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The Economic Impact of COVID-19 around the World

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Abstract

This article provides an account of the worldwide economic impact of the COVID-19 shock. In 2020, it severely impacted output growth and employment, particularly in middle-income countries. Governments responded primarily by increasing expenditure, supported by an expansion of the supply of money and debt. These policies did not put upward pressure on prices until 2021. International trade was severely disrupted across all regions in 2020 but subsequently recovered. For 2021, we find that the adverse effects of the COVID-19 shock on output and prices were significant and persistent, especially in emerging and developing countries.

JEL codes: E52, E62, F34, F41, G15

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1. INTRODUCTION

For over two years, the world has been battling the health and economic consequences of the COVID-19 pandemic. As of the writing of this article, deaths attributed to COVID-19 have surpassed six-and-a-half million people.[1] Global economic growth was severely impacted: World output by the end of 2021 was more than 4 percentage points below its pre-pandemic trend.[2] International trade was also significantly disrupted at the onset of the pandemic. The pandemic also prompted a strong policy response, resulting in a rise of government deficits and debt as well as widespread increases in the money supply. Finally, after an initial decline, prices have soared, resulting in elevated inflation rates.

This article provides an account of the worldwide economic impact of the COVID-19 shock. This shock was not felt simultaneously around the world, and mitigation policies, both health related and economic, varied substantially across countries. Yet there are some significant similarities in outcomes, especially when considering the pandemic period as a whole. Our analysis focuses on the shock's effects on specific groups of countries, related by their level of development and geographical location.

We find that the COVID-19 shock severely impacted output growth and employment in 2020, particularly in middle-income countries. The government response, mainly consisting of increased expenditure, implied a rise in debt levels. Advanced countries, having easier access to credit markets, experienced the highest increase in indebtedness. All regions also relied on monetary policy to support the fiscal expansion, and hence the money supply increased everywhere. The specific circumstances surrounding the shock implied that the expansionary fiscal and monetary policies did not put upward pressure on prices until 2021. International trade was severely

1. See worldometer for more information.
2. In January 2020, the International Monetary Fund estimated world growth to be 3.3 percent for 2020 and 3.4 percent in 2021, making the combined estimated growth 6.8 percent. However, actual growth is estimated to be –3.5 percent in 2020 and 5.9 percent in 2021, making the combined actual growth 2.2 percent.

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Table 1
Regional Attributes

Region	GDP per capita in 2019, USD	Total population in 2019, millions	Number of countries
Advanced	$48,526	1,071	37
E&D Asia (excl. China and India)	$3,809	873	16
China	$10,243	1,434	1
India	$2,099	1,366	1
E&D Europe	$10,319	381	15
E&D Latin America & Caribbean	$8,237	632	32
E&D Middle East & Central Asia	$5,246	723	25
E&D Sub-Saharan Africa	$1,702	1,013	42

SOURCE: Penn World Table, IMF, and authors' calculations.

NOTE: Total population here is less than the world total population for 2019 because this sample only includes countries that have nonmissing data for one or more of our variables of interest.

disrupted across all regions in 2020 but subsequently recovered. When extending the analysis to 2021, we find that the adverse effects of the shock on output and prices have been significant and persistent, especially in emerging and developing countries.

The rest of the article is organized as follows. Section 2 describes how we divide the world into regions and shows how excess mortality, output, and trade evolved during the pandemic. Section 3 explains our methodology and presents our results for the impact of the COVID-19 shock in 2020 on output, employment, government policy, inflation, and trade. Section 4 moves forward, to 2021, and discusses the overall impact on output and inflation. Section 5 concludes.

2. BASIC FACTS

We begin our analysis by showing evidence of the cross-country impact of the pandemic along three dimensions: excess mortality, output, and trade. Throughout the article, we divide the world into two main areas: advanced countries and emerging and developing countries. We use the International Monetary Fund's (IMF) classification to make this main partition and then further divide emerging and developing countries into regions.[3] We consider advanced countries as a group, but we also look at individual countries in some of the charts in this section. In the case of emerging and developing (E&D) countries, we focus on specific regions: E&D Asia, E&D Europe, E&D Latin America and Caribbean, E&D Middle East and Central Asia, and E&D Sub-Saharan Africa. The E&D Asia region excludes China and India, which we report separately since they overwhelm any population-weighted averages.

Table 1 above provides information about average gross domestic product (GDP) per capita, total population, and the number of countries included for each of the areas and the regions we study.[4] Advanced countries are far richer than other regions, with a GDP per capita of almost 50,000 dollars in 2019. Emerging and developing countries have much lower income: At the bottom, E&D Sub-Saharan Africa had a GDP per capita below 2,000 dollars in 2019, while at the top, E&D Europe had a GDP per capita just over 10,000 dollars in the same year. That is, income per capita in the richest emerging and developing region is only a fifth of that in advanced countries. Region populations range from 380 million in E&D Europe to about a billion in advanced countries and E&D Sub-Saharan Africa. The populations of China and India are the largest, about 1.4 billion each.

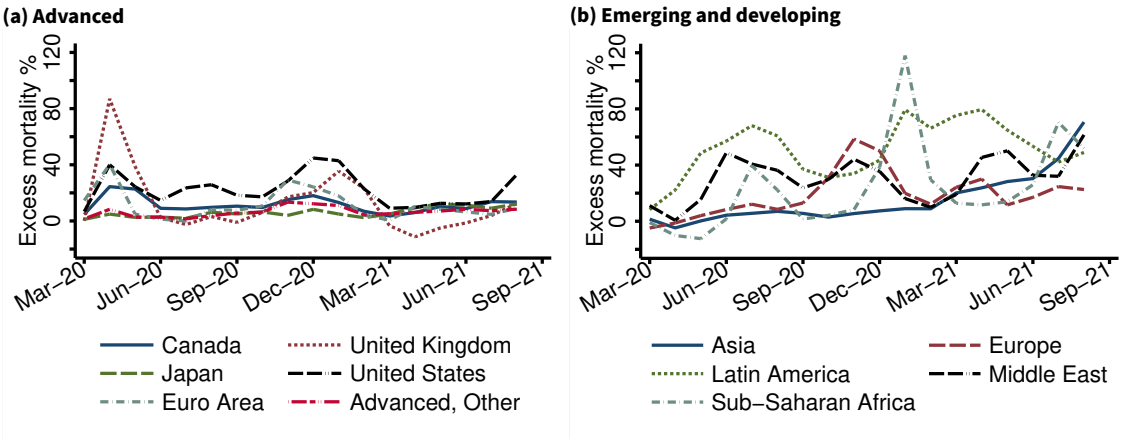
Figure 1 shows population-weighted averages of excess mortality across world regions. We define excess mortality as the difference between reported deaths and baseline deaths and present it as percentage of baseline deaths.[5] Panel (a) on the left focuses on advanced economies, while panel (b) on the right includes emerging and developing regions. Although nearly all countries and regions experienced high excess mortality, emerging and developing countries fared much worse than advanced countries, especially during the first half of 2021.

3. The groupings can be found here.

4. The list of countries in each region and data sources are in Appendix 1.

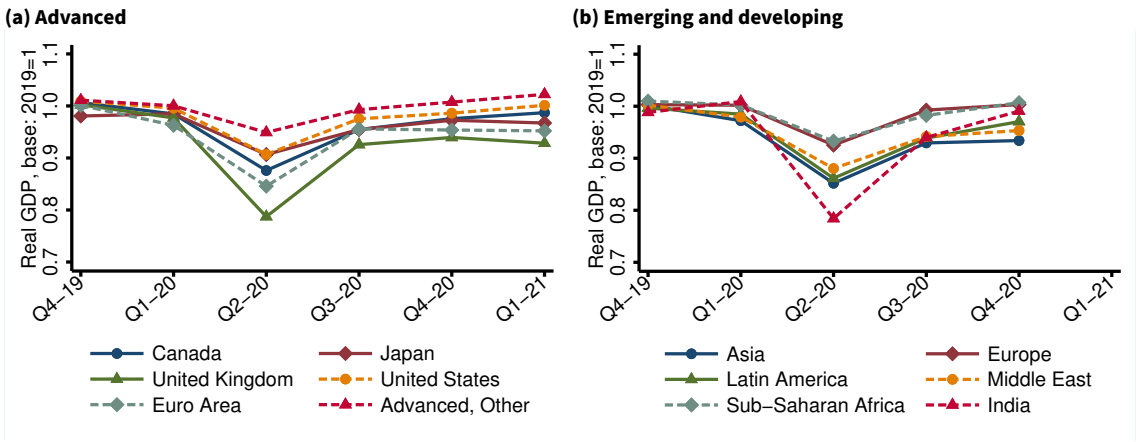
5. Excess mortality values (*p*-scores) are from Karlinsky and Kobak (2021) and Our World in Data (Ritchie et al., 2020). The baseline deaths for 2020–21 are estimated by fitting a linear regression model using mortality data from 2015 to 2019. See Karlinsky and Kobak (2021) for further details.

Figure 1
Excess Mortality



SOURCE: Karlinsky and Kobak (2021), Ritchie et al. (2020), IMF, and authors' calculations.
NOTE: Region averages are weighted by population. In panel (b), Asia represents E&D Asia (excluding China and India), Latin America represents E&D Latin America and Caribbean, Europe represents E&D Europe, and Middle East represents E&D Middle East and Central Asia. Data are shown at a monthly frequency. Countries with any missing observations within the time sample are excluded.

Figure 2
Real GDP



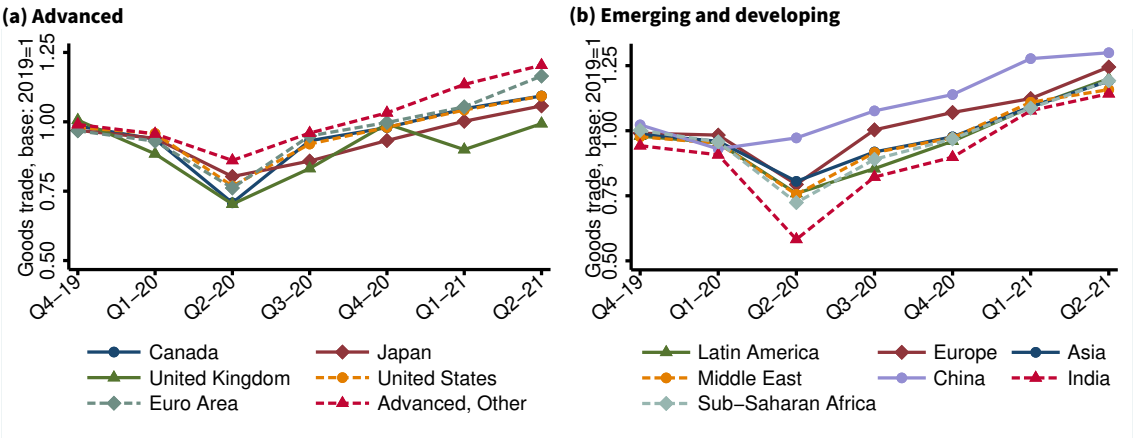
SOURCE: IMF and Organisation for Economic Co-operation and Development (OECD) via Haver Analytics and authors' calculations.
NOTE: In panel (b), Asia represents E&D Asia (excluding China and India), Latin America represents E&D Latin America and Caribbean, Europe represents E&D Europe, and Middle East represents E&D Middle East and Central Asia. Region averages are weighted by population, and GDP is seasonally adjusted.

In particular, E&D Latin America and Caribbean registered the highest mortality rates through much of the pandemic.

Figure 2 shows the evolution of real GDP by region. The series are normalized to 1 in 2019 to facilitate comparisons across time and regions. Panel (a) on the left shows that output in advanced countries declined significantly in the second quarter of 2020 when the pandemic first hit and lockdowns were the primary health mitigation policy tool. The plot shows that the United Kingdom suffered the most significant contraction, followed by the Euro area and Canada. Panel (b) on the right shows real GDP for emerging and developing countries. In this case, the most affected regions were E&D Latin America and Caribbean and E&D Asia (excluding China and India), followed by E&D Middle East and Central Asia. We also report output for India, which contracted severely in the second quarter of 2020. Interestingly, the range of the impact of the COVID shock on output is similar for advanced and developing countries.

Finally, there was a worldwide contraction in international trade at the onset of the pandemic. Figure 3 shows international trade per region, defined as the sum of the dollar amounts of goods exported and imported. We show trade in nominal terms, i.e., without removing the effect of price changes, and normalize it to one in

Figure 3
International Trade



SOURCE: OECD, International Financial Statistics (IFS), Haver Analytics, and authors' calculations.
NOTE: Total trade in goods is defined as the sum of goods exports and goods imports, in U.S. dollars. In panel (b), Asia represents E&D Asia (excluding China and India), Latin America represents E&D Latin America and Caribbean, Europe represents E&D Europe, and Middle East represents E&D Middle East and Central Asia. Region averages are weighted by population.

2019 to facilitate comparisons across time and regions. Emerging and developing countries, apart from China, shown in panel (b) on the right, experienced more significant declines in international trade on average than advanced countries, as shown in panel (a) on the left. However, trade recovered at a faster rate in emerging and developing countries; generally speaking, halfway through 2021, trade in these countries was about 20 percent above the pre-pandemic level.

3. COVID-19 IMPACT IN 2020

3.1 Methodology

To estimate the impact of the COVID-19 pandemic on economic outcomes and government policies, we primarily rely on the *World Economic Outlook* (WEO), published by the IMF.[6] Specifically, we look at WEO reports for data on GDP per capita, net government borrowing as a percentage of GDP, government revenue as a percentage of GDP, government expenditure as a percentage of GDP, and inflation. We use other sources for additional variables. We obtain data for prices indexes and monetary aggregates from Haver Analytics, where available, or Refinitiv Eikon otherwise. The employment-to-population ratio is from the World Bank.

Within each region, we weight observations using the 2019 population from the Penn World Table 10.0. Each WEO report includes projections for the following five years as of publication. We use the projected 2020 values from the October 2019 report to estimate what outcomes would have been had the COVID-19 pandemic not occurred.[7] We then compare these forecasts with the realized 2020 values published in the April 2022 report. Subtracting the estimated values from the realized values provides an estimate of the impact of COVID-19 for each variable. That is, we compute

$$Impact_{2020} = Realized_{2020} - Forecast_{2020}.$$

For variables not included in the WEO report, we compute the 2020 forecast using historical data, as described in Appendix 2.1.

3.2 Employment and Output

Table 2 shows that the impact of the pandemic on employment and output was significant in 2020. As mentioned above, we measure impact as the difference between the actual data and the pre-pandemic forecast. For advanced countries, the employment-to-population ratio was expected to grow by 0.45 percent but instead fell by 2.05 percent, a negative 2.50-percentage-point gap, which is our measure of the impact of the COVID-19 shock. The negative impact in emerging and developing regions was similar in magnitude except for E&D Latin America and Caribbean, where it amounted to 6.52 percentage points.

6. online here
7. See Appendix 3 for a robustness check of this assumption.

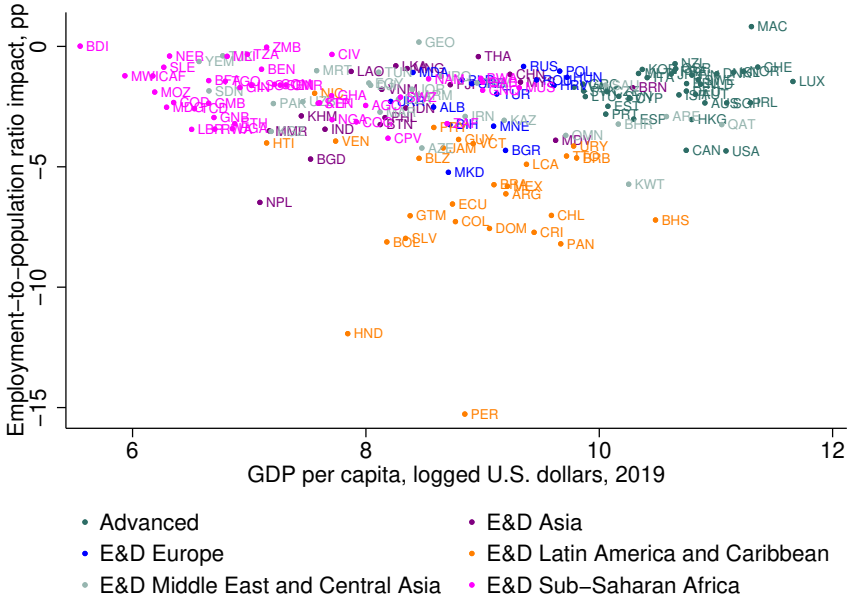
Table 2
2020 COVID-19 Impact on Indicators of Economic Activity by Region

	Change in employment-to-population ratio			Real GDP growth rate		
	2020 Forecast	2020 Data	COVID-19 impact	2020 WEO forecast	2020 Data	COVID-19 impact
Advanced	0.45	-2.05	-2.50	1.62	-4.83	-6.45
E&D Asia (ex. China and India)	0.20	-2.64	-2.84	5.74	-1.62	-7.36
China	-0.46	-1.62	-1.16	5.82	2.24	-3.57
India	-0.30	-3.74	-3.44	7.03	-6.60	-13.63
E&D Europe	0.11	-1.37	-1.48	2.57	-2.05	-4.62
E&D Latin America & Caribbean	0.12	-6.40	-6.52	1.56	-7.39	-8.96
E&D Middle East & Central Asia	-0.14	-2.30	-2.16	3.09	-2.12	-5.21
E&D Sub-Saharan Africa	0.02	-2.23	-2.25	4.52	-0.05	-4.57

SOURCE: World Bank, IMF, Penn World Tables, and authors' calculation.

NOTE: (i) Averages are weighted by population. (ii) If a country is missing either the forecasted value or actual 2020 value, that country is excluded from the sample. (iii) See Appendix 4.3 for further details on forecast errors. (iv) GDP is in constant prices.

Figure 4
COVID-19 Impact on Employment by Country



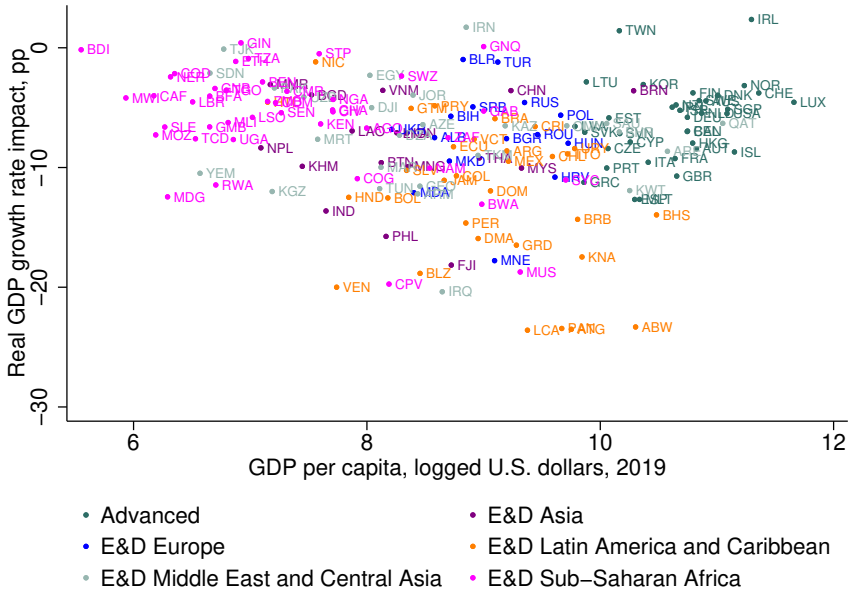
SOURCE: IMF, World Bank, Penn World Table, and authors' calculations.

Figure 4 plots the impact of COVID-19's impact on employment-to-population ratios against GDP per capita in 2019, country by country. The figure shows that E&D Latin America and Caribbean suffered a big impact, ranging from about –2 percentage points in Nicaragua to about –15 percentage points in Peru. The impact in other regions, both richer and poorer, was more compressed, clustering around 0 to –5 percentage points.

The right panel in Table 2 shows that GDP growth declined significantly due to the COVID-19 shock. The impact was approximately –6.45 percentage points for advanced countries. China and India are at the extremes, when compared to the averages for world regions, with an impact of –3.57 and –13.63, respectively. The impact in other emerging and developing regions ranged from –4.57 in E&D Sub-Saharan Africa to –8.96 in E&D Latin America and Caribbean.

Figure 5 presents a scatterplot showing the impact of COVID-19 on output growth against GDP per capita in 2019. This impact was between 0 and –10 percentage points for advanced countries and E&D Europe.

Figure 5
COVID-19 Impact on GDP by Country



SOURCE: IMF, Penn World Table, and authors' calculations.

Table 3
2020 COVID-19 Impact on Fiscal Policy by Region

	Revenue (% GDP)	Expenditure (% GDP)	Borrowing (% GDP)
Advanced	0.26	7.73	7.47
E&D Asia (excl. China and India)	-1.50	1.29	2.73
China	-3.45	0.92	4.63
India	-1.40	4.17	5.19
E&D Europe	0.31	3.72	3.74
E&D Latin America & Caribbean	-0.65	4.30	5.40
E&D Middle East & Central Asia	-2.37	-0.54	2.36
E&D Sub-Saharan Africa	-1.47	0.10	1.50

SOURCE: IMF, Penn World Table, and authors' calculations

NOTE: (i) Region averages are weighted by population. (ii) If a country is missing either the forecasted value or actual 2020 value, that country is excluded from the sample. (iii) See Appendix 4.3 for further details on forecast errors.

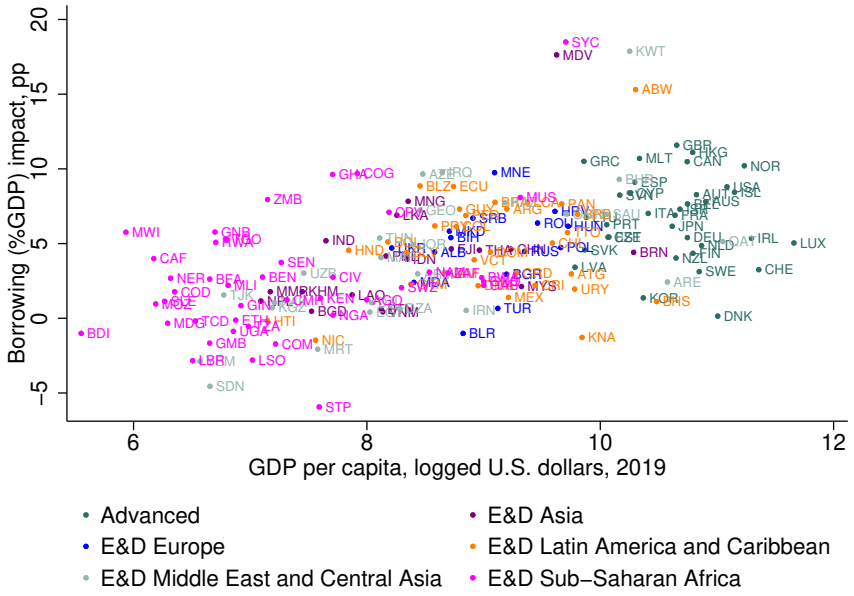
In other regions, the impact on output growth was more heterogeneous. It was worse for middle-income countries, with many suffering a contraction in GDP growth that was larger than 10 percentage points.

3.3 Revenue, Expenditure, and Net Borrowing

We now look at how the pandemic affected fiscal policy and focus on the impact on revenue, expenditure, and net borrowing, all expressed as fractions of GDP. Recall that we measure impact as the difference between the actual data and the pre-pandemic forecast. The first panel of Table 3 shows that, for most regions, the COVID-19 shock harmed revenue over GDP. This impact ranged from –3.45 percentage points in China to –0.65 percentage points in E&D Latin America and Caribbean. In contrast, for advanced countries, the impact on revenue over GDP was slightly positive, about 0.26 percentage points, while E&D Europe experienced an even higher positive impact, at 0.31 percentage points.[8]

8. See the tables in the online appendix for country-level details.

Figure 6
COVID-19 Impact on Borrowing by Country



SOURCE: IMF and authors' calculations.

As countries entered recessions induced by the lockdown policies designed to combat the pandemic, governments increased spending. The middle panel of Table 3 shows a positive impact of the COVID-19 shock on government expenditure over GDP for all regions except for E&D Middle East and Central Asia. Advanced countries experienced the most significant impact, at 7.73 percentage points. At the other end, E&D Sub-Saharan Africa experienced the smallest positive impact, at 0.10 percentage points, while E&D Middle East and Central Asia suffered a negative impact of –0.54 percentage points.

Naturally, increased expenditure and revenue shortfalls (or small increases, depending on the case) led to an increase in government debt. The right panel of Table 3 shows a positive impact of the COVID-19 shock on borrowing over GDP for all regions. Advanced countries had the most significant increase at 7.47 percentage points, which is explained by their significant increase in expenditure. E&D Sub-Saharan Africa and E&D Middle East and Central Asia had the smallest increases at 1.50 and 2.36 percentage points, respectively, which follows from their relatively small expenditure impacts. Figure 6 shows a positive correlation between real GDP per capita and the impact on borrowing as a percentage of GDP, implying that richer countries increased borrowing more than poorer countries. For the most part, this reflects the fact that richer countries have easier access to credit markets.

3.4 Monetary Aggregates and Inflation

In addition to the fiscal policy measures discussed in the prior section, many countries also used monetary policy to respond to the pandemic. The left panel of Table 4 shows the impact of the COVID-19 shock on the growth rate of the monetary base by region. The monetary base is typically defined as currency in circulation plus bank reserves. The shock's impact on the monetary base growth rate was positive across regions, ranging from 1.33 percentage points in India to 43.05 percentage points in advanced countries.

The middle panels of Table 4 show the shock's impact on the growth rate of M1 and M2 by region. The exact definitions of these monetary aggregates vary slightly by country. Since the message is similar regardless of the aggregate we choose, we focus on M2, which is the broader of the two. Typically, M2 includes currency in circulation, demand deposits, and items such as money market accounts and short-term time deposits. Basically, it is a combination of central and private banks' money-like liabilities. The COVID-19 shock positively impacted regions for the growth rate of M2, with E&D Latin America and Caribbean experiencing the most significant change at 11.87 percentage points and China experiencing the smallest change at 1.67 percentage points. Advanced countries are among those regions that increased M2 the most, with an impact of 11.39 percentage points.

Table 4
2020 COVID-19 Impact on Monetary Aggregates and Inflation by Region

	Monetary base growth rate	M1 growth rate	M2 growth rate	Inflation rate
Advanced	43.05	12.06	11.39	-1.17
E&D Asia (excl. China and India)	5.09	12.18	4.44	-1.33
China	1.57	5.69	1.67	-2.74
India	1.33	6.51	6.23	0.74
E&D Europe	18.82	19.91	7.19	0.69
E&D Latin America & Caribbean	12.07	24.62	11.87	-0.06
E&D Middle East & Central Asia	2.39	7.36	5.23	0.83
E&D Sub-Saharan Africa	10.81	9.39	10.79	2.99

SOURCE: IMF, Haver Analytics, Refinitiv Eikon, and authors' calculations.
NOTE: (i) Region averages are weighted by population. (ii) If a country is missing either the forecasted value or actual 2020 value, that country is excluded from the sample. (iii) See Appendix 4.3 for further details on forecast errors. (iv) The monetary base generally includes currency in circulation and bank reserves. (v) For the monetary base, we use the monetary base and population values for the Euro area within the advanced group. (vi) Inflation impact is truncated at –25% and 25%. Monetary aggregate impacts are truncated at the 5th and 95th percentiles. (vii) All values are end of period, and growth rates are annual.

Table 5
2020 COVID-19 Impact on International Trade by Region

	Real imports growth rate	Real exports growth rate
Advanced	-12.00	-13.95
E&D Asia (excl. China & India)	-16.31	-14.31
China	-3.47	-0.88
India	-21.45	-11.01
E&D Europe	-10.67	-9.42
E&D Latin America & Caribbean	-13.63	-13.55
E&D Middle East & Central Asia	-12.44	-12.80
E&D Sub-Saharan Africa	-11.41	-15.90

SOURCE: IMF, Penn World Tables, and authors' calculations.
NOTE: (i) Region averages are weighted by population. (ii) If a country is missing either the forecasted value or actual 2020 value, that country is excluded from the sample. (iii) See Appendix 4.3 for further details on forecast errors.

The last panel of Table 4 shows the shock's impact on annual inflation. Advanced countries, E&D Asia, China, and E&D Latin America and Caribbean experienced a negative impact on inflation, ranging from –2.74 to –0.06 percentage points. That is, in these regions, actual inflation in 2020 was lower than was forecasted pre-pandemic, in 2019. The remaining regions, E&D Europe, E&D Middle East and Central Asia, India, and E&D Sub-Saharan Africa, all experienced positive shocks to inflation ranging from 0.69 to 2.99 percentage points.

3.5 Trade

As discussed in the introduction, the COVID-19 shock hurt international trade in 2020. Table 5 shows the shock's impact on the growth rates of real imports and exports, computed as the difference between the actual realization and the forecast made before the pandemic. This impact was negative and significant on both import and export growth rates. That is, the growth rates of real imports and real exports were lower in 2020 than previously forecasted. The impact on real imports ranges from –21.45 percentage points in India to –3.47

Table 6
2020 COVID-19 Impact on Real GDP and Prices by Region

	Real GDP	Prices
Advanced	-3.27	1.30
E&D Asia (excl. China & India)	-10.73	-1.38
China	-1.40	-3.49
India	-12.23	3.04
E&D Europe	-1.07	6.09
E&D Latin America & Caribbean	-4.68	4.89
E&D Middle East & Central Asia	-4.59	1.91
E&D Sub-Saharan Africa	-4.47	6.46

SOURCE: World Bank, IMF, Penn World Tables, and authors' calculations.
NOTE: (i) Averages are weighted by population; see Appendix 4.1 for further details. (ii) If either the forecast or actual values are missing, then the country is excluded from the sample.

percentage points in China. The rest of the world regions had negative impacts ranging from -10.67 in E&D Europe to -16.31 in E&D Asia. The impact on real exports ranged from –15.90 percentage points in E&D Sub-Saharan Africa to –0.88 percentage points in China. The next least impacted region is E&D Europe, at –9.42. Advanced countries also suffered a significant adverse impact on international trade, –13.95, similar in magnitude to that of emerging and developing regions. The size of these effects reflects the economic disruptions caused by lockdowns during the initial phase of the pandemic.

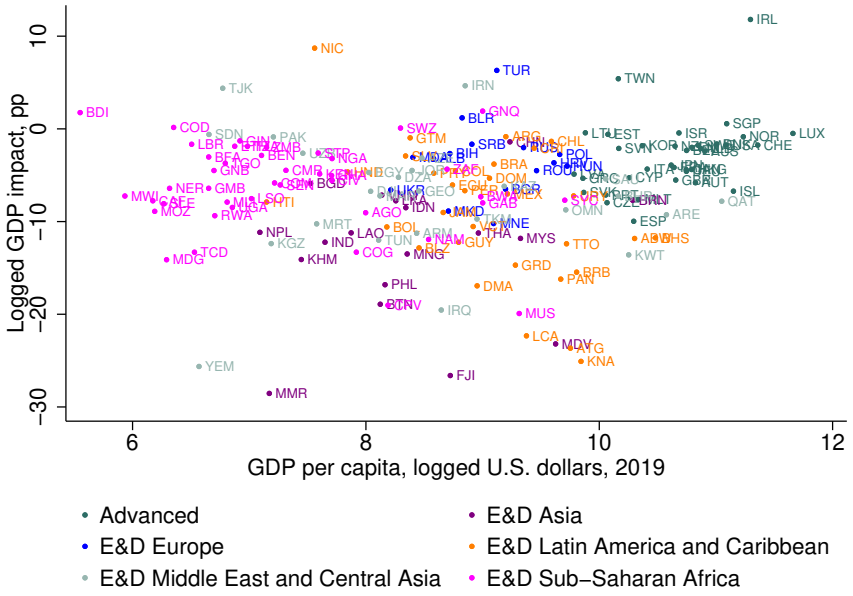
4. THE RECOVERY OF 2021 AND THE OVERALL IMPACT OF COVID-19

Economies around the world began to recover in 2021. Table 6 shows the accumulated impact of COVID-19 on output and prices over 2020 and 2021. For output, we take the difference between actual (log) real GDP for 2021 and the forecast made back in 2019. This calculation estimates where output is after two years of COVID-19, relative to the pre-pandemic trend. We perform the same calculation for the price level. One striking result is that all regions lag in terms of output, relative to their pre-pandemic trend. The impact is quite heterogeneous: E&D Europe is the region that was least affected, with real GDP only 1.07 percent below its pre-pandemic trend. India is the most affected, with real GDP 12.23 percent below its pre-pandemic trend. Notably, advanced countries are also lagging, with real GDP 3.27 percent below its pre-pandemic trend. Figure 7 plots the impact on real GDP against GDP per capita in 2019, country by country, to show the severity of the impact of the COVID-19 shock.[9] Within all regions, there are several countries that suffered severely.

In most regions, end-of-period prices were higher than forecasted for 2021. A positive number in the last column of Table 6 indicates that the cumulative price inflation in 2020 and 2021 was higher than expected before the pandemic. The impact of the COVID-19 shock on inflation ranged from –3.49 percent in China to 6.46 percent in E&D Sub-Saharan Africa. In advanced countries, the overall impact of COVID-19 on inflation was also positive: By the end of 2021, prices were 1.30 percent higher than forecasted before the pandemic. Figure 8 plots the impact on inflation against GDP per capita in 2019, country by country.[10] The impact is quite disparate, with both positive and negative cases, particularly as we move down the income distribution.

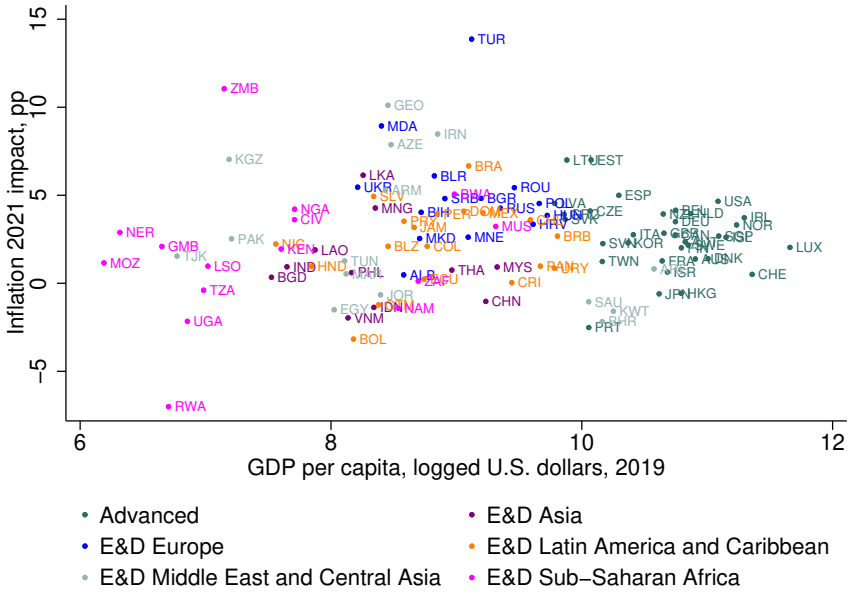
9. Countries with an impact below –30 percentage points (in this case, Macao) were cut off to make the chart more legible.
10. Countries with an impact above 15 percentage points (in this case, Argentina and Ethiopia) were cut off to make the chart more legible.

Figure 7
2020–21 COVID-19 Impact on Real GDP by Country



SOURCE: IMF and authors' calculations.

Figure 8
2020–21 COVID-19 Impact on Inflation by Country



SOURCE: IMF and authors' calculations.

5. CONCLUDING REMARKS

The economic consequences of the COVID-19 pandemic have been profound and persistent. In 2020, countries around the world experienced adverse impacts on real GDP growth, employment, and trade.[11] E&D Latin America and Caribbean, a region with many middle-income countries, suffered the most in terms of output

11. Country-level impact tables can be found in the online appendix.

growth and employment compared to other regions. India suffered the most overall in terms of output growth. The impact on government revenue was either negative or slightly positive but generally small. On the other hand, except for E&D Middle East and Central Asia, all regions experienced positive impacts on expenditure, in some cases quite substantial. As a result, borrowing increased everywhere as countries implemented their COVID-19 relief programs. Unsurprisingly, given their greater access to credit markets, advanced countries were able to increase expenditure and borrowing the most.

All regions experienced a positive impact on monetary aggregates as central banks around the world increased their supply of money. Combined with generous transfer programs, this resulted in an expansion of broader monetary aggregates, such as M1 and M2. The impact on inflation in 2020 was mixed, with some regions being affected positively and others negatively. By 2021, the impact of stimulus measures on prices started to materialize worldwide, with the notable exceptions of E&D Asia (excluding China and India) and China. Last, real output in 2021 was still below its pre-pandemic trend in all regions, with E&D Asia (exluding China and India) and India lagging significantly behind.

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APPENDIX 1. DATA SOURCES AND LIST OF COUNTRIES

Appendix 1.1 WEO data (October 2019 report and April 2022 report):

The WEO subject codes are in brackets. Access the databases on the World Economic Outlook page.

- GDP (percentage change) [NGDP_RPCH]: Annual percentages of constant price GDP are year-on-year (y-o-y) changes; the base year is country specific. Expenditure-based GDP is total final expenditures at purchasers' prices (including the free-on-board (f.o.b.) value of exports of goods and services) less the f.o.b. value of imports of goods and services. [SNA 1993]
- GDP (constant local currency) [NGDP_R]: We use this in 2020–21 GDP impact calculation, expressed in billions of national currency units. The base year is country specific. Expenditure-based GDP is total final expenditures at purchasers' prices (including the f.o.b. value of exports of goods and services) less the f.o.b. value of imports of goods and services. [SNA 1993]
- Revenue (%GDP) [GGR_NGDP]: Consists of taxes, social contributions, grants receivable, and other revenue. Revenue increases a government's net worth, which is the difference between its assets and liabilities (Government Finance Statistics Manual (GFSM) 2001, paragraph 4.20). Note: Transactions that merely change the composition of the balance sheet do not change the net worth position, for example, proceeds from sales of nonfinancial and financial assets or the incurrence of liabilities. Revenue is compiled on a fiscal year basis.
- Primary net lending/borrowing (%GDP) [GGXONLB_NGDP]: Is net lending (+)/borrowing (-) plus net interest payable/paid (interest expense minus interest revenue). Note that we multiply the value by –1, so positive values indicate borrowing.
- Total expenditure (%GPD) [GGX_NGDP]: Consists of total expense and the net acquisition of nonfinancial assets. Note: Apart from being on an accrual basis, total expenditure differs from the GFSM 1986 definition of total expenditure in the sense that it also takes the disposals of nonfinancial assets into account.
- Inflation [PCIEPCH]: Annual percentages of end-of-period consumer prices are y-o-y changes.
- Imports (y-o-y % change) [TM_RPCH]: Includes goods and services. Percentage change of volume of imports refers to the aggregate change in the quantities of total imports whose characteristics are unchanged. The basket of goods and services and their prices are held constant; therefore changes are due to changes in quantities only. [Export and Import Price Index Manual: Theory and Practice, Glossary]
- Exports (y-o-y % change) [TX_RPCH]: Includes goods and services. Percentage change of volume of exports refers to the aggregate change in the quantities of total exports whose characteristics are unchanged. The basket of goods and services and their prices are held constant; therefore changes are due to changes in quantities only. [Export and Import Price Index Manual: Theory and Practice, Glossary]

Appendix 1.2 Other data:

- Monetary aggregates: Values of monetary base, M1 and M2, are from each country's central bank and are downloaded via Haver Analytics (EMERGE, CANADA, and IFS databases), Refinitiv Eikon, or the central bank's website depending on availability. The values are in local currency and are not seasonally adjusted. For most countries, observations are end-of-period values at a monthly frequency. We use the December values for each year. When this is not the case, the quarterly data reflect the end-of-quarter values, and we use the fourth quarter values for each year.
- Employment: The employment-to-population ratio used in the tables is from the World Bank and is available at a yearly frequency. The observations are the percentage of employment to population for persons 15 years and older (modeled International Labour Organization (ILO) estimate). Access here.
- GDP time series: Quarterly data are seasonally adjusted, in real local currency from Haver Analytics. Specifically, we use the IFS, EMERGE (data for emerging and developing countries), and OECD databases. We prioritize OECD data followed by IFS data and then fill any remaining gaps with EMERGE data. The values are normalized, where the average GDP for 2019 is equal to one.
- Trade time series: We obtain quarterly, seasonally adjusted import and export values (of goods) in total U.S. dollar amounts traded from Haver Analytics and OECD. Specifically, we use the EMERGE (data for emerging and developing countries) database from Haver Analytics. Total trade is the summation of the two values by country and quarter. The values are normalized, where average trade for 2019 is equal to one. The OECD series are from the BOP6 category on stats, available on the OECD webpage.

Table Appendix 1.1
Countries Included by Region

Advanced	E&D Asia	E&D Europe	E&D Latin America & Caribbean	E&D Middle East & Central Asia	E&D Sub-Saharan Africa
Australia	Bangladesh	Albania	Aruba	U.A.E.	Angola
Austria	Brunei	Bulgaria	Argentina	Armenia	Burundi
Belgium	Bhutan	Bosnia/Herzegovina	Antigua & Barbuda	Azerbaijan	Benin
Canada	Fiji	Belarus	The Bahamas	Bahrain	Burkina Faso
Switzerland	Indonesia	Croatia	Belize	Djibouti	Botswana
Cyprus	Cambodia	Hungary	Bolivia	Algeria	Central African Republic
Czech Rep	Lao PDR	Moldova	Brazil	Egypt	Cote d'Ivoire
Germany	Sri Lanka	North Macedonia	Barbados	Georgia	Cameroon
Denmark	Maldives	Montenegro	Chile	Iran	Congo, Dem Rep
Spain	Myanmar	Poland	Colombia	Iraq	Republic of Congo
Estonia	Mongolia	Romania	Costa Rica	Jordan	Comoros
Finland	Malaysia	Russia	Dominica	Kazakhstan	Cabo Verde
France	Nepal	Serbia	Dominican Rep	Kyrgyz Republic	Ethiopia
United Kingdom	Philippines	Turkey	Ecuador	Kuwait	Gabon
Greece	Thailand	Ukraine	Grenada	Morocco	Ghana
Hong Kong SAR	Vietnam		Guatemala	Mauritania	Guinea
Ireland			Guyana	Oman	Gambia
Iceland			Honduras	Pakistan	Guinea-Bissau
Israel			Haiti	Qatar	Eq Guinea
Italy			Jamaica	Saudi Arabia	Kenya
Japan			St Kitts & Nevis	Tajikistan	Liberia
Korea			St Lucia	Turkmenistan	Lesotho
Lithuania			Mexico	Tunisia	Madagascar
Luxembourg			Nicaragua	Uzbekistan	Mali
Latvia			Panama	Yemen, Rep of	Mozambique
Macao			Peru		Mauritius
Malta			Paraguay		Malawi
Netherlands			El Salvador		Namibia
Norway			Trin/Tobago		Niger
New Zealand			Uruguay		Nigeria
Portugal			St Vincent/Grens		Rwanda
Singapore			Venezuela		Senegal
Slovak Republic					Sierra Leone
Slovenia					Sao Tome & Principe
Sweden					eSwatini
Taiwan					Seychelles
United States					Chad
					Togo
					Tanzania
					Uganda
					South Africa
					Zambia

NOTE: Some countries are missing data for one or more variables of interest.

APPENDIX 2. NOTES ON TABLE CALCULATIONS:

In the tables, we drop Lebanon, Sudan, Syria, Suriname, and Zimbabwe from the sample because these countries were facing economic turmoil/high inflationary pressures before/regardless of COVID-19. Because the tables are population weighted, India's and China's large populations skew the numbers for E&D Asia, so they are included separately in the tables.

- **Calculating the 2020–21 GDP impact:** We take the forecasted GDP growth rates for 2020 and 2021 from the October 2019 WEO report. We apply those growth rates to annual 2019 GDP data to get the estimated 2021 GDP. The 2020–21 COVID-19 impact is 100 times the difference between the logged 2021 estimated GDP and logged actual 2021 GDP.
- **Calculating the 2020–21 inflation impact:** We take the forecasted end-of-period inflation rates for 2020

and 2021 from the October 2019 WEO report. We apply those growth rates to end-of-period 2019 Consumer Price Index) (CPI) values to get the estimated 2021 end-of-period CPI. The 2020–21 COVID-19 impact is 100 times the difference between the logged 2021 estimated end-of-period CPI and the logged actual end-of-period 2021 CPI.

Appendix 2.1 Calculating Impact for the Variables Not in the WEO Report

- **Employment-to-population ratio change impact:** We take the employment-to-population ratio (%) for each year from the World Bank. The average percentage point change in the employment-to-population ratio from 2016 to 2019 is taken as the 2019 ratio minus the 2016 ratio, divided by three. This number is taken as a forecast for the expected change in the employment to population for 2020. The actual percentage point change in employment for 2020 is the ratio of employment to population for 2020 less the ratio of employment to population for 2019. The impact is the percentage point difference between the actual change in the employment-to-population ratio and the forecasted change in the employment-to-population ratio.
- **Monetary aggregate growth rate impact:** To obtain the forecasted value for 2020, we calculate the annualized growth rate for the monetary aggregate from 2017 to 2019 (i.e., the 2017–18 growth rate and the 2018–19 growth rate, annualized). The actual growth rate is the growth rate from 2019 to 2020 of the monetary aggregate. Then the impact is the percentage point difference between the forecasted growth rate for 2020 and the actual growth rate for 2020.

APPENDIX 3. FORECAST ERRORS BEFORE THE COVID-19 PANDEMIC

Our methodology relies on the forecast made in 2019 for several macroeconomic variables for the years 2020 and 2021. One concern may be the accuracy of these forecasts. For most variables, we use the 2019 WEO forecasts. For those not included there, we made our forecast based on data available in 2019 as described in Appendix 2.1.

When can this be a problem? For example, if the WEO has consistently optimistic forecasts, then our impact measure will be too negative because even without COVID-19, the year 2020 was going to be worse than expected. This is an important concern because there is previous evidence of optimism bias in the WEO reports (Ismail, Perrelli, and Yang, 2020; Timmermann, 2007).

In this section, we analyze forecast errors for the years 2011–19 to provide support for our methodology. The top panel of Table Appendix 3.1 contains percentile values of historical forecast errors in the WEO report by region (advanced and emerging and developing). The forecast error is the difference between the value for the variable in year n from the April 2022 WEO report and the forecast value for year n from the October WEO report in year $n-1$.[12] The impact for 2020, presented in the last column, is colored in green when it is outside the 10th–90th percentile range, black when it is outside the 25th–75th percentile range, and red when it is inside the 25th–75th percentile range.

First note that the 2020 impact estimate for change in GDP and borrowing (% GDP) are outside of the 10th–90th percentile range, for both the advanced and emerging groups. This indicates that the impact values are significant for 2020. Likewise, the impact values for expenditure (%GDP), imports volume, and exports volume are also very large and somewhat significant. The impact estimates for inflation and revenue (%GDP) are not significant.

To forecast the variables not included in the WEO reports, we estimated the forecasts for M1, M2, the monetary base, and the employment-to-population ratio for the period 2011 to 2019 using a similar methodology as in Appendix 2.1. We then take the forecast error to be the difference between the variable in each year and the forecast for that year. The bottom panel of Table Appendix 3.1 contains percentile values of these forecast errors. The 2020 impacts for employment-to-population ratio and the change in M1 are significant in both regions since the values are outside the historical forecast error 10th–90th percentile range. Similarly, the impact values for change in M2 and the change in monetary base are significant for the advanced group. The impact value for change in M2 is somewhat significant for the emerging group, and the impact value for the monetary base in the emerging group is not significant since it is inside the 25th–75th percentile range.

12. For example, the variable forecasts for 2015 are taken from the October 2014 WEO report and the actual values for 2015 are taken from the April 2022 report.

Table Appendix 3.1
Forecast Errors for 2011–2019 and 2020 Impact

		Error percentiles 2011-2019					Impact
Group	Variable	p10	p25	p50	p75	p90	2020
Advanced	Change GDP	-1.54	-0.79	-0.01	0.81	1.92	-6.45
Emerging	Change GDP	-3.81	-1.75	-0.3	0.77	2.11	-7.16
Advanced	Borrowing (%GDP)	-2.21	-1.28	-0.28	0.67	1.71	7.47
Emerging	Borrowing (%GDP)	-3.25	-1.41	-0.08	1.39	3.39	3.76
Advanced	Expenditure (%GDP)	-3.89	-2.03	-0.35	1.1	3.22	7.73
Emerging	Expenditure (%GDP)	-8.52	-4.87	-1.7	0.54	3.33	1.86
Advanced	Imports volume (% YoY)	-5.09	-2.77	-0.45	2.28	5.2	-12.00
Emerging	Imports volume (% YoY)	-14	-6.94	-0.7	4.58	11.2	-12.72
Advanced	Exports volume (% YoY)	-4.24	-2.49	-0.23	2.05	4.99	-13.95
Emerging	Exports volume (% YoY)	-14.93	-7.38	-1.8	2.92	8.45	-10.29
Advanced	Inflation	-1.87	-1.15	-0.43	0.33	1.14	-1.17
Emerging	Inflation	-3.54	-2.05	-0.65	0.93	3.03	-0.03
Advanced	Revenue (%GDP)	-2.93	-1.28	0.07	1.24	3.2	0.26
Emerging	Revenue (%GDP)	-8.45	-4.48	-1.43	0.58	2.87	-1.82
Advanced	Change emp to pop	-0.49	-0.1	0.34	0.75	1.22	-2.50
Emerging	Change emp to pop	-0.76	-0.26	0.02	0.37	1	-2.70
Advanced	Change M1	-7.32	-4.03	-0.8	3.08	5.94	12.06
Emerging	Change M1	-10.96	-5.77	-0.6	3.67	9.17	9.79
Advanced	Change M2	-3.81	-1.82	-0.05	1.61	4.35	11.39
Emerging	Change M2	-7.83	-3.86	-0.52	2.65	6.11	5.86
Advanced	Change monetary base	-14.17	-4.56	-0.2	5.87	17.38	43.05
Emerging	Change monetary base	-16.94	-7.9	-0.87	6.67	14.25	5.39

SOURCE: WEO, Haver Analytics, Penn World Table, World Bank, Refinitiv Eikon, and authors' calculations.
NOTE: The impact for 2020 is colored in green when it is outside the 10th–90th percentile range, black when it is outside the 25th–75th percentile range, and red when it is inside the 25th–75th percentile range.