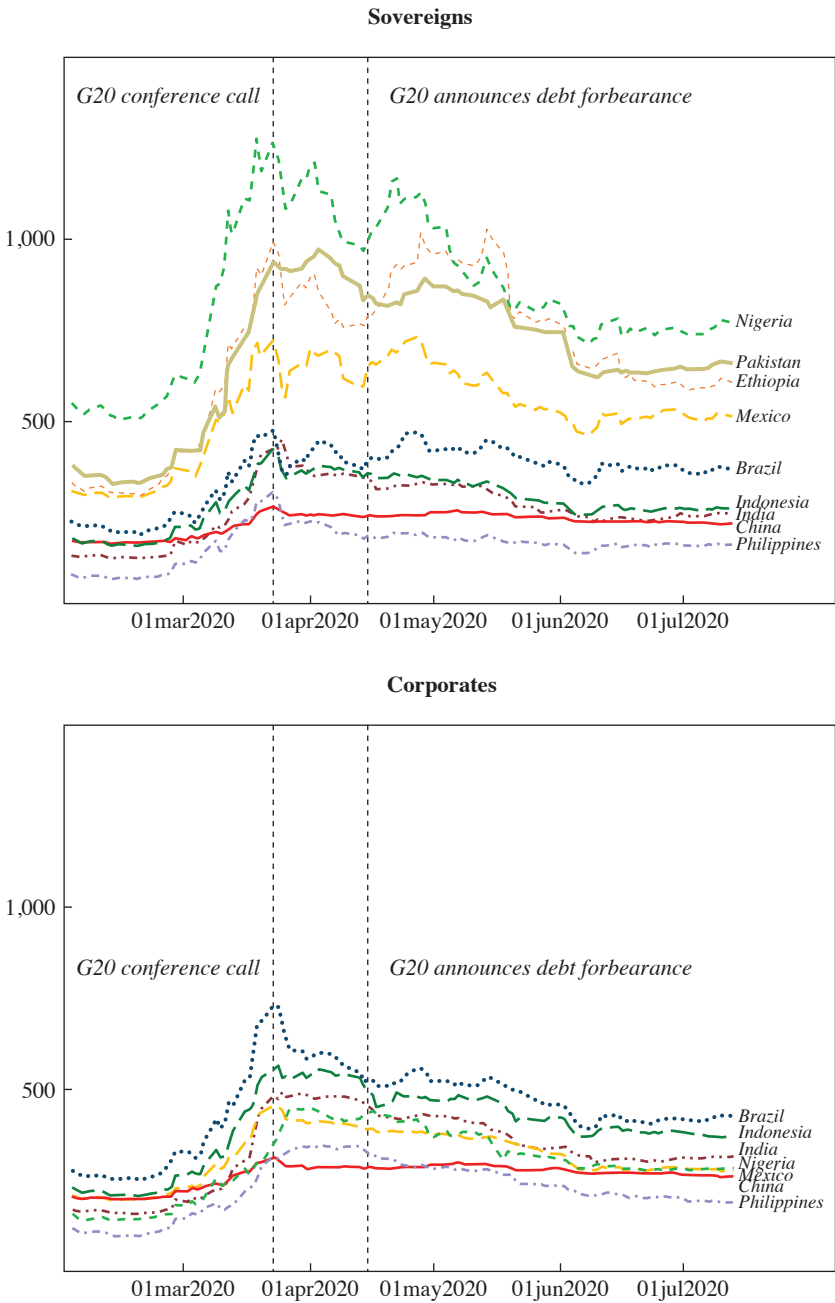
that governments and corporations will not be able to honor liabilities denominated in foreign currency (Das and others 2020).

As shown in figure 5, these March outflows coincided with a substantial increase in hard currency bond spreads. Though the increase was shared across corporate and sovereign bonds, sovereigns were hit particularly hard. At a time precisely when governments faced large emergency spending needs, access to international capital markets almost disappeared. In several cases (e.g., Nigeria, Mexico) sovereigns had been trading at a spread over corporates, suggesting the market already viewed these governments as a greater risk than private firms in these countries.

Examining the movement of bond spreads highlights the limitations facing international institutions attempting to support EMDEs during this crisis. On March 23, Group of Twenty (G-20) finance ministers and central bank governors held a conference call and stated their willingness to support developing economies through the IMF and World Bank Group. This is exactly the moment when spreads peaked in most countries, suggesting these statements perhaps eased some anxieties about the increased risk of sovereign and corporate default. However, on April 15, when the G-20 announced its detailed action plan, the main initiative of which was to offer less-developed countries the option of forbearance—delayed payment—on bilateral loans, sovereign spreads again increased, for instance, in Nigeria and Ethiopia. Spreads also increased in Brazil and Mexico, even though these countries were ineligible for forbearance under the G-20 proposal, which focused on the poorest countries. Under the terms proposed, countries could request to suspend loan payments from May 1, 2020, until the end of the year. Private creditors were encouraged to offer similar terms, if countries requested them. Though interest would continue to accrue, leaving the net present value of the loans unchanged, forbearance still effectively increases maturities, introducing greater risk. It seems that the market evaluated this additional risk relative to the counterfactual of on-time payment rather than default; the spreads in Ethiopia, Nigeria, and Pakistan (and to a lesser degree in Brazil and Mexico) increased immediately after the G-20 forbearance announcement. Though these spreads have come down in the meantime, for now, apart from subsidized direct finance through multilateral development banks, the international community has not been able to reduce substantially the higher borrowing costs EMDEs now face in private markets.

The greatest concern is that higher borrowing costs will make each country's emergency response more difficult to finance. Beyond short-run risks to financial stability, concerns about a massive capital flight may be

Figure 5. Hard Currency Bond Spreads in Emerging Markets



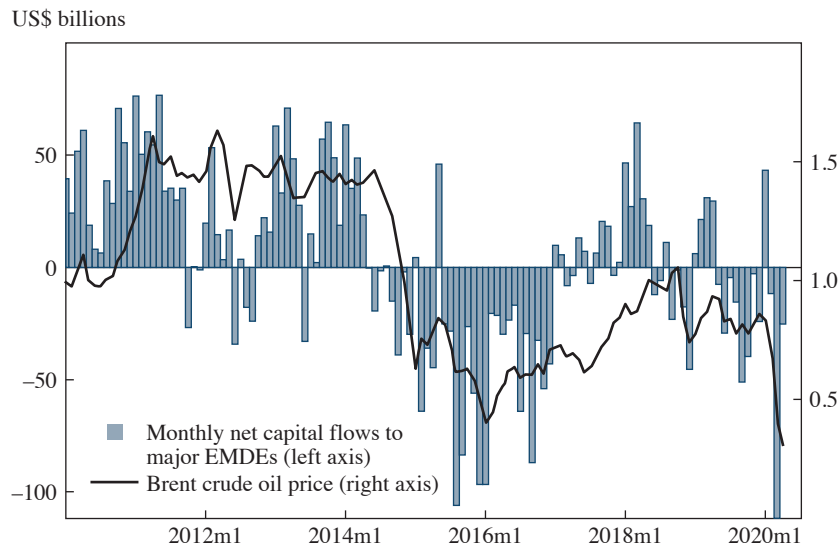
Source: J. P. Morgan Markets.

exaggerated. The top panel of figure 6 shows estimates of overall net capital flows from fifteen major EMDEs over the same time period as portfolio investment flows that were shown in figure 4.¹⁶ By this broader measure, which includes also direct investment and banking flows, total net capital outflows in March 2020, though more than \$100 billion, were for these fifteen countries of comparable magnitude as in late 2015, during that year's trough in the oil price, which is included in the panel for reference. Flows therefore were large but not unprecedented. The bottom panel of figure 6 reports accumulated net capital flows for select countries over the most recent year, as a multiple of GDP. Even accounting for recent outflows, India and Indonesia, for instance, have still accumulated 2 percent and 4.5 percent of GDP respectively in new capital since last year. Country-level trends in net capital accumulation do not appear to have changed.

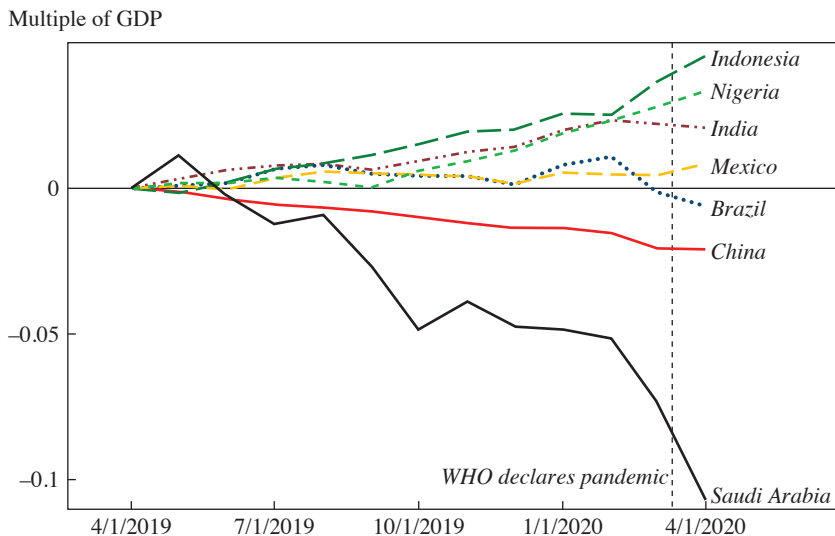
An interesting feature of figure 6 is the strong correlation between overall net capital flows to EMDEs and the oil price over the last decade. While we do not claim there is a simple causal relationship between the two, this observation raises the possibility that some of the capital outflows in March—and the financial distress of EMDEs more broadly—may be linked to the decline in commodity prices rather than the pandemic *per se*. The collapse in the oil price, also in early March, was the result of a supply shock related to a price war between Saudi Arabia and Russia—the full extent of the collapse in oil demand emerged only shortly thereafter. In support of the hypothesis that oil prices specifically were a contributor to the EMDE sell-off, Saudi Arabia experienced by far the largest year-on-year decline in overall net capital flows as a share of GDP, by -8.1 percent, among all EMDEs tracked by the Institute of International Finance. Outflows from that country alone accounted for 22 percent of the value of net capital flows in the month of March.

16. We focus on net flows in the tradition of Calvo (1998). Some authors (for example, Forbes and Warnock 2012; Brunnermeier and others 2012; Broner and others 2013) have made the case for also keeping track of gross cross-border capital flows, as gross flows provide a more appropriate measure of risk sharing across countries and global financial integration. We return to this issue at the end when we discuss the long-run risks associated with deglobalization. These estimates are produced by the IIF. The advantage of the IIF data is that they are available at high frequency, while balance of payments data are available only on a quarterly basis. We emphasize that figure 6 is based on estimates rather than actual data. However, the IIF estimates have tracked balance of payment data closely in the past, as shown in the supplementary figures for selected countries in the online appendix.

Figure 6. Overall Net Capital Flow to Emerging Markets



Accumulated net flows over most recent year



Sources: Institute of International Finance; World Bank Commodity Markets Outlook.

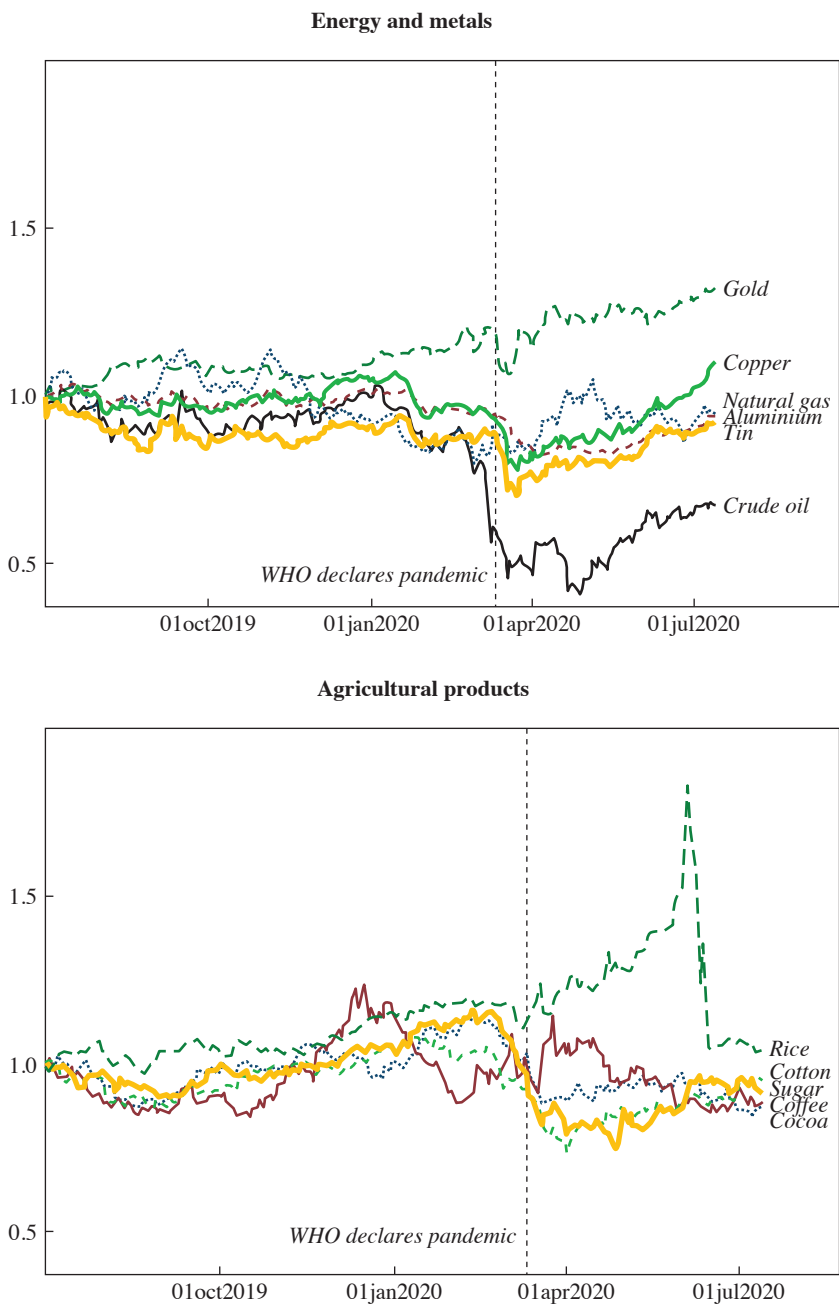
Notes: Overall net capital flows include all types of flows from both residents and nonresidents covering portfolio flows (i.e., purchases or sales of stocks and bonds), banking flows, direct investment, and other components of the financial account in a nation’s balance of payments and are equal to the change in the current account, excluding central bank reserve operations. Monthly net capital flows in the top panel are the sum of net flows to Argentina, Brazil, Chile, China, Egypt, India, Indonesia, Malaysia, Mexico, Nigeria, Poland, Saudi Arabia, South Africa, Turkey, and Ukraine.

Some of the economic effects of the crisis in EMDEs may not be dissimilar from a standard commodity price shock. Figure 7 shows how prices of energy, metals, and various agricultural commodities have changed from the start of the pandemic until July 15. Crude oil has been the biggest loser. In May, it was down more than 50 percent since the last year, but then recovered, to be approximately 40 percent lower than last year. Though gold prices have risen—unsurprising at a time of global risk aversion—prices of the base metals copper, aluminum, and tin as a group declined by approximately 20 percent between January and May 2020. Natural gas also experienced a drop in price, but rapidly recovered this loss during the month of April. By July 15, all of these commodity prices had recovered, with the price of copper even higher than a year before. Effects on agricultural products have been more varied, with sharp declines in the prices of cocoa, cotton, and sugar during March, but sharp spikes in the prices of coffee and rice. All these prices as of July 15 had returned to roughly where they were in the previous year.

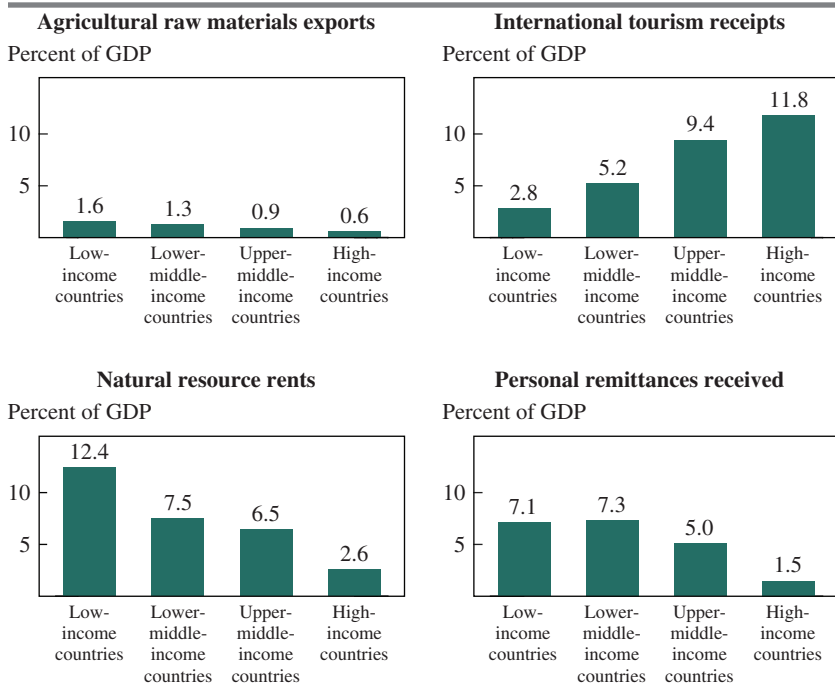
Figure 8 summarizes the exposure of countries, by income group, to four risk factors for an external recession, including a collapse in commodity prices. These four factors are agricultural raw materials exports, natural resource rents, international tourism receipts, and remittances, all measured as a share of GDP. The United Nations predicts a global decline in international tourism arrivals by 60–80 percent in 2020 (United Nations World Tourism Organization 2020), and the World Bank predicts a 20 percent decline in remittances (Ratha and others 2020) to low- and middle-income countries specifically. Among these risk factors, low-income countries are most exposed to the decline in commodity prices, with natural resource rents accounting for 12.4 percent of GDP, compared to just 2.6 percent in high-income countries. Though low-income countries export more agricultural raw materials as a share of GDP relative to other income groups, the value of these exports, just 1.6 percent, pales in comparison to their revenues from natural resources. Though international tourism receipts are worth more to low-income countries than agricultural raw materials, at 2.8 percent of GDP, tourism is still predominantly an export of high-income countries, where receipts account for 11.8 percent of GDP. Remittances are most important in low- and lower-middle-income countries, though in both income groups the value of natural resource rents is greater.

These observations, which are not new, suggest the downside for EMDEs due to external factors is likely to play out through familiar channels. Smaller economies highly dependent on commodity prices and remittances will suffer the most. In larger economies, where growth is determined to

Figure 7. Commodity Prices



Source: J. P. Morgan Markets.

Figure 8. Risk Factors for Exposure to External Recession

Source: World Bank World Development Indicators.

a greater extent by local demand, the speed of economic recovery will depend on how quickly the public health crisis passes. If the COVID-19 disease burden is ultimately not as dire in these countries—as we have suggested in the previous section it may not be—this observation leaves us cautiously optimistic that the largest EMDEs, especially those not reliant on energy and metal exports, could recover quickly.

This view is reflected to a certain extent in growth forecasts. For example, in the *World Economic Outlook Update, June 2020*, the IMF predicts -3 percent real GDP growth for 2020 in EMDEs, relative to -8 percent growth in advanced economies. The IMF also expects what could be called a V-shaped recovery, with 5.4 percent global growth in 2021 (IMF 2020). The World Bank estimates in *Global Economic Prospects* (2020b) are overall more pessimistic, but they too predict a less severe output contraction in EMDEs relative to advanced economies: in 2020, EMDEs are predicted to see growth of -2.5 percent while advanced economies are predicted to see growth of -7 percent. Commodity exporters face

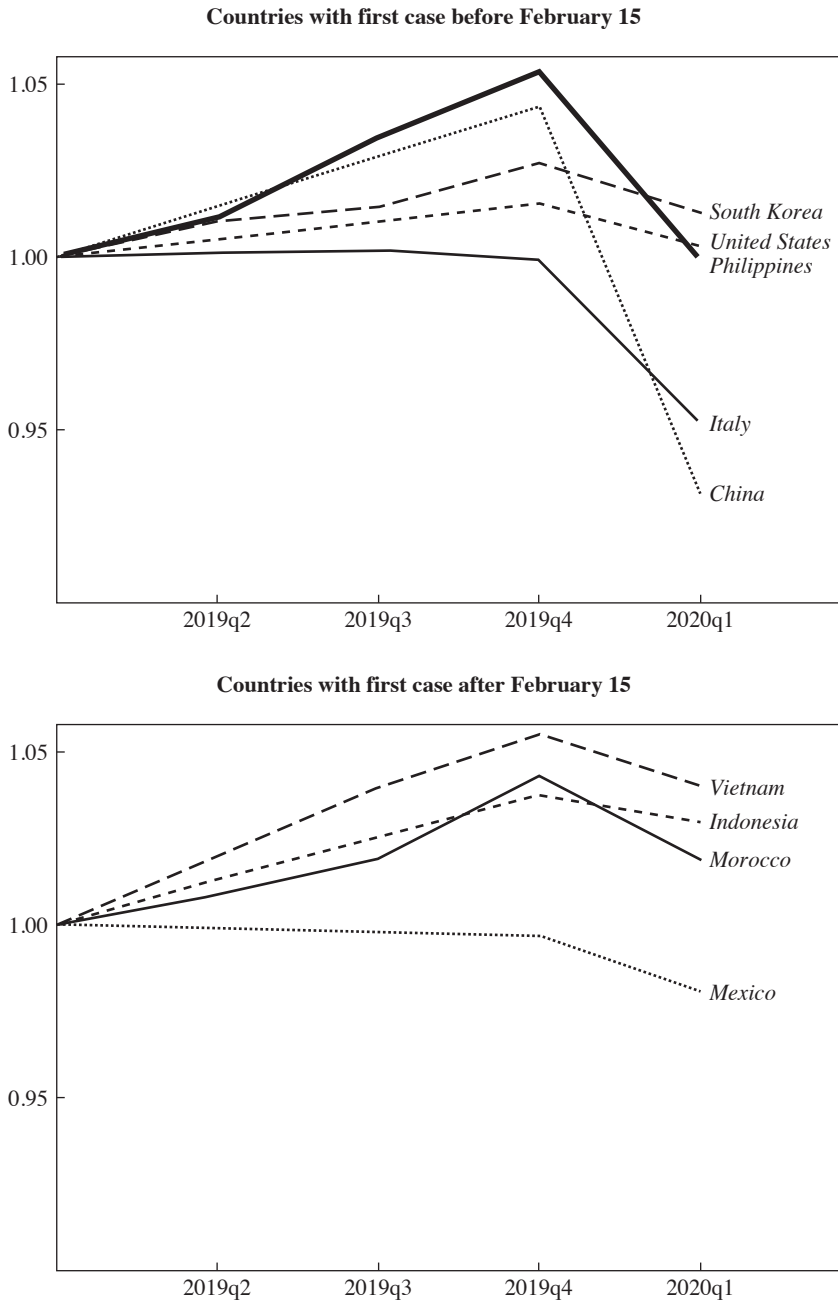
growth of -4.5 percent compared to the rest of EMDEs, who are predicted to see growth of -1 percent (World Bank 2020b). Of course, we do not mean to be overly sanguine. Declines in growth, even when they do not turn negative for individual countries, have a tremendous cost in lower-income countries. Mahler and others (2020) expect that the pandemic will push 49 million people into extreme poverty in 2020, causing the first increase in the global poverty rate since the Asian financial crisis in 1998.

EFFECTS OF COUNTRIES' OWN CONTAINMENT POLICIES Just as in advanced economies, some of the most severe economic effects of the pandemic will be due to containment measures, especially general and prolonged lockdowns. As a first look at the effects so far, figure 9 shows year-on-year changes in real GDP for EMDEs that have already reported actual values for the first quarter of 2020. The figure allows one to judge the losses so far relative to the gains of the previous three quarters. Given the economic effects are likely not to have appeared until after the first COVID-19 cases and subsequent lockdowns, countries are separated into two panels: on the top are those with their first case before February 15, and on the bottom are those with their first case after February 15. China, which had its first confirmed case in the fourth quarter of 2019, appears to have fared the worst, as expected, with a -6.8 year-on-year decline in income. In the Philippines, the pandemic erased three-quarters of GDP growth that had been even faster than that of China, so that it experienced essentially 0 percent year-on-year growth. Vietnam, Indonesia, and Morocco, where the virus arrived in the second half of the quarter, all experienced declines in income, but not enough to erase gains from 2019.

Losses in the second quarter of the year of course are expected to be much worse, as stay-at-home orders have now spanned much of the quarter, though as of May many countries are tentatively reopening. The experience of China, which first issued stay-at-home recommendations early in the quarter on January 23, provides guidance for how large these second quarter losses might be. China experienced -36.5 percent annualized real GDP growth in the first quarter of 2020 according to the National Bureau of Statistics. This corresponds to a $((1 - 0.365)^{1/52} - 1) \times 100 = -0.86$ percent loss of income per week. Rounding up slightly to account for the fact that stay-at-home orders did not span the whole quarter, 1 percent of GDP is a very rough estimate of the potential income lost per week of lockdown.

While we are awaiting official data, several phone surveys provide an early picture of economic losses. Relative to official statistics, these surveys have the advantage of capturing (at least part of) the informal sector

Figure 9. Real Gross Domestic Product



Source: Haver Analytics.

which is prevalent in developing countries. On the other hand, one may worry about potential selection as owning a smartphone is a prerequisite for survey participation. Such selection may imply that the poorest segments of countries' populations may not be represented.

Even with this caveat in mind, the reported losses appear devastating. Indicatively, according to the World Bank's Living Standards Measurement Study (LSMS) for Nigeria, which was released in early June 2020, 42 percent of respondents reported that they were not currently working due to COVID-19, mostly in the commerce, service, and agriculture sectors (though they were employed prior to the onset of the crisis); 79 percent of respondents reported that their households' total income had decreased since mid-March; and 51 percent of households reported reducing food consumption because of falling income.¹⁷ Results from the LSMS for Ethiopia paint a similar picture (Wieser and others 2020). Surveys from several other sub-Saharan countries (Kenya, Uganda, Sierra Leone, Senegal, etc.) as well as from South Asia (India, Pakistan, Nepal) consistently report loss of work and income along with disruptions to education and routine health care and difficulties meeting basic nutritional needs.¹⁸ The income loss in conjunction with rising food prices in some countries and the risk of desert locust damage to crops in others (East Africa in particular) have led to heightened food insecurity. According to the Famine Early Warning Systems Network (2020), forty-six countries are on food security alert and four countries are on famine alert, including Nigeria, which, in addition to the income losses resulting from mobility restrictions, saw rising imported staple food prices resulting from the depreciation of its currency.

POLICY IMPLICATIONS What can be done? As noted by Loayza and Pennings (2020), it is impossible to stimulate an economy under lockdown. In the short run, the focus must be on the public health response and support for the poor and vulnerable. Happily, countries are rising to the task. Up to 124 countries globally have launched cash transfer programs, which are planned for an average duration of three months. These transfers are also sizable in value, especially in low-income countries where they provide on average for 47 percent of monthly GDP per capita; this value

17. COVID-19 National Longitudinal Phone Survey 2020: Nigeria 2020, World Bank, <https://microdata.worldbank.org/index.php/catalog/3712/related-materials>.

18. See, for example, a survey in Senegal by the Center for Global Development (Le Nestour and Moscoviz 2020); various reports on India's Centre for Monitoring Indian Economy website: <https://economicoutlook.cmie.com/>; and a *Quartz Africa* report on Nigeria (Kazeem 2020).

is 27 percent in lower-middle-income countries and 22 percent in upper-middle-income countries (Gentilini and others 2020). Many countries have also introduced support for small and medium-sized enterprises to stem the collapse of employment relationships, in the form of concessional lending, approvals of debt payment deferral, and direct wage subsidies (Freund and Garcia Mora 2020).

In the medium term, macroeconomic stimulus will be required. Unfortunately, fiscal multipliers in developing countries are very small (Kraay 2020). Monetary policy could in principle be employed, but monetary transmission is weak. One question is whether unconventional monetary policy, through quantitative easing, may be useful. Monetary authorities in several countries have indeed begun purchasing bonds in the open market. Such actions, however, appear more motivated by a desire to stabilize bond markets rather than lower interest rates per se. In Indonesia and South Africa, for instance, two countries with ongoing operations, the policy rate is still above 3 percent. These monetary authorities still have room to reduce rates through conventional means.

Overall, the greatest challenge facing EMDEs is limited fiscal space. If the pandemic is not contained and the next months are spent cycling in and out of lockdown, direct transfers to the poor and support to small and mid-sized enterprises will need to be funded. Without recovery in global demand, small states dependent on commodity exports and remittances will be those least able to fund these transfers. With declining tax revenues, for all countries alike the only option will be to borrow at exorbitant rates. Lower rates induced by emergency central bank operations in advanced economies could induce a hunt for yield that eventually drives rates lower in EMDEs. Indeed, historical evidence shows that monetary policy and low interest rates in advanced economies are an important driver of positive spillovers and capital inflows to EMDEs (Kalemli-Özcan 2019). Consistent with this view, the smaller sales of portfolio securities by nonresidents in April compared to March could be due in part to the United States lowering the policy rate from 0.65 percent to 0.05 percent in April, which, all else being equal, should increase demand for higher-yield EMDE bonds. This hunt for yield cannot tell the whole story, however. Positive purchases of portfolio securities by nonresidents returned only in June, at which point the effective federal funds rate had increased very slightly to 0.08 percent. This suggests the role of an additional factor, most likely a reduction in global risk aversion, in bringing capital back to EMDEs. Whether it is the hunt for yield or the reduction in global risk aversion that brings capital back to the EMDEs, this is good news for these countries if it persists

in the future. On the other hand, slow growth in advanced economies is typically associated with less capital flow to EMDEs (Calvo, Leiderman, and Reinhart 1996; Koepke 2019), suggesting further news about a protracted health crisis in advanced economies could lead to persistence in high borrowing costs for EMDEs. In the next year, the fate of EMDEs will depend on whether and how quickly the virus is controlled at home and abroad.

Finally, EMDEs and the international community at large will have to deal with the unfolding debt crisis. The current consensus is that the debt service standstill agreed to in April is a step in the right direction but not enough for addressing the solvency issues of heavily indebted countries—indeed the plan does not forgive debt, it merely postpones service. Further, the scope of the agreement is limited as it does not apply to many middle-income countries that may face debt sustainability issues in the coming months. Even within the set covered by the debt standstill, according to the IMF, of seventy-seven countries that are eligible for debt relief under the agreement, only twenty-two have requested forbearance so far, out of fear that debt relief would affect their credit ratings. During May, Moody's had placed two participating countries (Ethiopia and Pakistan) on a negative watch, citing specifically the G-20's call for private sector creditors to participate in the debt standstill on comparable terms to official creditors. Moreover, there are concerns that without mandatory private creditor participation, funds made available by debt relief will be used to service private creditor debt rather than expenses related to the COVID-19 crisis.

While there is wide agreement that private creditor participation is a prerequisite for progress, it is less clear how to achieve such participation. Several supplementary or alternative approaches have been proposed, ranging from debt jubilee to major restructuring of current obligations, which will need to be evaluated over the coming months on a case-by-case basis. Any proposed solution has to trade off substantive debt relief against concerns about moral hazard and the prospect of raising borrowing costs even further. Notably, many countries that today face a high risk of external debt distress are the same countries whose debt was forgiven under the Heavily Indebted Poor Countries Initiative, which commenced in 1996. At this point, there is still uncertainty as to which countries will face insolvency and to what extent solvency problems are due to the COVID-19 pandemic as opposed to longer-term structural problems. Against this background, one of the main advantages of the debt standstill is that it gives relevant stakeholders time to evaluate the situation.

II.B. Long Run

The evidence we have presented so far suggests that EMDEs have weathered the COVID-19 crisis better than originally expected. However, considerable uncertainty remains regarding the long run.

The main source of uncertainty is, of course, on the public health side. A second wave of pandemic in the fall would plunge the world economy into an even deeper crisis. But even in the absence of a second wave, the gradual reopening of countries worldwide as infections subside poses challenges for developing countries. Many (but not all) of them adopted strict containment policies proactively. As they start reopening their economies and borders, there is considerable risk of importing infections from abroad, setting in motion the contagion process many had feared. Vigilant quarantines for those entering from abroad combined with testing and tracing may help mitigate this concern.

On the economic side, the long-run prospects of EMDEs will depend to a large extent on how quickly capital returns and how fast advanced economies recover. Both are highly uncertain in the face of the challenges that advanced economies themselves face. But independent of how recovery plays out in advanced countries, the developing countries' own domestic policies will shape their future. Here the big unknown is how large and persistent the indirect effects of their virus containment policies will turn out to be.

In their effort to prevent or contain the virus spread most developing countries adopted policies similar to those in advanced economies, including nationwide lockdowns. While these policies have a big economic cost everywhere, their effects are particularly severe in developing countries, in part because most of these countries do not have the fiscal or monetary space to compensate those most adversely affected.¹⁹ As noted earlier, several preliminary accounts from low-income settings report substantial loss of income, unemployment, and difficulties in meeting nutritional needs. Whether these effects are only temporary or will persist in the future will be hard to assess in a systematic way given that the majority of people in developing countries are employed in the informal sector.²⁰ This means not

19. See Ray and Subramanian (2020) for a preliminary report of the effects of the lockdown in India on the country's economy, and Barnett-Howell and Mobarak (2020), who argue lockdowns may not be an optimal policy in lower income settings.

20. The International Labor Office estimates that about 60 percent of the workforce in EMDEs is employed in the informal sector; in Africa, this figure is estimated to be between 80 and 90 percent (International Labor Office 2018).

only that the formal, employer-based safety network cannot reach most of the population in developing countries but also that their experience will not be accurately reflected in future official employment statistics and GDP measures. Tracing the long-term effects of the crisis on people's livelihoods in developing countries will therefore require longer-term, academic-style research involving household surveys that contain information on informal employment and earnings.

Perhaps the most worrisome long-term impacts of the coronavirus pandemic will be in the areas of education and health care. School closures are particularly problematic in settings where students do not have access to computers or the internet, so that online learning is not an option. Current estimates suggest that only 29 percent of low-income countries provide distant learning for their students; in contrast, 90 percent of high-income countries provide some type of program (Carvalho and Hares 2020). Worse, there are reasons to fear that this halting of education may not be temporary. Experience from the Ebola crisis taught us that when schools reopened, not all students returned: many younger girls dropped out permanently.²¹ If this experience repeats itself in the current crisis, the long-run effects of temporary school closings on women's education could be detrimental with potentially important implications for fertility. Furthermore, there are serious concerns about the indirect effects of the health crisis on child and maternal mortality. An early analysis of the pandemic's indirect effects by Roberton and others (2020) predicts substantial increases in maternal and child deaths due to reductions in coverage of labor and delivery and sick child care.²² A retroactive analysis of the Ebola crisis by Elston and others (2017) finds that such indirect effects were more severe than the direct impact of the Ebola crisis itself. Along the same lines, health care disruptions may have long-run effects if they lead to persistent discontinuations of malaria treatments or basic immunizations, especially among children. In many developing countries, extended campaigns have been necessary to persuade people to embrace vaccinations and put their children on an immunization schedule. Disrupting this schedule, even if only temporarily, may cause them not to return to clinics, halting if not

21. Bandiera and others (2019) find that in Sierra Leone, young girls in highly disrupted villages experienced a persistent 16 percentage point drop in school enrollment post-crisis, while out-of-wedlock pregnancies increased.

22. The study predicts that reductions in health coverage of around 15 percent for six months would result in 253,500 additional child deaths and 12,190 additional maternal deaths, while reductions of around 45 percent for six months would result in 1,157,000 additional child deaths and 56,700 additional maternal deaths.

reversing progress in this area. In general, many effects that in high-income settings would be reasonably viewed as temporary may have long-lasting or permanent consequences in low-income settings.

Finally, the future of EMDEs will depend on the changing attitudes toward globalization in advanced economies. Experience, especially from East Asia, suggests that trade played an important role in the growth and development of low- and middle-income countries. In a recent paper (Goldberg and Reed 2020), we find that trade, especially with high-income countries, has been an important contributor to poverty reduction. However, the growth of trade has slowed down considerably since the global financial crisis, and the last five years have seen a strong political backlash against multilateralism and globalization in many advanced countries, culminating in the US-China trade war. At the same time, automation has led to concerns that the traditional comparative advantage of low-skill, low-wage developing countries in the production of basic manufacturing may become less relevant in the future and that the days of offshoring are over. This is the backdrop against which the COVID-19 crisis unfolded. The pandemic has intensified preexisting deglobalization trends and has led to new calls for protectionism based on novel arguments involving independence and resilience of global value chains. Similarly, restrictions on the movement of people (i.e., immigration) are now being justified on public health grounds, which could harm remittance flows. On the financial side, there is a risk that the crisis will lead to large reductions in gross capital flows, that is, smaller capital inflows by foreigners and smaller capital outflows by domestic residents in EMDEs. Existing research (Broner and others 2013) suggests that during crises, reductions in gross flows are often substantially larger than reductions in net flows. This implies a reduction in countries' ability to finance domestic investments with foreign funds as well as to share idiosyncratic domestic risk with foreigners. As advanced countries are increasingly turning inward, closing their borders to goods, people, and capital from lower-income countries, EMDEs may have to rely on themselves more than ever. Domestic reforms promoting structural adjustment in response to the new realities may be the only path toward long-term recovery.

III. Concluding Remarks

Our preliminary assessment of the COVID-19 crisis as it is unfolding in developing countries may seem too optimistic. We do not argue that the situation in EMDEs is rosy; rather, our claim is that it is not as dire

as initially feared. This has important policy implications. On the public health side, while there is still considerable uncertainty about the future, the better than expected record of many developing countries to date suggests that, to the extent that these countries do not face new waves of infections and their health systems do not get overburdened, they may be able to devote more resources to addressing the economic fallout of the crisis. Furthermore, it suggests that many countries may be able to lift strict containment policies, such as nationwide, prolonged lockdowns or school closings that have particularly high costs in low-income settings. Of course, the situation will need to be monitored closely for outbreaks of infections, and containment measures may have to be reintroduced periodically. On the economic side, there are encouraging signs as financial markets have stabilized and commodity prices are trending upward. We are more concerned about long-run effects arising from the shutting down of economies: the loss of education among girls, the suspension of vaccinations among children, the falling back into poverty of those living close to subsistence. Above all, we are concerned about the implications that advanced economies turning inward will have for the growth and development of poorer countries. These effects are hard to quantify in the short run but may prove the most tragic legacy of the COVID-19 crisis in developing countries in the long run.

ACKNOWLEDGMENTS We thank our discussants, Şebnem Kalemli-Özcan and Michael Kremer, as well as the editor, Janice Eberly, for many useful comments on an earlier draft. We are also grateful to the United Kingdom Department for International Development for sharing with us their weekly “C19 Economic Evidence Roundups” with up-to-date information on the impact of the crisis in several developing countries.

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