CHAPTER 2

AFTER-EFFECTS OF THE COVID-19 PANDEMIC: PROSPECTS FOR MEDIUM-TERM ECONOMIC DAMAGE

The COVID-19 pandemic has led to a severe global recession with differential impacts within and across countries. A key question facing policymakers is the extent of persistent damage (scarring) that may result from this crisis. This chapter examines the possible persistent effects of the pandemic and the channels through which they may occur. History suggests that deep recessions often leave long-lived scars, particularly to productivity. Importantly, financial instabilities—typically associated with worse scarring—have been largely avoided in the current crisis so far. The concentration of the pandemic's initial impact on more highly contact-intensive service sectors has generated lower sectoral spillovers than in most previous recessions, but its sheer size means that it still represents a large shock to the broader economy. Expected medium-term output losses from the pandemic are substantial, with output for the world in 2024 expected to be about 3 percent lower than anticipated pre-pandemic. Losses are anticipated to be lower than after the global financial crisis, assuming that the pandemic is brought under control globally by the end of 2022. The degree of expected scarring varies across countries, depending on the structure of economies and the size of the policy response. Emerging market and developing economies are expected to suffer more scarring than advanced economies. To limit scarring, policymakers should continue to provide support to the most-affected sectors and workers while the pandemic is ongoing. Remedial policies for the setback to human capital accumulation, measures to lift investment, and initiatives to support reallocation (retraining, reskilling, and insolvency procedures) will be key to address long-term GDP losses and the rise in inequality.

Introduction

A crisis like no other. The COVID-19 pandemic has led to a severe global recession that is unique in many ways. The contraction in 2020 was very sudden and deep compared with previous global crises, even as the policy response in many countries was swift and sizable. Global output declined about three times as much as during the global financial crisis in half the time. The pandemic crisis also stands out for its differential impacts across sectors and countries, complex channels of transmission, and high uncertainty about the recovery path, given that it depends on the fate of the virus itself.

An extraordinary policy response. The policy response has also been unprecedented—both in size, particularly in advanced economies, and in the use of novel "lifeline" measures akin to disaster relief, to improve health care systems and lessen the pain for households, workers, and firms.[1] About 40 percent of the fiscal response in Group of 20 (G20) advanced economies (30 percent in G20 emerging market economies) was directed to firms and initiatives to preserve employment.[2] Support in emerging markets and developing economies has been generally more limited (see the April 2021 *Fiscal Monitor*).

Exceptional uncertainty. Continued uncertainty about the duration of the health crisis affects all aspects of the recovery path. Moreover, questions about the potential permanent effects of the shock become more prominent as the pandemic persists: how much scarring (persistent damage to supply potential) could occur?[3] With COVID-19 now continuing for more than one year, some degree of supply-side scarring from decreased productive

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[1]Numerous monetary and financial sector policies were deployed to support credit provision and provide liquidity to firms (see the October 2020 *Global Financial Stability Report* (GFSR)). Fiscal measures included transfers, expanded unemployment benefits, temporary tax cuts and deferrals, wage subsidies, direct and guaranteed loans, and equity injections (see the October 2020 *Fiscal Monitor*).

[2]Including above-the-line measures, such as grants and tax deferrals and reductions, and below-the-line equity injections and loans, but excluding government credit guarantees. The size and composition of the fiscal response varied across countries.

[3]Such supply damage could result from the loss of economic ties in production and distribution networks arising from job destruction and firm bankruptcies.

capacity and demand-side persistent preference shifts is likely. This will differ across countries, as the extent of the health crisis interacts with countries' economic structures (such as the importance of "high-contact" sectors, where people are in close proximity) and varying policy responses.

What are the main channels of scarring and implications for the medium-term outlook? The atypical features of the crisis—its severity, differential impacts, complex transmission, and high uncertainty—make assessment of the economic effects of COVID-19 challenging. To shed light on these issues, this chapter investigates the following questions:

1. What can we learn about prospects for scarring from historical experience with recessions? What are the most relevant channels in the current setting (productivity, labor, capital)?
2. How important are sectoral spillovers in propagating shocks to the broader economy? How relevant are such effects in the current crisis?
3. Given (1) and (2), what are the implications for the medium-term outlook?

The main findings of the chapter are the following:

- *The prospects for scarring from COVID-19 are substantial, even if lower than after the global financial crisis*. Severe recessions in the past, particularly deep ones, have been associated with persistent output losses. The relative financial stability following the COVID-19 shock so far is encouraging, however, as the greatest scarring in the past has occurred in recessions associated with financial crises.[4] Experience from previous recessions also suggests that the productivity channel could be particularly important, as recessions have typically been followed by persistent losses to total factor productivity (TFP).
- *Sectoral productivity shocks have persistent effects and sectoral spillovers have been an important amplification mechanism.*[5] On average, sectors have not recovered after productivity shocks in the past, demonstrating the potential for permanent declines in sectors most affected by the COVID-19 shock. Although the relative size of sectoral spillovers (compared with the effect of shocks within the same sector) is smaller for the COVID-19 shock than in past recessions (given that high-contact sectors are less central to production networks), spillovers are still sizable and are likely to have meaningfully amplified the COVID-19 shock.
- *Expected medium-term output losses from the pandemic shock are sizable, but they exhibit significant variation across economies and regions*. Despite higher-than-usual growth as the global economy recovers from the COVID-19 shock, world output is still anticipated to be about 3 percent lower in 2024 than pre-pandemic projections suggested. This expected scarring is less than what was seen following the global financial crisis, consistent with financial sector disruptions being contained in the current crisis. Unlike during the global financial crisis, when advanced economies were much more affected, emerging market and developing economies are expected to have deeper scars than advanced economies. This reflects in part their more muted policy responses, as countries with larger pandemic-related fiscal responses are projected to experience smaller losses. After accounting for income differences, economies that are more reliant on tourism, and those with larger service sectors, are projected to experience more persistent losses.

After a brief primer on the economic impacts of supply versus demand shocks in the context of the pandemic, this chapter turns to the analysis of previous recessions and channels through which scarring occurred. Then, to better understand how a large and uneven shock, such as that of the COVID-19 pandemic, can transmit through domestic and global supply chains, the section that follows examines historical sectoral shocks and their spillovers to other sectors. The next section examines the implications for the medium-term outlook. The penultimate section draws together the implications for policies to limit scarring from the crisis. The chapter concludes with a summary of the main takeaways.

[4]While the global financial system has been resilient so far during the pandemic, some stresses are emerging, with asset valuations appearing stretched, financial vulnerabilities intensifying in some sectors, and loan defaults potentially increasing in 2021 as debt service moratoriums expire. A repricing of risk in markets and resultant tightening in financial conditions could interact with such vulnerabilities, further affecting confidence and endangering macro-financial stability (see Chapters 1 and 2 of the April 2021 GFSR).

[5]The analysis considers sector level changes to TFP, which reflects technology changes as well as the efficiency of combining inputs in the production process.

Table 2.1 Differential Impact across Sectors

High-contact, affected sectors
Effectively shut down
For example, hotels, restaurants, transportation, brick-and-mortal retail
Supply and demand collapsed simultaneously.
High-contact, less-affected sectors
Essential services and outdoor activities
For example, health services, grocery stores, construction
In some, supply was constrained and demand increased.
Low-contact service sectors
Shifted quickly to online delivery
For example, professional and business services
Supply was largely unaffected, but demand decreased.
Other low-contact sectors
For example, manufacturing
Supply was constrained; demand increased or decreased depending on subsector.

Source: IMF staff compilation.

Demand and Supply in a Low-Contact Economy: A Primer on the Pandemic Shock

Given the unique nature of the crisis, a brief exploration of the supply and demand shocks at play can help outline the transmission of the pandemic's economic effects and its differential impacts across sectors and countries. Sectors can be grouped into four categories based on their contact intensity and vulnerability to disruption by the pandemic (Table 2.1). High-contact, affected sectors have been most severely impacted by lockdowns and other pandemic containment measures (Figure 2.1, panel 1), but the decline in activity was also sudden and severe in other sectors.

- *On the supply side*, lockdowns reduced effective productive capacity. Some businesses also experienced lower productivity because they had to reorganize production to increase the physical distance between workers. These initial sectoral supply shocks spilled over to affect supply in other sectors through links in production networks.[6]
- *Demand* fell due to reduced mobility and as precautionary savings rose amid heightened uncertainty. The initial supply shocks also propagated to a decline in demand.[7] This propagation was amplified in many cases by liquidity-constrained households and firms forced to cut back on outlays, leading to more layoffs and further declines in private spending.[8]

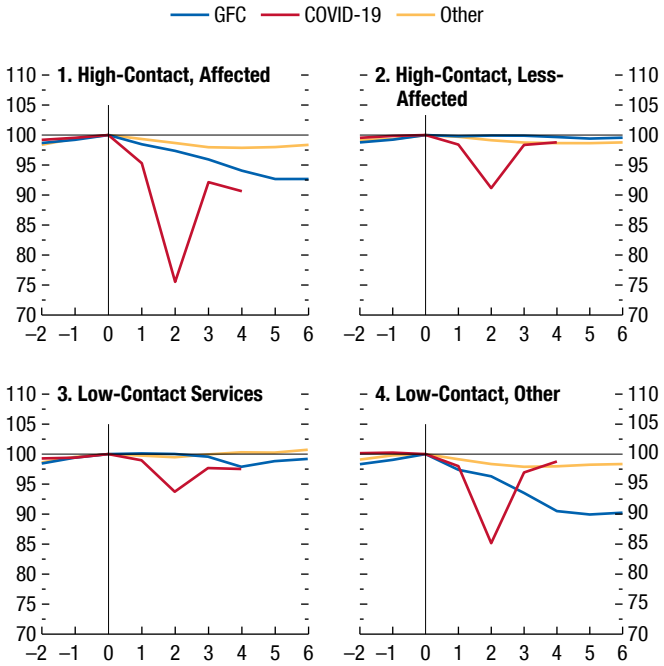
[6]See Baqaee and Farhi (2020) for an illustration.

[7]See Guerrieri and others (2020) and Baqaee and Farhi (2021) for models in which supply shocks can transform into Keynesian aggregate demand shocks.

[8]A large portion of the policy response was focused on mitigating household and firm liquidity constraints, but the number of households and firms in financial distress rose nonetheless in many countries following the COVID-19 outbreak. See Li and others (2020).

Figure 2.1. Value Added during Recessions, by Sector Group
(Index, last prerecession quarter = 100)

COVID-19 led to a sharp contraction. High-contact sectors have been most severely affected, but the contraction was also sudden and severe in other sectors.



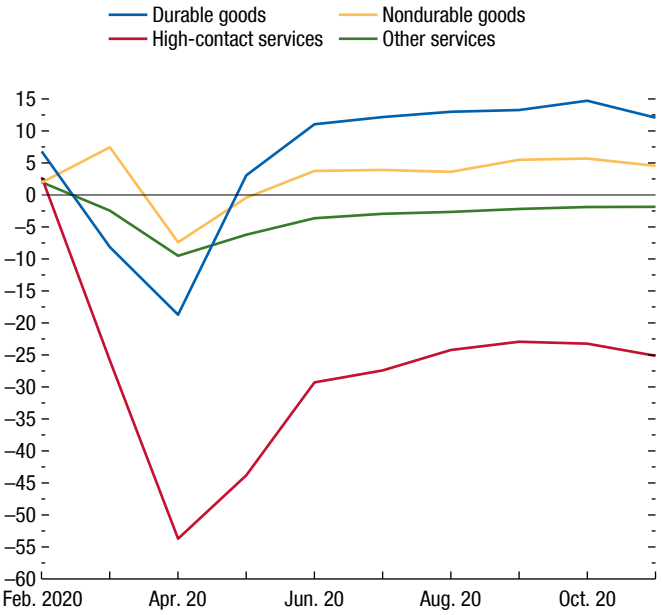
Sources: Organisation for Economic Co-operation and Development; US Bureau of Economic Analysis; and IMF staff calculations.
Note: Data are for 1990:Q1–2020:Q4 from 38 countries (the number of countries used for each recession line varies). Time since the shock (in quarters) is on the *x*-axis. Lines are averages weighted by country's purchasing-power-parity GDP, with quarter 0 as the last prerecession quarter. For the COVID-19 crisis, quarter 0 is 2019:Q4. For the global financial crisis (GFC), quarter 0 is the country-specific date of peak real GDP during 2007–08. Other recessions are country specific and identified by two consecutive quarters of negative growth during 1990–2006 and 2009–19. High-contact, affected sectors are accommodation and food services; arts, entertainment, and other service activities; wholesale and retail trade; and transportation; high-contact, less-affected sectors are construction; and public administration, education, and health care; low-contact services are information and communication; financial and insurance activities; real estate activities; and other professional and scientific activities; other low-contact sectors are agriculture; manufacturing; and mining and utilities.

Overall, the economic contraction in the first half of 2020 is best understood as a combination of a massive initial supply shock and a large decline in demand, with propagation through production networks. The swift action taken by policymakers cushioned household income and firms' cash flow, improved confidence, and prevented a rapid amplification of shocks through the financial sector and further demand channels.

Focusing on the case of the United States, for which detailed and timely data are available, a picture emerges of the relative strengths of the supply and

Figure 2.2. Consumption Patterns during COVID-19 in the United States
(Year-over-year percent change)

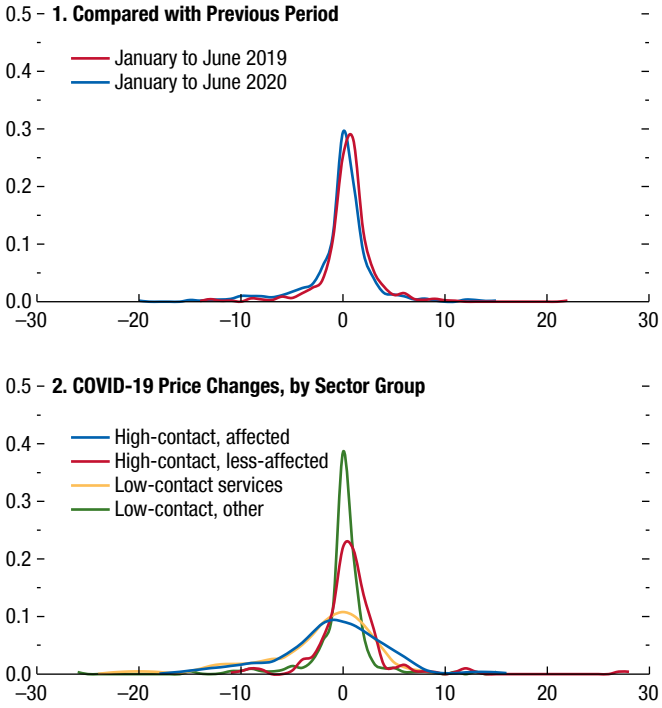
In the United States, an increase in durable goods consumption partially offset the decrease in consumption of high-contact services.



Sources: Haver Analytics; and IMF staff calculations.
Note: High-contact services are food, accommodation, recreation, and transportation services.

Figure 2.3. Sectoral Price Changes in the United States
(Kernel density)

Price movements have been muted overall, but there has been more dispersion in service sectors.



Sources: Bureau of Labor Statistics; and IMF staff calculations.
Note: Percent change in industry-level US producer prices on *x*-axis. Data are for the United States. In panel 2, price changes are from January to June 2020. See Table 2.1 for a description of the sector groups.

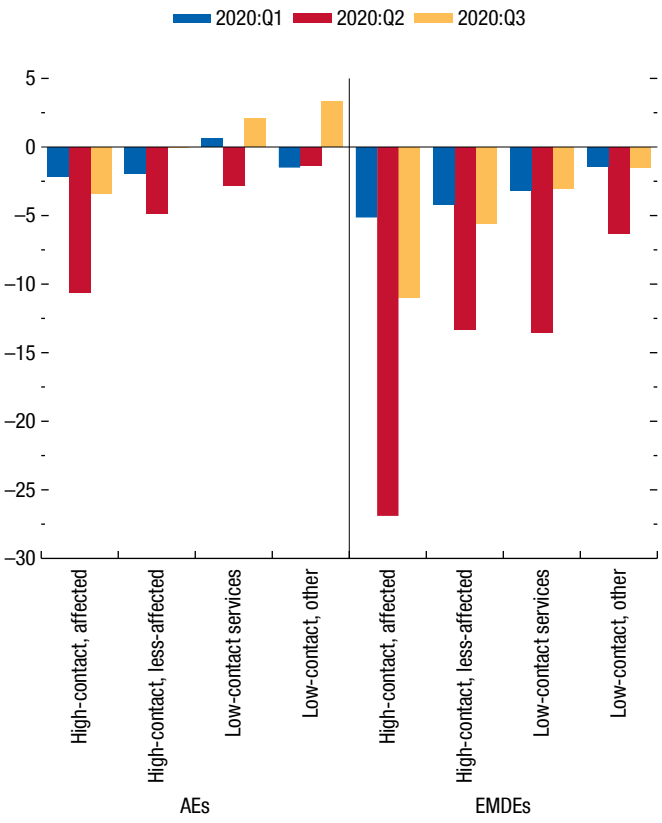
demand forces at work. While quantities purchased initially fell across the board (Figure 2.2), changes in prices have been relatively muted (Figure 2.3, panel 1). Price movements across four sector groupings point to differential impacts across sectors (Figure 2.3, panel 2). Wider dispersion in price movements is seen, for example, among the more-affected, high-contact sectors and among services more generally. Statistical decompositions of sectoral price variation suggest that supply shocks dominated, accounting for about two-thirds of the decrease in employment and output in the United States in the second quarter of 2020 (Bekaert, Engstrom, and Ermolov 2020; Brinca, Duarte, and Faria-e-Castro 2020), but with large demand shocks in the food services, accommodation, and tourism sectors (del Rio-Chanona and others 2020).

As a result of the differential impact across sectors, countries with a larger share of high-contact sectors have been more exposed to the pandemic recession and had larger contractions. Economic structure has also affected the effectiveness of the policy response; high informality in labor markets, for example, has made containment measures difficult and aggravated the crisis (see the October 2020 *Regional Economic Outlook: Western Hemisphere*). Countries dependent on tourism have been severely affected and are most vulnerable to the length of the crisis and travel-related restrictions (see Box 2.1). Within countries, the crisis has had uneven effects on workers and firms. Employment declines have been disproportionately concentrated among lower-skilled workers (see Chapter 3), while exits at small businesses appear to be increasing (Crane and others 2020; see also Figures 2.4 and 2.5).

As the pandemic has progressed, and lockdowns have been lifted and reimposed, sometimes for

Figure 2.4. Employment, by Sector Group
(Total hours worked, cumulative percent change from 2019:Q4)

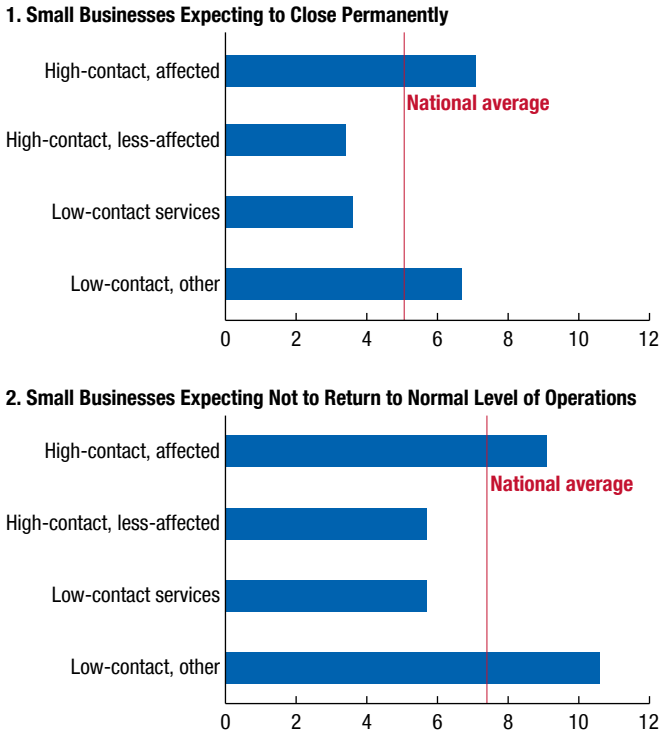
Employment fell in many economies in the first half of 2020 and has recovered less in high-contact sectors.



Sources: International Labour Organization; and IMF staff calculations.
Note: Data are from 43 economies (27 AEs, 16 EMDEs) for 2019:Q4–20:Q3.
AEs = advanced economies; EMDEs = emerging market and developing economies.

Figure 2.5. Impact on US Small Businesses
(Percent of businesses)

COVID-19 has affected small businesses in particular, with many more expecting to close or have a permanent decline in business.



Sources: US Census Bureau, Small Business Pulse Survey, Phase 3 (Nov 9, 2020–Jan 10, 2021); and IMF staff calculations.
Note: The sample includes approximately 885,000 businesses from the United States. A small business is defined as a single location business with employment between 1 and 499.

narrower regions or in a less restrictive manner than in early 2020, the supply shocks have unwound to varying degrees across sectors. The effectiveness of measures taken by businesses to adapt to the lower-contact environment has also varied across sectors, leaving the remaining supply constraints highest in the high-contact sectors.

Overall, the potential for medium-term scarring from the pandemic in an economy appears related to the interplay of four elements: (1) the future path of the pandemic and associated containment measures, (2) the heavier impact of the pandemic shock on high-contact sectors, (3) the capability of businesses and workers to adapt to a lower-contact working environment and lower-contact transactions, and (4) the effectiveness of the policy response to limit economic damage. The chapter next examines the historical experience to get a better sense of the persistent effects of downturns (for typical recessions, financial crises, and pandemics), the channels—including propagation across sectors—by which they occur, and how the COVID-19 crisis may or may not be different.

Analysis of Historical Recessions

This section first looks at the aftermath of previous recessions, distinguishing between more typical downturns and those associated with financial crises and pandemics, to get a sense of how long lived their effects have tended to be and the supply-side channels

(capital, labor, and productivity) through which they manifest. It then analyzes the sectoral dimension of recessions and their propagation, focusing on how the production structure of an economy can amplify and spread an initial, more-concentrated adverse shock.

Prospects for Scarring from COVID-19 Are Substantial

Permanent damage to an economy's supply potential following a "typical" recession can occur through a number of channels.[9]

- First, unemployment may remain high even after the recession (Blanchard and Summers 1986) and could result in a smaller labor force as discouraged workers exit. Human capital accumulation and future earnings can be affected by skill deterioration during extended periods of unemployment, delayed labor market entry for young workers, and negative effects on educational achievement in the longer term.[10]
- Weak investment could result in slower physical capital accumulation and affect productivity through slower technology adoption.
- Productivity could also be permanently affected by the loss of firm-specific know-how as a result of bankruptcies and their spillovers (Bernstein and others 2019), the effects of a decline in research and development and innovation during the recession, and an increase in resource misallocation (see, for example, Furceri and others 2021).

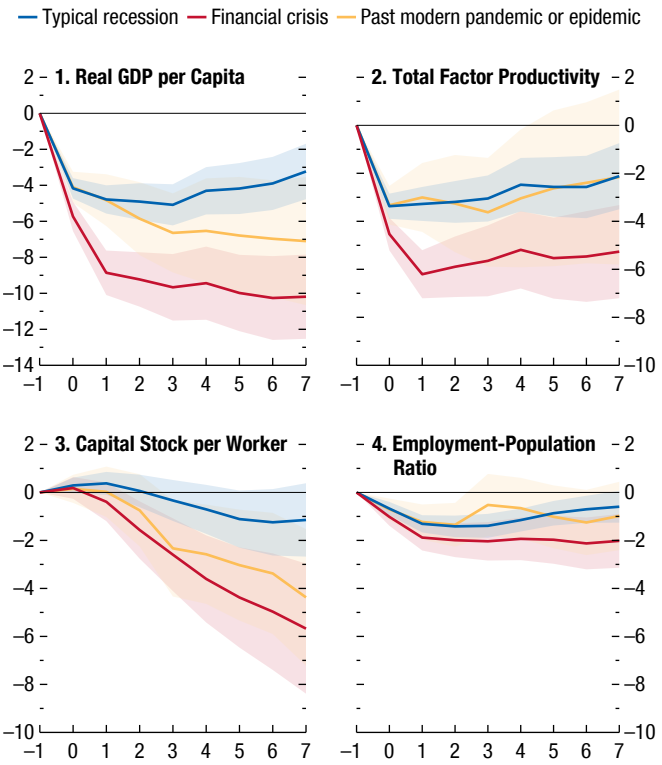
Recoveries from past recessions point to persistent effects on output paths (Figure 2.6, panel 1).[11] For typical recessions—those that do not coincide with violent conflict, a financial crisis, pandemic, or natural disaster—the depressed output path results primarily from persistently weaker productivity, while the employment rate declines somewhat in the short term before recovering.[12]

Previous epidemics and pandemics in the modern era have been followed by output losses of magnitudes larger than those following typical recessions, but smaller than those following financial crises (Figure 2.6, panel 1).[13] The COVID-19 pandemic, however, is even more widespread than past, modern-era pandemics,

Figure 2.6. Medium-Term Output Losses and Channels of Impact

(Percentage points)

For typical recessions, medium-term output losses can be attributed primarily to losses in TFP. For financial crisis recessions, TFP, capital-to-worker ratios, and employment losses all play a role.



Sources: Penn World Table 10.0; and IMF staff calculations.
Note: The solid lines represent the estimated cumulative impulse response functions and shaded areas represent 90 percent confidence intervals. Time since the shock (in years) on the *x*-axis. Past modern pandemics and epidemics include Hong Kong flu, SARS, H1N1, MERS, Ebola, and Zika. See Online Annex 2.2 for details. TFP = total factor productivity.

[9]See Cerra, Fatás, and Saxena (2020) for a review of the related literature.

[10]Parental job losses can adversely affect children's schooling and future labor market outcomes (Oreopoulos, Page, and Stevens 2008; Stuart, forthcoming). In the short-term, however, reduced labor market opportunities during recessions can lead to higher educational attainment for high school- and college-aged students.

[11]The analysis uses unbalanced panel data for 115 countries from 1957 to 2019. Recessions are divided into those associated with financial crises, previous pandemics, natural disasters, conflicts, and other "typical" recessions. See Online Annex 2.2 (all annexes are available at www.imf.org/en/Publications/WEO) for the local projection model specification. Permanent output loss following recessions has also been found in the literature (for example, Cerra and Saxena 2008; Ball 2014; and Blanchard, Cerutti, and Summers 2015).

[12]Furceri and others (2021), which uses a measure of utilization-adjusted productivity and focuses on deep recessions in advanced economies, also finds that these recessions lead to permanent losses in TFP because of an increase in resource misallocation across sectors.

[13]There are six of these in the sample: 1968 flu, SARS, H1N1, MERS, Ebola, and Zika.

and more severe, suggesting a greater potential for damage.[14] The absence of a financial crisis following COVID-19 thus far is favorable, however; the greatest scarring has occurred following recessions associated with financial crises (Figure 2.6, panel 1), with permanent deteriorations in TFP, the capital-to-worker ratio, and per capita employment.[15]

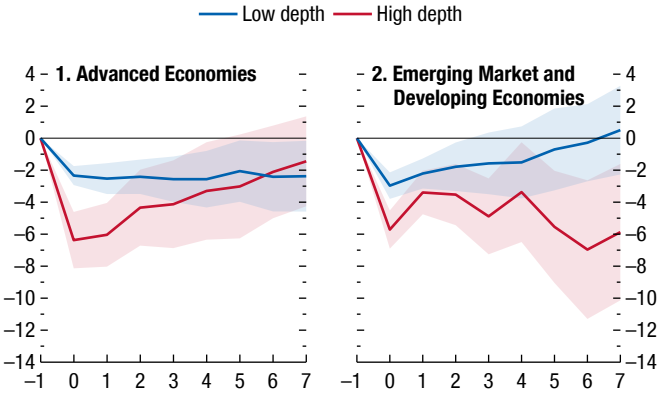
Deep recessions, comparable to the 2020 episode, have had different recoveries across country groups. In advanced economies, deep but short-lived recessions are associated with V-shaped recoveries and no permanent output loss after several years (Figure 2.7, panel 1). Emerging market and developing economies, however, experience protracted downturns and permanent losses, on average (Figure 2.7, panel 2).[16]

Scarring in the labor market may be larger with the COVID-19 shock than in past recessions, as some high-contact sectors may shrink permanently. Moreover, widespread school closures have occurred across countries, with disproportionately adverse impacts on schooling in low-income countries and those less prepared to switch to virtual learning (Box 2.2). Greater scarring through the physical capital channel could also occur as a persistent shrinkage of high-contact sectors could also result in sector-specific capital being stranded[17] and the large corporate debt buildup during the crisis (see Chapter 2 of the April 2021 GFSR) could hamstring more-leveraged firms and weaken investment.

Productivity-decreasing resource mismatches from the COVID-19 crisis, across sectors and occupations, may be larger than in previous crises, depending on how permanent the asymmetric losses are.[18] COVID-19–related disruptions to upstream and downstream suppliers in the production network could also have knock-on effects, hurting productivity in connected firms. Productivity could also be negatively affected by a decline in competition, if the market power of large companies increases due to small business closures in high-contact sectors and even more

Figure 2.7. Recovery Paths following Deep and Shallow Recessions
(Percentage points)

A larger bounce-back occurs after deeper recessions, but permanent real GDP losses still result in emerging market and developing economies.



Sources: Penn World Table 10.0; and IMF staff calculations.
Note: The solid lines represent the estimated cumulative impulse response functions; the shaded areas represent 90 percent confidence intervals. Time since the shock (in years) is on the *x*-axis. High- and low-depth recessions are split, based on the median per capita output loss. The figure includes only recessions that last one year and does not include recessions related to financial crises, past modern pandemics and epidemics, disasters, or conflicts. See Online Annex 2.2 for details.

[14]The Spanish flu of 1918–20 was a global and severe pandemic, comparable to COVID-19 from an epidemiological perspective, but less so from an economic perspective because it broke out in the last year of World War I. US GDP, for example, grew by 9 percent in 1918, even as the pandemic killed an estimated 40–50 million people worldwide. See Barro, Ursúa, and Weng (2020), which attempts to disentangle the effects of the flu and war deaths. Other recent studies of the economic effects of epidemics and pandemics include Jordà, Singh, and Taylor (2020) and Ma, Rogers, and Zhou (2020).

[15]Larger output losses following financial crises have occurred in both advanced economies and emerging market and developing economies (Online Annex 2.2). Chapter 4 of the October 2009 WEO and Chapter 2 of the October 2018 WEO also document larger output losses following banking crises, stemming from lasting declines in capital per worker, TFP, and employment. Adler and others (2017) analyzes the widespread decline in TFP growth following the global financial crisis.

[16]Chapter 2 of the October 2012 WEO shows that economic performance in many emerging market and developing economies improved substantially over the preceding two decades, after relatively deep and protracted downturns in the 1970s and 1980s. The chapter finds that the improvement is due largely to greater policy space and improved policy frameworks, with inflation targeting and a countercyclical fiscal policy significantly increasing both the length of expansions and speed of recoveries after recessions.

[17]Chapter 3 of the April 2021 GFSR discusses the implication of structural shifts in the demand for commercial real estate properties after COVID-19. Vacancy rates in the retail segment could increase significantly, as demand for traditional brick-and-mortar retail erodes further.

[18]Productivity could improve, however, if reallocation forces shift resources from unviable businesses in lower-productivity, high-contact sectors toward higher-productivity service sectors and industries. Bloom and others (2020) finds that, in the United Kingdom, this positive between-firm reallocation effect is likely to only partially offset the negative within-firm effects. The study estimates private sector TFP to be 5 percent lower at the end of 2020 than it would have been, and likely to remain 1 percent lower in the medium term.

broadly.[19] At the same time, the pandemic has spurred increased digitalization and innovation in production and delivery processes, likely helping to offset the adverse productivity shock in some countries, as others lack the prerequisite widespread and reliable connectivity (Njoroge and Pazarbasioglu 2020).

Taken together, these factors suggest that the prospects for scarring differ across countries, depending on their exposure to the COVID-19 shock. This is partly related to the specific production structure of the economy and how it transmits the COVID-19 shock, which are considered in the next subsection.

Recessions Typically Feature Shock Amplification via Sectoral Spillovers

Digging deeper into how shocks transmit, this section draws implications for the COVID-19 crisis on sectoral spillovers from the hard-hit, high-contact sectors. It highlights the importance of productivity shocks in explaining both sectoral and aggregate outcomes through their persistence and amplification in supply chains, and illustrates an important channel through which productivity losses can lead to medium-term scarring as discussed in the previous section.

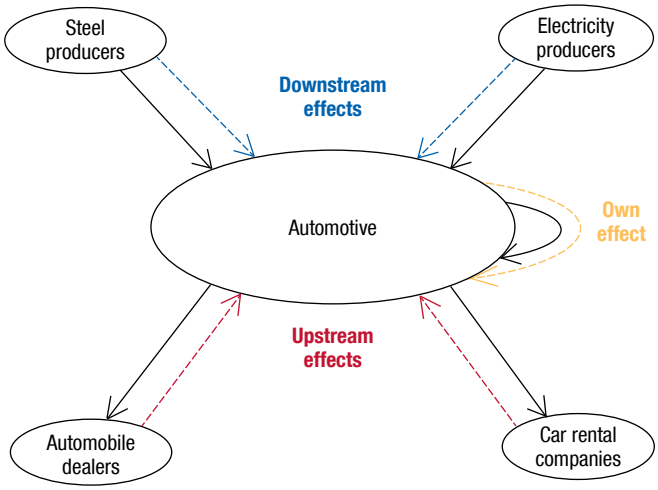
While the high-contact sectors, such as restaurants and retail trade, are less central to production networks than, say, the energy sector or financial intermediation, and supply disruptions turned out to be shorter lived than initially feared, the analysis indicates large spillovers by historical standards due to the size of the COVID-19 disruption. These spillovers considerably amplified the initial shocks to the locked-down sectors and may cause persistent aggregate output losses. Specifically, the analysis shows that losses are not limited to the high-contact sectors themselves but can be greatly amplified through production networks.

The sector-level analysis measures the size and persistence of sectoral spillovers in the past and makes use of intercountry input-output tables to map links across sectors.[20] For each sector, the exercise estimates the effects of shocks in the same sector (*own effect*) and from other sectors (*spillover effects*) on the cumulative change in real gross value added.

- *Spillover sources.* Shocks from other sectors are grouped into upstream and downstream, based on their origin: downstream effects are those stemming from shocks traveling downstream from suppliers to the focal sector of interest, while upstream effects are those traveling upstream from customers to the focal sector (Figure 2.8). For example, a productivity shock to the steel industry is likely to affect the downstream automotive industry, while a decrease in government purchases of cars will reverberate upstream to the steel industry. Upstream and downstream shocks are further divided into domestic and foreign sources. Overall, there are four types of shocks examined, based on their position in the production network: upstream domestic, upstream foreign, downstream domestic, and downstream foreign.
- *Supply and demand shocks.* The transmission of two types of sector-level shocks is analyzed: a supply

Figure 2.8. Own and Spillover Effects

A stylized version of the production network for the automotive sector illustrates own, downstream, and upstream effects. Own effects result from shocks originated in the same sector. Downstream and upstream effects result from shocks originated in supplier and customer sectors, respectively.



Source: IMF staff.
Note: Solid, black arrows correspond to (net) trade flows. Dashed, colored arrows correspond to shocks and their resultant effects on the focal sector (automotive).

[19]See Bernstein, Townsend, and Xu (2020), for example, which documents this "flight to safety" of consumers and job-seekers toward known brands and large companies in the US labor market. At the same time, new business formation in the United States reached a record high in the third quarter of 2020 (Brown 2020).

[20]Online Annex 2.3 provides additional details on the empirical specification, which builds upon Acemoglu, Akcigit, and Kerr (2016) and Acemoglu and others (2016).

shock, proxied by changes in sectoral TFP; and a demand shock, captured by changes in sectoral government spending.[21]

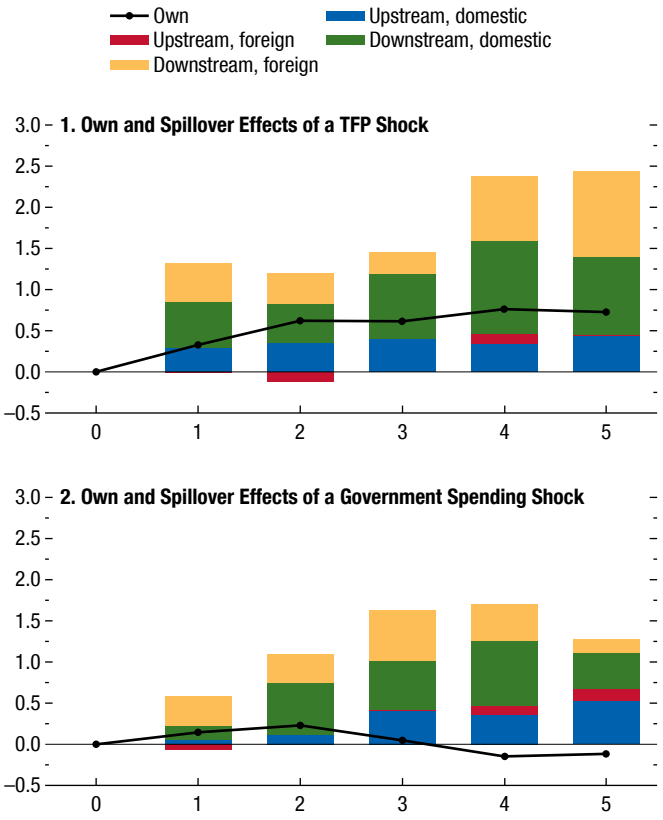
Spillover effects are large compared with the "own" effect for both types of shocks. For a productivity shock, total spillover effects are almost two times larger than the own effects, on average (Figure 2.9, panel 1).[22] For the government spending shock, spillover effects are broadly the same size as for the supply shock, while own effects are smaller (Figure 2.9, panel 2). As a result, the relative size of the spillover effects, compared with the own effect, is about seven times larger for the government spending shock than for the productivity shock. Spillover effects are persistent for both types of shocks, remaining sizable up to five years after the shock hits, although even more so for productivity shocks.[23] This means that the pandemic not only reduced activity in sectors directly exposed to the COVID-19 shock, but was amplified through spillovers to connected sectors. This has important implications, in particular for countries where high-contact sectors are a large part of the total economy, as discussed in the following section and in Box 2.1.

Productivity shocks also tend to have much larger estimated downstream effects, consistent with earlier literature, which also finds large downstream effects, as shocks to the productivity of suppliers leads to price changes that in turn affect quantities in the focal sector downstream (Acemoglu, Akcigit, and Kerr 2016).[24]

Shock amplification through the sectoral structure of production—including for negative shocks, as occurs in recessions—can be substantial. The importance of negative sectoral productivity shocks to potential scarring is apparent from the next set of findings shown here. On average, a sector does not recover from a typical adverse productivity shock in its own sector, with the sector's share of total gross value added remaining 5 percent lower up to five years after the shock (Figure 2.10, panel 1). Government spending shocks and shocks originating in other sectors, however, do not statistically significantly affect a sector's share in total gross value added, although there are signs that productivity shocks elsewhere may have longer-lived effects (Figure 2.10,

Figure 2.9. Own and Spillover Effects from Sectoral Shocks
(Cumulative change in GVA, percentage points)

Supply (TFP) and demand (government spending) shocks have led to large and persistent spillovers in the past.



Sources: World Input-Output Database; and IMF staff calculations.
Note: Bars and dots represent the estimated coefficients of the cumulative impulse response function for sectoral GVA from a one-standard-deviation increase in each shock type. See Online Annex Tables 2.3.1 and 2.3.2 for the significance of each individual coefficient. Total spillover effects (encompassing all four network shocks) from TFP shocks (reported in Online Annex Table 2.3.1, panel B) are statistically significant at the 1 percent level at horizons 1 to 5; total spillover effects from government spending shocks (reported in Online Annex Table 2.3.2, panel B) are statistically significant at the 5 percent level at horizons 2 to 4. The sample covers up to 31 advanced and 12 emerging market economies over 1995–2014. Own effects result from shocks originated in the same sector. Downstream domestic/foreign and upstream domestic/foreign effects result from shocks originated in domestic/foreign supplier and customer sectors, respectively. See Online Annex 2.3 for further methodological details. GVA = gross value added; TFP = total factor productivity.

[21]For each sector, TFP changes are calculated as the change in real gross value added minus total hours worked, weighted by the sectoral labor share, and the real fixed capital stock, weighted by the capital share. Changes in sectoral government spending are calculated as the share of country-level government spending directed to each sector according to input-output links.

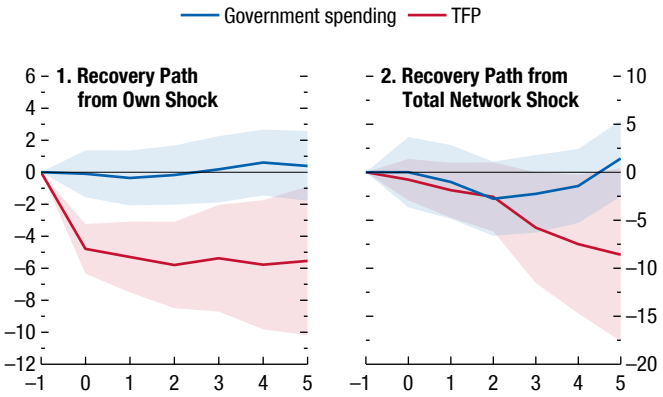
[22]The standardization of the effects reported in Figure 2.9 implies that the total network effect is different from the sum of the four network effects. Online Annex 2.3 describes the methodology adopted to derive the total network effect.

[23]Total spillover effects from TFP shocks are statistically significant from horizons one to five years after the shock, while total spillover effects from government spending shocks remain statistically significant up to four years after the shock. See Online Annex Tables 2.3.1 and 2.3.2.

[24]The result of a dominant role for upstream effects in response to demand shocks found in previous studies focusing on domestic spillovers in the United States is, however, not confirmed in the broader sample analyzed in this chapter.

Figure 2.10. Recovery from Negative Sectoral Shocks
(Cumulative change of sectoral share in GVA, percentage points)

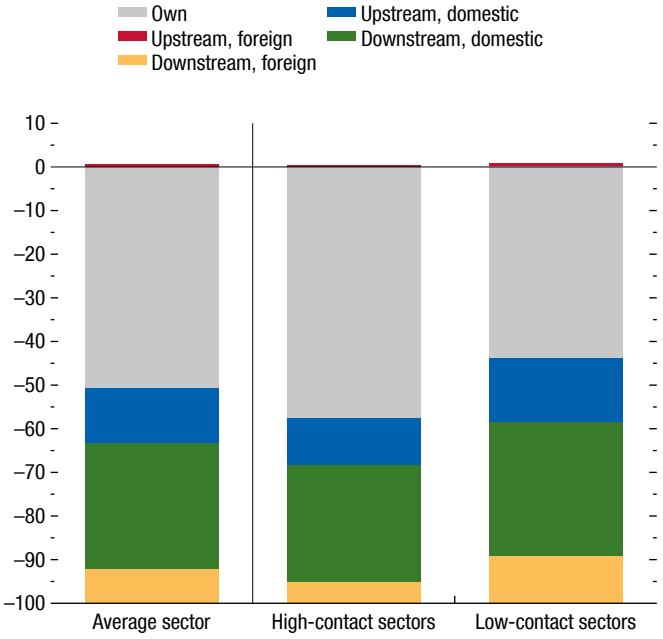
Sectors shrink permanently after a TFP shock originating in its own sector, on average. Neither government spending shocks nor network shocks have significant effects on sector size.



Sources: World Input-Output Database; and IMF staff calculations.
Note: The solid lines represent the estimated coefficients of the cumulative impulse response function for the sectoral share in GVA from a one-standard-deviation decrease in own shock (panel 1) and of total network shocks (panel 2). Shaded areas are 95 percent confidence intervals, with standard errors clustered at the country-sector level. Time since the shock (in years) on the *x*-axis. The sample covers up to 43 economies (31 advanced and 12 emerging market economies) over 1995–2014. See Online Annex 2.3 for further details.
GVA = gross value added; TFP = total factor productivity.

Figure 2.11. Relative Own and Spillover Effects from the COVID-19 Shock
(Percent contribution to the 2020 GVA decline)

There were significant spillovers from the COVID-19 shock, relatively larger for low-contact sectors.



Sources: World Input-Output Database; OECD Quarterly National Accounts; International Labour Organization; and IMF staff calculations.
Note: The relative effects can be interpreted as those occurring in the aftermath of the initial shock in 2020. High-contact sectors are wholesale and retail trade, hotels and restaurants, entertainment and personal services, transportation, education, health care, and construction. Low-contact sectors are all the others. Effects are reported with the reverse sign. Sample covers up to 34 countries (24 advanced and 10 emerging markets) over 1995–2014. See Online Annex 2.3 for details. GVA = gross value added.

panels 1 and 2). The COVID-19 demand shocks are likely to have larger and more persistent effects than the typical past spending shock, however, as they may induce permanent shifts in consumer preferences. Taken together, these results illustrate the importance of sectoral exposure to the COVID-19 shock and spillovers based on economic structure in shaping medium-term losses.

Sectoral Propagation in the COVID-19 Crisis

To understand the importance of sectoral spillovers in the current crisis, a back-of-the envelope exercise is considered, which combines the historical coefficients presented in the previous subsection, the sectoral changes to employment and productivity in 2020, and the pre-pandemic network structure from input-output tables. This exercise indicates that sectoral spillovers have also been significant in the current crisis (Figure 2.11). Downstream effects—from suppliers to final demand—are again dominant, which highlights the importance of supply shocks in this crisis and, in particular, of the productivity channel. Foreign spillovers appear to have a more limited role, consistent with recent studies of the transmission of the COVID-19 shock through global value chains (Bonadio and others 2020; Cerdeiro and Komaromi 2020).[25]

The "own effect" is larger for high-contact sectors while the relative importance of spillovers is larger for low-contact sectors (Figure 2.11). The absolute size of the spillovers in low-contact sectors remains relatively modest, however, as the contraction in gross value added is less severe (see Figure 2.1). Moreover, while still sizable, the relative size of sectoral spillovers compared with own effects in the COVID-19 crisis is smaller than historical spillovers from productivity and government spending shocks. The difference

[25]Bonadio and others (2020) finds that one-quarter of the average real GDP downturn caused by the COVID-19 shock was due to transmission through global supply chains, while Cerdeiro and Komaromi (2020) shows that lockdowns in early 2020 resulted in strong but short-lived trade spillovers.

results from the current shock's concentration in sectors that are more peripheral to production networks (predominantly services), unlike in previous downturn episodes. However, the magnitude of the COVID-19 shock, especially for countries with large sectoral exposure, means that the current crisis could still result in substantial scarring, as shown in the following section.

Moreover, the longer the crisis continues—and if the number of small business failures climbs—the greater the likelihood the shock will spread widely across economies. From closed restaurants and bars, to farms and wineries shutting down, to lower demand for tractors and other agricultural equipment, damage to high-contact sectors will continue to spread to other sectors. Drawing on the transmission and scarring channels identified here, the next section discusses implications of the COVID-19 shock for the medium-term outlook, including the role of sectoral composition of economies.

Implications for the Medium Term: How Persistent Are Output Damages from COVID-19 Likely to Be?

A Unique Crisis with a Wide Range of Possible Medium-Term Outcomes

As discussed in the previous section, the historical record suggests that most recessions leave persistent scars—largely through lower productivity growth and (in the case of pandemic recessions and financial crises) slower capital accumulation. Moreover, adverse productivity shocks concentrated in some sectors can propagate, spilling over to other sectors and contributing to a broader downturn. Because the sectoral propagation is different from the past—with more peripheral sectors (high-contact sectors) worse affected this time—the overall scarring for the (average) economy may therefore be less severe than in previous episodes, even if the effects for the hardest-hit sectors end up larger than in the past. Nevertheless, differences in sectoral composition across countries could bring about differences in the magnitude of medium-term output losses.

In addition, the unprecedented policy response has helped preserve economic relationships, cushioned household income and firms' cash flow, and prevented amplification of the shock through the financial sector. These actions helped maintain a foundation from which activity has been able to recover quickly (Chapter 1). Moreover, large household savings accumulated during the pandemic (for instance, in advanced economies) point to the possible release of pent-up demand and boost to growth once the health crisis comes to an end and restrictions are durably lifted. These factors suggest that medium-term damages following the extreme contraction of 2020 could be less severe than the depth of that collapse would suggest, based on past patterns.

However, as noted in Chapter 1, there is high uncertainty around the outlook, over both the short and medium term. The extent of scarring also depends on factors unique to a pandemic-driven downturn and inherently hard to predict: the path of the pandemic (whether transmission of new variants outpaces vaccinations and makes COVID-19 an endemic disease of as yet-unknown severity) and the scale of activity disruptions from restrictions needed to lower transmission before vaccinations start to deliver society-wide protection. Other factors also remain uncertain, including the effectiveness of the evolving policy response; possible amplification through the financial system; and global spillover channels, such as portfolio flows and remittances.

Expected Medium-Term Losses Are Sizable, but Typically Smaller than during the Global Financial Crisis

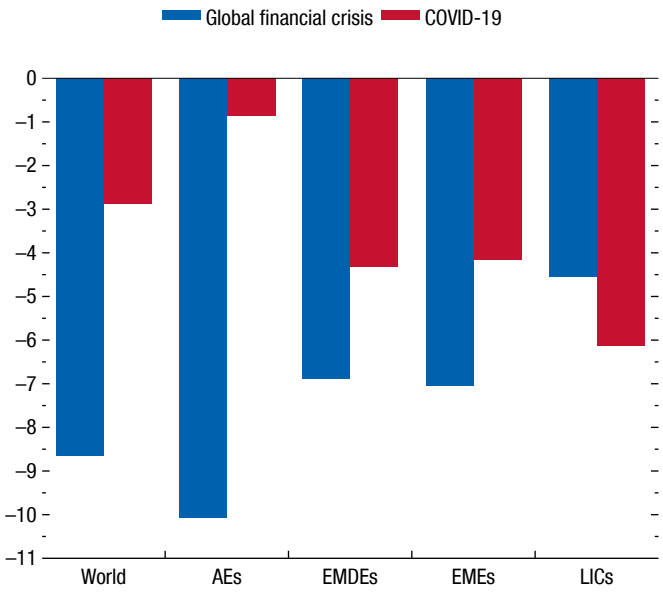
Taking into account this uncertainty, the medium-term (five-year horizon) outlook in the current forecast envisions output losses, relative to pre-pandemic projections, of about 3 percent for the world economy (Figure 2.12). By comparison, the lasting damages over a comparable period from the global financial crisis were larger, at almost 10 percent for the world as a whole.[26]

The smaller global losses currently expected from COVID-19, compared with the global financial crisis, reflect less severe impacts on advanced and, to a lesser extent, emerging market economies. In contrast, lower-income countries are expected to do worse, on average, than they did following the global financial crisis. These patterns are consistent with the baseline assumption of a sustained recovery from the current crisis in which financial stability risks remain contained,

[26]Figure 2.12 shows the expected medium-term output losses from COVID-19 and realized medium-term output losses following the global financial crisis. Forecasts for medium-term output losses one year into the global financial crisis show the same pattern. That is, expected medium-term output losses following the global financial crisis were considerably larger than is now expected for COVID-19, with larger losses expected in advanced and emerging market economies than in low-income countries.

Figure 2.12. Medium-Term Output Losses
(Percent difference from precrisis forecast)

Scars from the COVID-19 pandemic recession are expected to be less than those from the global financial crisis, but with emerging market and developing economies hurt more than advanced economies on average.



Source: IMF staff estimates.
Note: Bars show the percent difference in real GDP four years after the crisis and anticipated GDP for the same period prior to the crisis for the indicated group. For the COVID-19 crisis, it compares the current WEO vintage forecast for 2024 versus that from the January 2020 vintage (prior to the pandemic). For the global financial crisis, it compares the April 2013 vintage for 2012 versus the October 2007 vintage (prior to the start of the US recession at the end of 2007). Economy weights are fixed using April 2013 vintage year 2007 for the global financial crisis, and the current vintage year 2019 for the COVID-19 crisis. Sample consists of 178 economies. AEs = advanced economies; EMDEs = emerging market and developing economies; EMEs = emerging market economies; LICs = low-income countries; WEO = *World Economic Outlook*.

unlike what happened with the global financial crisis.[27] Moreover, advanced economy losses are expected to be much lower than in emerging market and developing economies, likely reflecting their larger policy support and anticipated faster access to vaccines and therapies.[28] Losses are expected to be largest among low-income countries, consistent with their more limited room to provide policy support. These differences in expected losses underscore the importance of universal vaccine access for both health and economic outcomes.

[27]The protracted period of financial stress in the global economy started with the subprime mortgage crisis in the United States in 2007 and continued through the euro area sovereign debt crisis, which peaked in 2012.

[28]The pandemic has exacerbated inequalities in both advanced and emerging market and developing economies, however. See Chapter 2 of the April 2021 *Fiscal Monitor*.

Expected Scarring Varies with Economic Structure and Size of Policy Response

A simple regression analysis of the correlates of news about expected medium-term output losses (as captured by forecast revisions) aligns with this story, suggesting that the average income level, the sectoral structure of the economy (its precrisis dependence on tourism and its precrisis services share), and the size of the fiscal policy response in 2020 help explain the variation across economies. The exercise examines revisions to output forecasts across economies, focusing on the outer years of the forecast horizon (2022–24).[29]

The largest impacts of the crisis are on the most tourism-dependent economies, with a one-standard-deviation increase in tourism and travel share of GDP associated with a 2.5 percent reduction in expected output in 2022 (Figure 2.13, panel 1). The exposure through tourism is expected to fade somewhat over time but remains close to 2 percent in 2024. Economies with larger service sectors are also likely to experience larger output losses, with a ½ percent reduction in expected output in 2022.[30] Policy support also plays an important role. Countries with larger pandemic-related above-the-line fiscal measures are projected to experience smaller losses, all else equal (see also Chapter 1 of the April 2021 *Fiscal Monitor*).

Uncertainty High and Dependent on the Pandemic Path

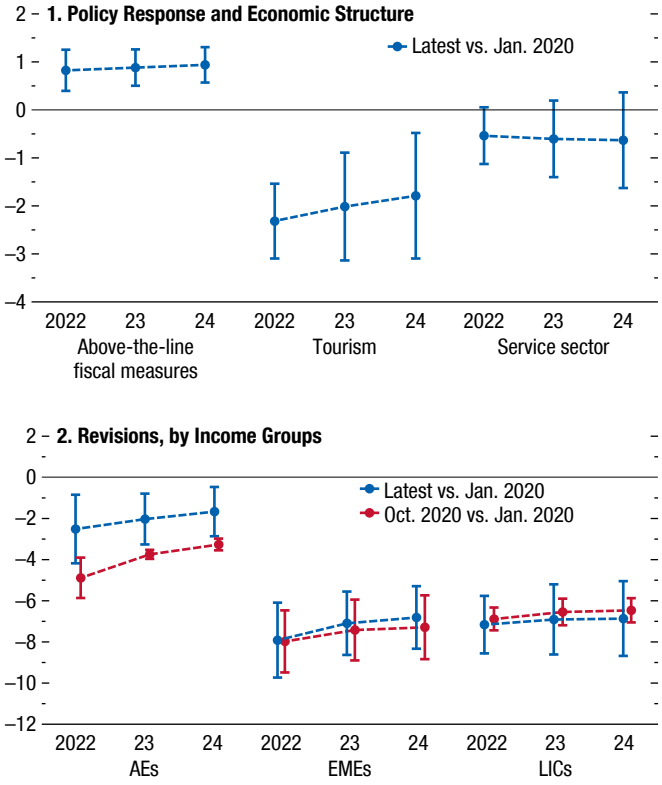
The uncertainty surrounding these projections (and the extent to which incoming news affects views on the outlook) can be seen by examining changes in expectations of medium-term losses between the October 2020 *World Economic Outlook* (WEO) and the current forecast (Figure 2.13, panel 2). Recent favorable news

[29]The regressions also include dummy variables for country income groups and regions. For ease of comparison of effects across explanatory variables, each regressor is standardized to mean-zero and a standard deviation of one. Importantly, the current severity of the pandemic affects the forecast revision in the near term but is not a significant explanatory factor further out in the forecast horizon once other variables (most notably, income classification) are considered. These results are robust to including additional variables that capture the severity of the pandemic, health care capacity, and the level of government debt. See Online Annex 2.4.

[30]The relationship between services share and output losses will depend on the composition of services, as low-contact services, such as information and communication, financial, and professional and business services, have been less affected (see Figure 2.1) by the pandemic. The results are robust to using a measure of the precrisis high-contact services share of the economy rather than the services share.

Figure 2.13. Expected Medium-Term Output Losses: Explanatory Factors and Revisions
(Percentage points)

Economies more exposed to demand for tourism and services have been hit hardest, but pandemic-related fiscal measures have mitigated losses. Medium-term losses are larger and more persistent in emerging market economies; prospects for advanced economies have improved in recent months.



Sources: World Bank, World Development Indicators; World Travel and Tourism Council; and IMF staff calculations.
Note: *X*-axis units are different forecast horizons. Above-the-line fiscal measures refer to additional spending and forgone revenue in response to COVID-19. Both the tourism and service sectors are in share of GDP. Chart shows point estimate and two standard error ranges for coefficients of a cross-sectional, cross-country regression (unweighted) of forecast revisions on explanatory variables. Panel 2 shows the estimated coefficient on the economy group indicator. Explanatory variables are standardized to have zero mean and unit standard deviation. Units of the *y*-axis are therefore percent change in output per one-standard-deviation increase across countries. Regression specification also includes dummies for region and income group (not shown). Standard errors are clustered by region. AEs = advanced economies; EMEs = emerging market economies; LICs = low-income countries.

with regard to vaccines and a stronger-than-expected second half of 2020 had a larger impact on advanced economy projections. The losses currently projected (blue lines) are notably smaller than those foreseen in the October 2020 WEO (red lines) for the advanced economy group, but broadly similar for the other income groups.

It is important to remember that the assessment described here is based on the current understanding of the path of the pandemic. As the changes from the October 2020 WEO demonstrate, the prospects for medium-term scarring and the associated medium-term forecast will evolve, based on incoming news about vaccines, new virus mutations, disruptions to activity, and the policy response.

Policies to Limit Persistent Damage

Experience from past recessions underscores the importance of avoiding financial distress as the COVID-19 policy response evolves. To prevent scarring that could result from future financial instability, measures that support credit provision should be maintained while ensuring balance sheet resilience and adequate buffers (see Chapter 1 and the April 2021 GFSR).

As vaccine coverage improves and supply constraints ease, countries will need to tailor their policy response to the different stages of the pandemic. Targeted fiscal support that addresses the disparate sectoral effects of the crisis may be most effective while supply constraints remain in place, whereas public investment can help boost both supply and demand as these constraints ease. Where fiscal space permits, policymakers should deploy a combined package of better-targeted support for affected households and firms and public investments aimed at the following:

- *Reversing setbacks to human capital accumulation and encouraging employment.* Ensuring adequate resources for health care, early childhood development programs, and education will help mitigate long-term individual earnings losses and damages to aggregate productivity (see Chapter 1 of the October 2020 WEO and Chapter 2 of the October 2020 *Fiscal Monitor*). Worker retraining and investment in digital literacy would broaden access to emerging job opportunities and avoid further economic divergence. Expanding social safety nets and support for displaced workers through what could be a long adjustment period will be key in addressing the rise in inequality that is likely to result from the pandemic (see Chapter 3).
- *Supporting productivity.* In addition to allowing for the exit of nonviable firms, active labor

market policies[31] and other policies to facilitate resource reallocation—such as structural reforms to improve labor mobility and reduce product market rigidities—can help prevent persistent misallocation. Policies to promote competition, innovation, and technology adoption would also lift productivity growth.

- *Boosting investment.* Public investment in infrastructure, particularly a green infrastructure push, can help crowd-in private investment (see the October 2020 WEO and Chapter 2 of the April 2021 *Fiscal Monitor*). Corporate balance sheet repair would reduce debt overhang and promote investment (see Chapter 1 of the October 2020 WEO). Improved bankruptcy and debt restructuring mechanisms would help reallocate productive capital (see the April 2021 GFSR; and Bauer and others 2021).

In countries with a larger share of high-contact, affected sectors, more reallocation will likely be needed. Here, lifeline policies for firms and employment preservation that gradually unwind, coupled with policies to facilitate reallocation, will be particularly important. Supporting growth opportunities related to the accelerated shift to e-commerce and increasing digitalization of the economy will have positive spillovers and thus help transition away from shrinking sectors. Last, but not least, multilateral cooperation is critical to prevent further economic divergence, as discussed in Chapter 1.

Conclusions

Recoveries after past recessions suggest that prospects for scarring are considerable, particularly given the depth of the COVID-19 shock. Analysis of historical sector-level shocks shows that sectoral spillovers from both supply and demand shocks have been large and persistent. Sectoral productivity shocks, in particular, have persistent effects, leading to long-lasting declines, on average, in the sectors they have struck. Nonetheless, this crisis is different from past recessions in many ways, and high uncertainty surrounds the outlook.

Medium-term output losses following the pandemic are currently expected to be large but exhibit significant variation across economies and regions. Despite higher-than-usual growth as the global economy recovers from the COVID-19 shock, world output is still anticipated to be about 3 percent lower in 2024 than pre-pandemic projections suggested. These expected losses are lower than what was seen during the global financial crisis, consistent with the swift policy response that supported incomes and helped contain financial sector disruptions. However, emerging market and developing economies, in particular, are expected to have deeper scars than advanced economies, partly reflecting their greater sectoral exposure to the pandemic shock and more muted policy response.

The picture of divergent recoveries that is emerging, with a larger likelihood and extent of scarring in many of the same countries that have limited fiscal space, suggests a challenging path ahead. Ensuring effective policy support until the recovery is firmly under way will help limit persistent damage. Avoiding financial distress as the COVID-19 policy response evolves is important, given that the greatest scarring in the past has occurred in recessions associated with financial crises. To maximize the use of limited fiscal space, policymakers should tailor their responses, targeting support to the most-affected sectors and firms. Policies that reverse the setback to human capital accumulation, boost job creation, and facilitate worker reallocation will be key to addressing long-term GDP losses and the rise in inequality. Finally, multilateral cooperation on vaccines to ensure adequate production and timely universal distribution will be crucial to prevent even worse scarring in developing economies.

[31]Active labor market policies, which help workers transition between jobs, include worker retraining, public employment services, public work schemes, wage subsidies to support job creation, and support for self-employment/micro-entrepreneurs.

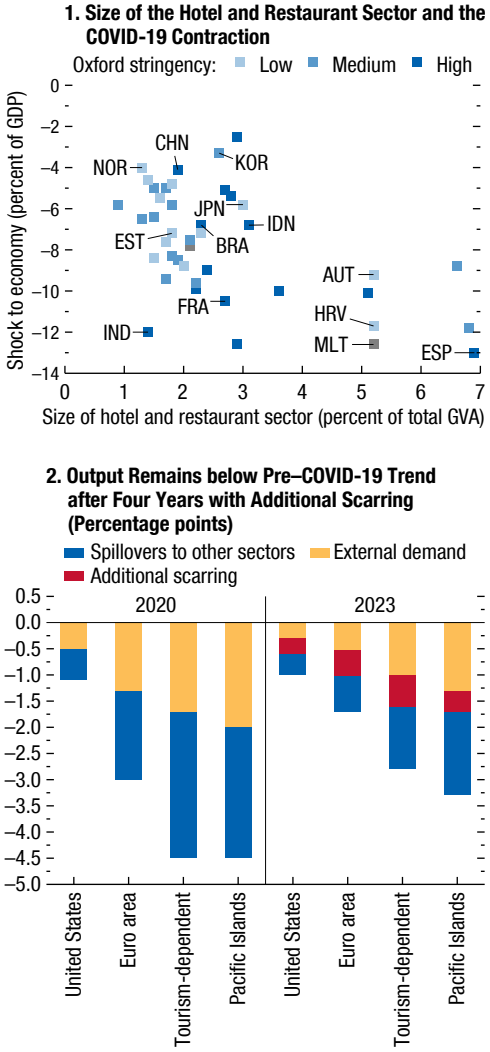
Box 2.1. A Perfect Storm Hits the Hotel and Restaurant Sector

The hotel and restaurant sector has suffered large employment and production losses from COVID-19. While international supply-side spillovers from the sector are smaller than from an average sector, the propagation to other sectors within the economy is important. The sector's recovery will depend critically on how quickly the pandemic is contained, with larger scarring the longer it takes for demand to recover.

Hotels and restaurants have been particularly hard hit by the COVID-19 crisis. In the United States, for example, employment in the sector fell by almost 40 percent from February to May 2020, compared with 13 percent overall. Data up to the third quarter of 2020 suggest that countries more reliant on the hotel and restaurant sector suffered considerably from the pandemic (Figure 2.1.1, panel 1), even where lockdowns were less stringent.[1] This illustrates the importance of sectoral composition in determining the aggregate impact of COVID-19 as shocks to this and other high-contact sectors propagate to the rest of the economy. One important feature of this sector is that it is more connected to other sectors in the local economy than the median industry. Thus, spillovers to other sectors can be sizable.[2]

In the medium term, scarring in tourism-dependent economies is expected to be larger than in other countries. GDP is estimated to be 2.2 percent below the pre–COVID-19 trend by 2023 from just the shock to the hotel and restaurant sector itself (Figure 2.1.1, panel 2).[3] The Pacific Islands are most affected by this shock, with GDP estimated to be about 3 percent below trend in 2023, of which 0.4 percentage point is estimated to be due to additional scarring from the shock. As other sectors were also affected in all economies, the overall negative effect on medium-term output from COVID-19 is likely to be even larger.

Figure 2.1.1. COVID-19 Damage to the Hotel and Restaurant Sector



Sources: UNCTAD-Eora Global Value Chain database; and IMF staff calculations and estimates.
Note: Shock to the economy is measured as the percent deviation from the pre–COVID-19 *World Economic Outlook* forecast for 2020 GDP growth. The size of the hotel and restaurant sector is measured as its value added as a percentage of total value added. The Oxford stringency index records the strictness of "lockdown-style" policies that primarily restrict people's behavior. GVA = gross value added.

The author of this box is Allan Dizioli.

[1]The size of the shock to the hotel and restaurant sector is inferred using disaggregated data from the United Kingdom, the value-added weights of different sectors in each country's GDP, and other aggregated sectoral data, taking differences in containment measures across countries into account. For countries where no recent disaggregated sectoral information is available, air traffic data are used. The average shock is 25 percent of the pre–COVID-19 value added in the sector and is heterogenous across countries—at less than 10 percent in Turkey and as high as 60 percent in Samoa.

[2]Using input-output data for about 170 countries. The data are from the Eora database, which is a set of global harmonized input-output matrices covering 26 sectors and final uses. See Lenzen and others (2013) for a detailed description of the database.

[3]Two complementary methods—partial equilibrium and dynamic stochastic general equilibrium—are used to estimate the amplification effects and country spillovers from COVID-19 and assess its possible long-term impacts. The first method, developed by Bems, Johnson, and Yi (2011), uses world input-output table links and assumes no substitutability between sources of inputs and no price changes. The second method uses the IMF's G20 Model, which is a general equilibrium model with substitutability between goods, but is less rich in modeling the sectoral links. Both approaches yield very similar results.

Box 2.2. Education Losses during the Pandemic and the Role of Infrastructure

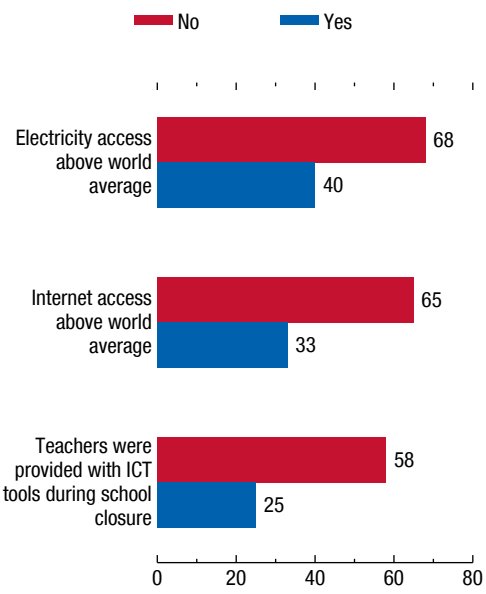
School closures and other pandemic-related disruptions pose a serious risk to human capital accumulation across the world. Early evidence shows that education losses were larger in economies with preexisting gaps in infrastructure (such as access to electricity and internet), which constrained their ability to effectively implement remote learning programs. Remedial measures are essential to prevent the scarring effect on human capital stock, which would lead to further economic divergence. This calls for urgent policy action as well as international support for low-income countries and many emerging market economies with limited infrastructure and inadequate educational funding.

Global education losses due to the COVID-19 pandemic pose significant challenges to human capital accumulation. School closures affected 1.6 billion students in 180 countries at the peak of the pandemic (World Bank 2020b). In 2020 countries reported an average of 49 missed days of instruction, equivalent to about one-quarter of an academic year.[1] Education losses were more severe in low-income developing countries, where students missed an average of 69 days of instruction in 2020, compared with 46 days in emerging market economies and 15 days in advanced economies. Educational disruptions will likely cause losses in learning and impair human capital accumulation.[2] In addition, girls and students from low-income households face disproportionately greater risk of learning losses.[3]

COVID-19 can exacerbate existing disparities in education across countries. Despite significant global convergence in primary school enrollment rates, average years of schooling among adults in low-income developing countries (five years) were less than half that in advanced economies (12 years) in 2018 (UNESCO Institute for Statistics).[4] Furthermore, gender parity in enrollment across all education levels is yet to be achieved in many developing economies (World Bank 2018).

Pandemic-induced disruptions in educational systems are especially large in countries with limited infrastructure (Figure 2.2.1). The global shift to remote learning

Figure 2.2.1. Where Are Education Losses Larger?
(Average number of missed days of instruction)



Sources: UNESCO-UNICEF-World Bank Survey on National Education Responses to COVID-19 School Closures; World Bank, World Development Indicators; and IMF staff calculations.
Note: Each bar corresponds to the average number of missed days of instruction across countries with a given infrastructure characteristic. The differences are statistically significant at the 5 percent level. ICT = information and communication technology.

The authors of this box are Mariya Brussevich, Marina Conesa Martinez, and Futoshi Narita. This box is part of a research project on macroeconomic policy in low-income countries supported by the United Kingdom's Foreign, Commonwealth and Development Office (FCDO). The views expressed here do not necessarily represent the views of the FCDO.

[1]We use the second wave of the *Survey on National Education Responses to COVID-19 School Closures* designed for Ministries of Education and conducted by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations Children's Fund, and the World Bank between July and October 2020 (UNESCO, UNICEF, and the World Bank 2020). For each education level (pre-primary, primary, lower secondary, upper secondary), 80 economies (27 low-income developing countries, 41 emerging market economies, 12 advanced economies) answered this question: "How many days of instruction have been missed or projected to be missed (taking into account school breaks, and so on) for the academic year impacted by the COVID-19?" We use the average of missed days of instruction across education levels.

[2]"Missed days of instruction" are likely to exclude remote learning days. This conjecture is based on the comparison with an indicator of "school closing" under the Oxford COVID-19 Government Response Tracker (Hale and others 2020). Learning losses are likely to be greater than suggested by missed days of instruction considering the potentially lower effectiveness of remote schooling than in-person schooling. See Chapter 2 of the April 2021 *Fiscal Monitor* for more discussion and estimates of learning losses using the data from the Oxford COVID-19 Government Response Tracker.

[3]Refer to CGD (2020) for discussion on gender differences and to Agostinelli and others (2020), Azevedo and others (2020), and Engzell and others (2020) for discussion on household income differences.

[4]In 2008 the gap in primary school enrollment rates between advanced economies and low-income developing countries was closed (World Bank, World Development Indicators database).

Box 2.2 *(continued)*

has limited education losses, but its uptake and effectiveness have been uneven across countries. Education losses are 70 percent higher in economies ranking below the world average in access to electricity—90 percent of the population in 2018—compared with those above the world average. In economies where less than half of the population had internet access (world average in 2018), students missed 65 days of instruction—double the average in the economies with higher connectivity rates. In addition, governments that did not provide information and communication technology tools or free connectivity to support teachers' transition to remote learning during the pandemic reported almost double the number of missed days compared with the governments that provided such support. Online platforms for remote learning are available only in three-quarters of low-income developing countries. Most of these countries resorted to radio and television for broadcasting educational content, but almost one-quarter of these countries reported that these tools were not effective for remote learning.

Many economies risk significant education losses during the pandemic, with corresponding long-term income loss.[5] These call for mitigating policy action. Although online learning is likely to play a larger role in the delivery of education in the future, infrastructure gaps and inadequate educational funding in low-income countries and many emerging market economies can pose significant obstacles. To avoid further economic divergence, modernizing educational systems, investing in necessary infrastructure, and ensuring equitable school funding are urgent. Remedial policies also include teacher training to alleviate education losses, financial support to accommodate schooling demands, adjustments to the length of the school year, and complementary tutoring programs for those severely affected during the closures (World Bank 2020a). The international community should support such efforts with increased development assistance for education and digital infrastructure, which could be financed by multilateral development banks, nontraditional partnerships through philanthropic organizations and corporate social responsibility initiatives, or with resources freed up by the debt relief initiatives (World Bank 2020c).

[5]While the exact learning and associated income losses are not yet known, the estimates of long-term income drop per lost year of schooling span a range of 9–12 percent (Psacharopoulos and Patrinos 2018; Kattan and others 2021). Azevedo and others (2020) estimates the lifetime loss in labor earnings for the affected cohort at $10 trillion—or 8 percent of global GDP in 2017—without remedial measures. Hanushek and Woessmann (2020) estimates that learning losses equivalent to a half academic year loss translate to 2.2 percent lower annual GDP for the remainder of the century. For the United States, Jang and Yum (2020) and Fernald and others (2021) show milder impacts of 0.25 percent and less than 0.1 percent, respectively.

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