The Economic Impact of COVID-19 around the World

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Abstract

For over two years, the world has been battling the health and economic consequences of the COVID-19 pandemic. This paper provides an account of the worldwide economic impact of the COVID-19 shock, measured by GDP growth, employment, government spending, monetary policy, and trade. 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. The specific circumstances surrounding the COVID-19 shock implied that the expansionary fiscal and monetary policies did not put upward pressure on prices until 2021. We also find that the adverse effects of the COVID-19 shock on output and prices have been significant and persistent, especially in emerging and developing countries.

JEL: E52, E62, F34, F41, G15

Key Words: COVID-19, Government Debt, Fiscal Policy, Monetary Policy, Emerging Markets, Inflation, International Trade, Employment

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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 paper, deaths attributed to COVID-19 have amply surpassed six 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 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 paper 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 effects of the COVID-19 shock 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. Hence, the money supply increased everywhere. The specific circumstances surrounding the COVID-19 shock implied that the expansionary fiscal and monetary policies did not put upward pressure on prices until 2021. International trade was severely disrupted across all regions in 2020, but subsequently recovered. When extending the analysis to 2021, we find that the adverse effects of the COVID-19 shock on output and prices have been significant and persistent, especially in emerging and developing countries.

The paper 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 paper, we divide the world into two main areas: advanced countries on the one hand, and emerging and developing countries on the other. We use the International Monetary Fund's (IMF) classification to make this main partition and then further divide emerging and

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[1] See https://www.worldometers.info/coronavirus/

[2] In January 2020, the IMF 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.

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 & Caribbean, E&D Middle East & Central Asia, and E&D Sub-Saharan Africa. The E&D Asia region excludes China and India: China due to data limitations and India since it overwhelms any population-weighted averages. However, we sometimes report data for India separately, when available and appropriate.

Table 1 below provides some basic descriptive statistics for each of the areas and regions we study: average GDP per capita, total population, and the number of countries included. Advanced countries are far richer than other regions, with a GDP per capita of almost fifty thousand 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 two thousand dollars in 2019, while at the top, E&D Europe had a GDP per capita just over ten thousand 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. Populations range from 380 million in E&D Europe to about a billion in Advanced countries and E&D Sub-Saharan Africa. In our sample, about a fourth of the world population lives in advanced countries and three-fourths in emerging and developing regions. The exclusion of China and India is important here: in reality, less than 15% of the world's population lives in advanced countries.

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
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

Sources: Penn World Tables, 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 non-missing data for one or more of our variables of interest.

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 percent of baseline

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[3] World Economic Outlook Database April 2021 -- WEO Groups and Aggregates Information (imf.org).

deaths[4]. 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. In particular, E&D Latin America & Caribbean registered the highest mortality rates through much of the pandemic.

Figure 1: Excess Mortality

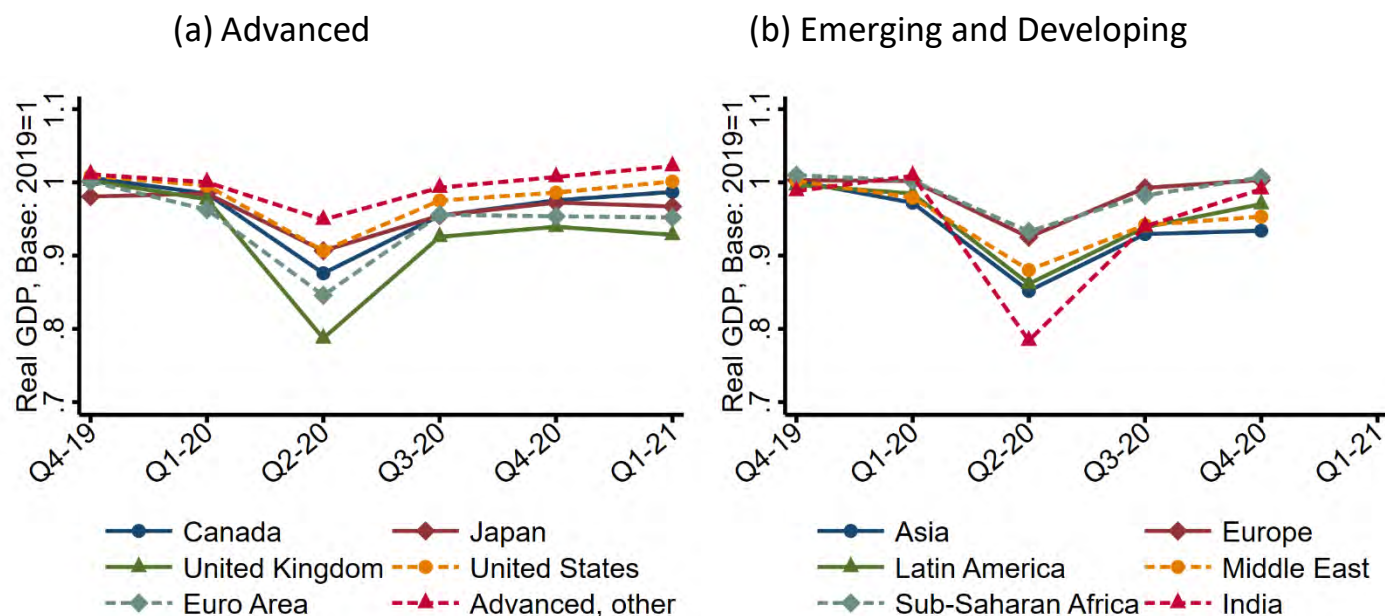| (a) Advanced	(b) Emerging and Developing
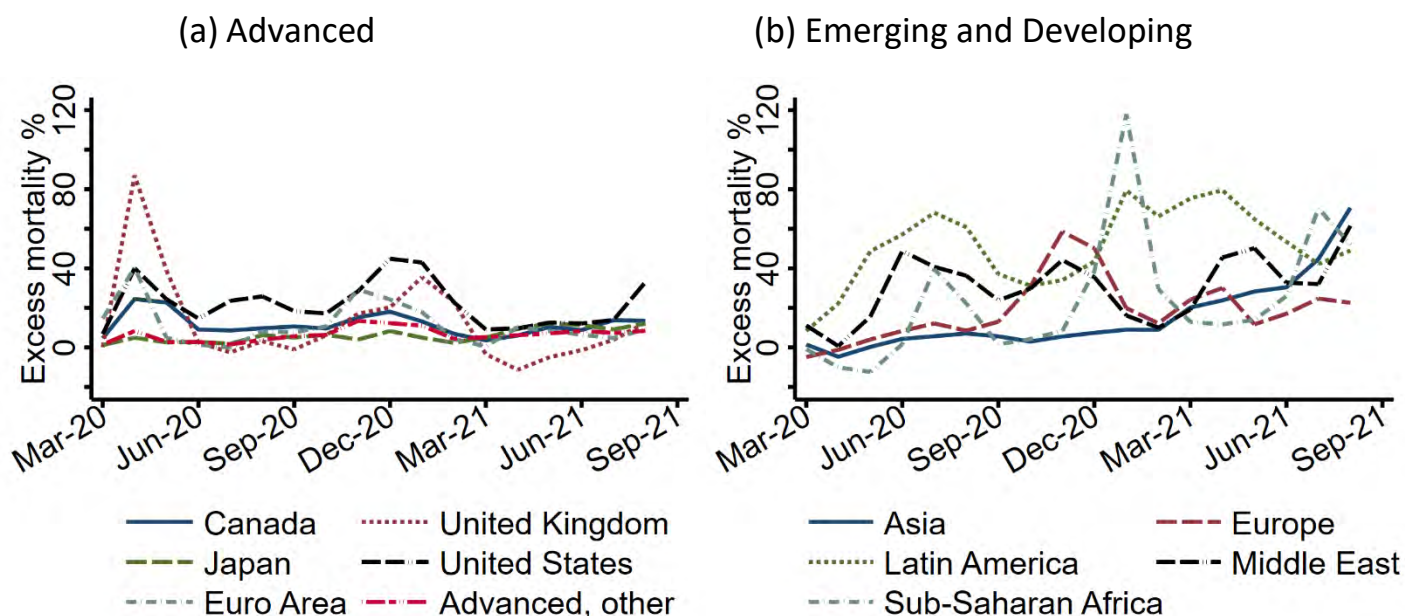
Sources: Karlinsky and Kobak (2021), Ritchie, et al. (2020), IMF and authors' calculations.

Note: Region averages are weighted by population In panel (b), Asia represents Emerging and Developing (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. See Figure A2 in the Appendix for country-level detail.

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 Latin America & Caribbean and Asia (excl. China and India), followed by Middle East & 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.

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[4] Excess mortality values (p-scores) are from Karlinsky and Kobak (2021) and Our World in Data. The baseline deaths for 2020-21 are estimated by fitting a linear regression model using mortality data from 2015-2019. See Karlinsky and Kobak (2021) for further detail.
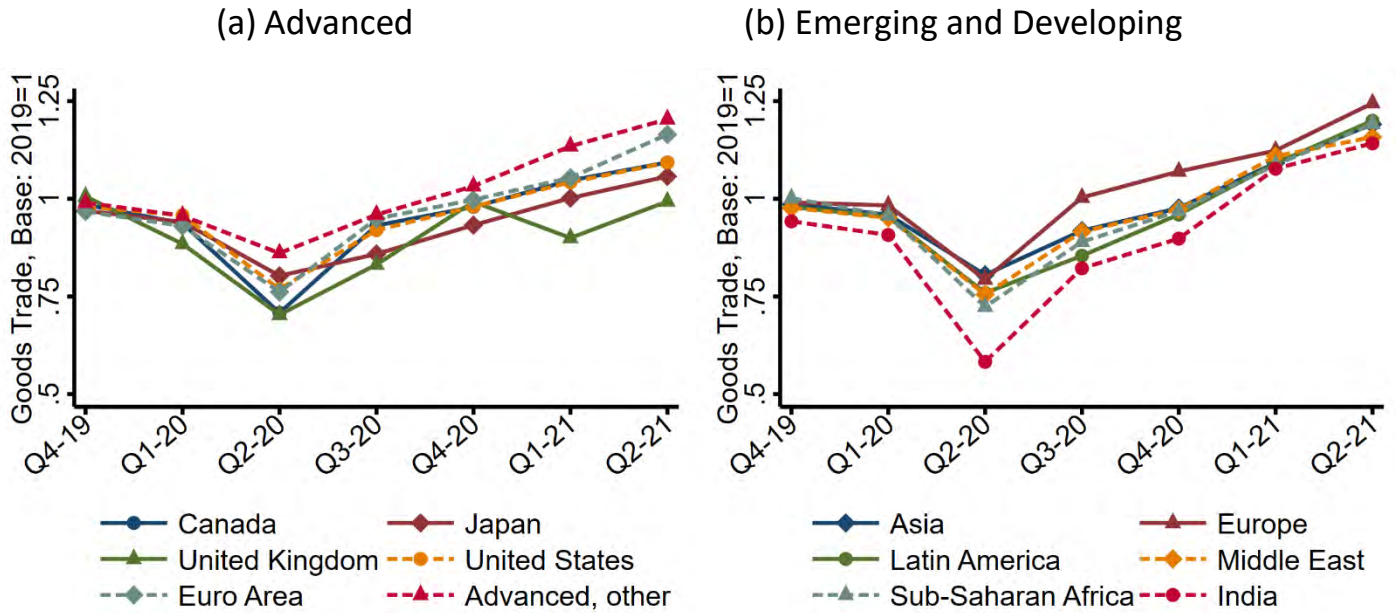
Figure 2: Real GDP

(a) Advanced   (b) Emerging and Developing

Note: In panel (b), Asia represents Emerging and Developing (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. GDP is seasonally adjusted.

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 1 in 2019 to facilitate comparisons across time and regions. Emerging and developing countries, 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.

Figure 3: International Trade

Sources: OECD, IFS, Haver Analytics and authors' calculations.

Note: Total trade in goods is defined as the sum of goods exports and goods imports, in US dollars. In panel (b), Asia represents Emerging and Developing (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.

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.[5] Specifically, we look at WEO reports for data on: GDP per capita; net government borrowing as a percent of GDP; government revenue as a percent of GDP; government expenditure as a percent 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.[6] We then compare these forecasts with the realized 2020 values published in the April 2022

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[5] World Economic Outlook (imf.org).
[6] See Appendix A.4 for a robustness check of this assumption.

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 in the WEO report, we compute the 2020 forecast using historical data, as described in the Appendix.

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 0.46 percent but instead fell by 2.04 percent, a negative 2.49 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 Latin America & Caribbean, where it amounted to 6.52 percentage points.

**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	0.46	-2.04	-2.49	1.62	-4.82	-6.44
E&D Asia (ex. China and India)	0.20	-2.64	-2.84	5.74	-1.62	-7.36
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	1.57	-7.39	-8.95
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	4.53	-0.01	-4.54

Sources: World Bank, IMF, Penn World Tables, and authors' calculations

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 A.3 for further detail on employment forecast errors and A.4 for further detail on GDP growth rate forecast errors. (iv) GDP is in constant prices.

Figure 4 plots the impact of COVID-19 on employment-to-population ratios against GDP per capita in 2019, country by country. The figure shows Latin America & Caribbean countries 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.

## Figure 4: COVID-19 Impact on Employment by Country
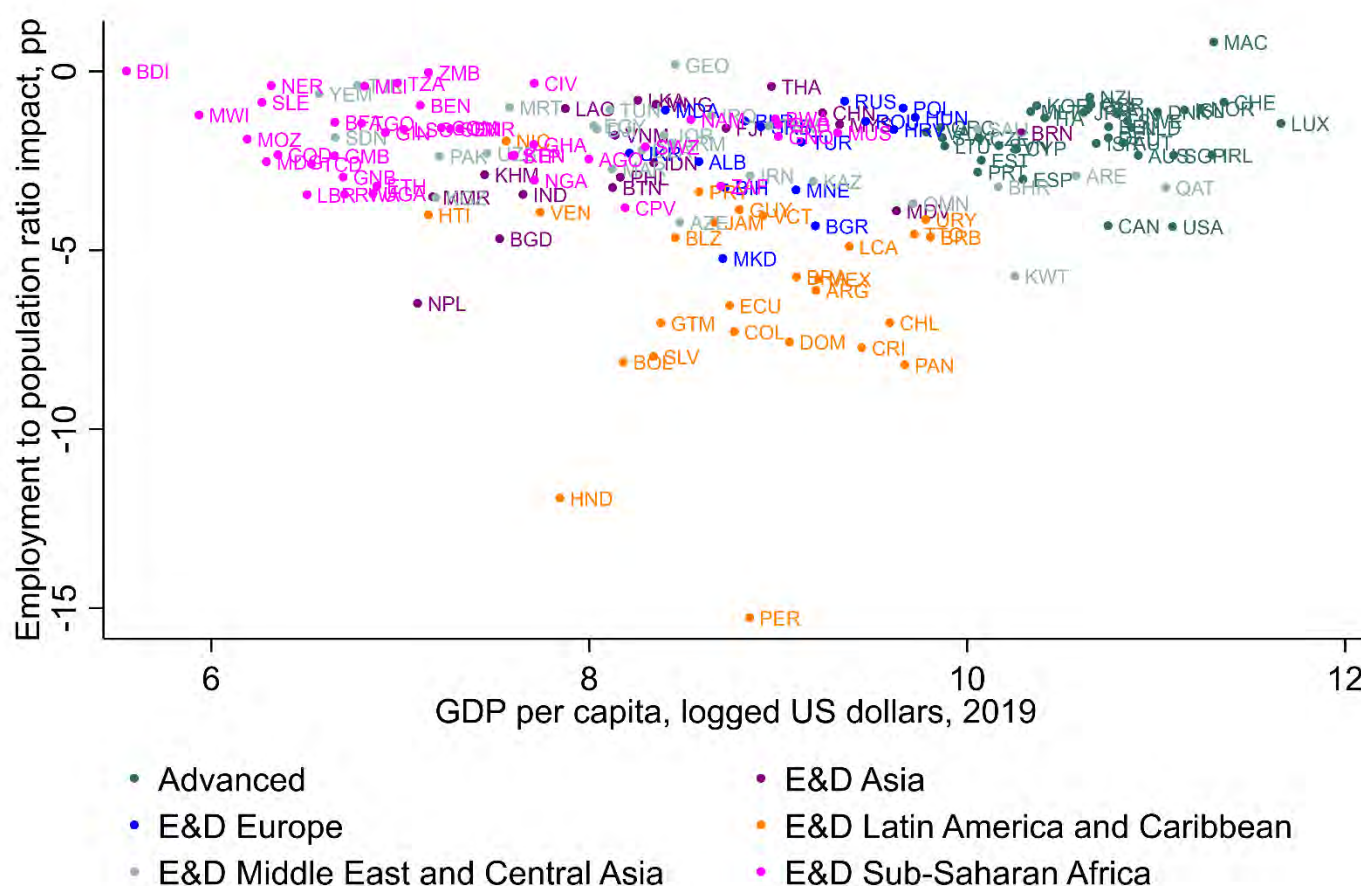
Sources: IMF, World Bank, Penn World Tables, and authors' calculations.

The right panel in Table 2 shows that GDP growth declined significantly due to the COVID-19 shock. The impact was approximately -6.44 percentage points for advanced countries and between -4.54 and -8.95 percentage points on average for emerging and developing regions. Again, Latin America & Caribbean was the region most negatively affected.

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. 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 due to COVID-19 larger than 10 percentage points.

Figure 5: COVID-19 Impact on GDP by Country
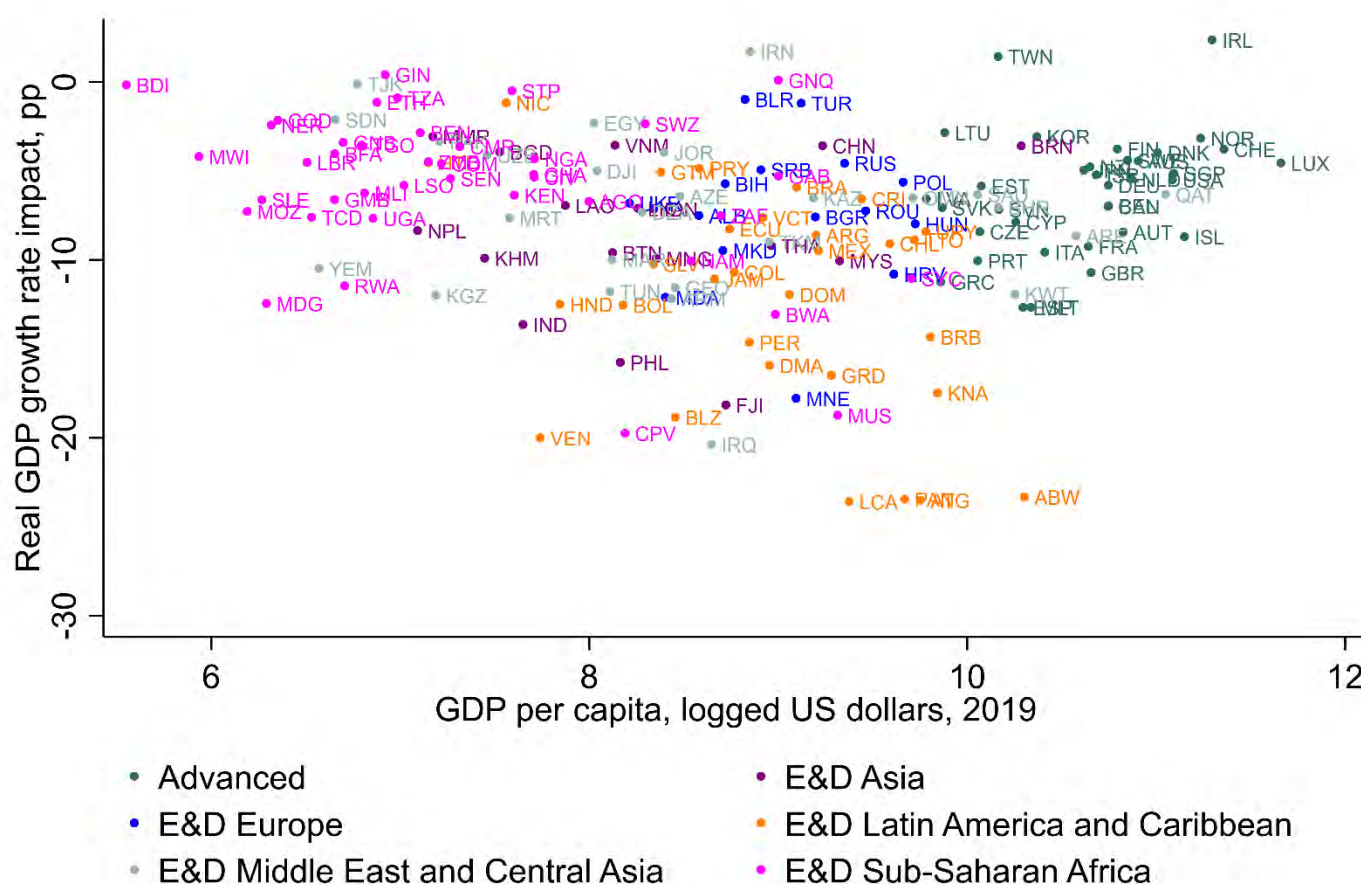
Sources: IMF, Penn World Tables, and authors' calculations.

3.3. Revenue, Expenditure, and Borrowing

We now look at how the pandemic affected fiscal policy. We 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 -2.37 percentage points in E&D Middle East & Central Asia to -0.65 percentage points in E&D Latin America & Caribbean. In contrast, advanced countries had a slightly positive impact of COVID-19 on revenue over GDP, about 0.26 percentage points, while E&D Europe had an even higher positive impact, at 0.31 percentage points.[7]

As countries entered recessions induced by the lockdown policies designed to combat the pandemic, governments increased spending. The middle panel of Table 2 shows a positive impact of the COVID-19 shock on government expenditure over GDP for all regions, with the exception of E&D Middle East & Central Asia. Advanced countries had the most significant impact, at 7.73 percentage points. At the other end, E&D Sub-

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[7] See tables in the online appendix for country-level detail.

Saharan Africa experienced the smallest positive impact at 0.10 percentage points, while E&D Middle East & Central Asia suffered a negative impact of -0.54 percentage points.

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
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

Sources: IMF, Penn World Tables, and authors' calculations

Notes: (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 A.4 for further detail on forecast errors.

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 & 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 percent 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.

Figure 6: COVID-19 Impact on Borrowing by Country
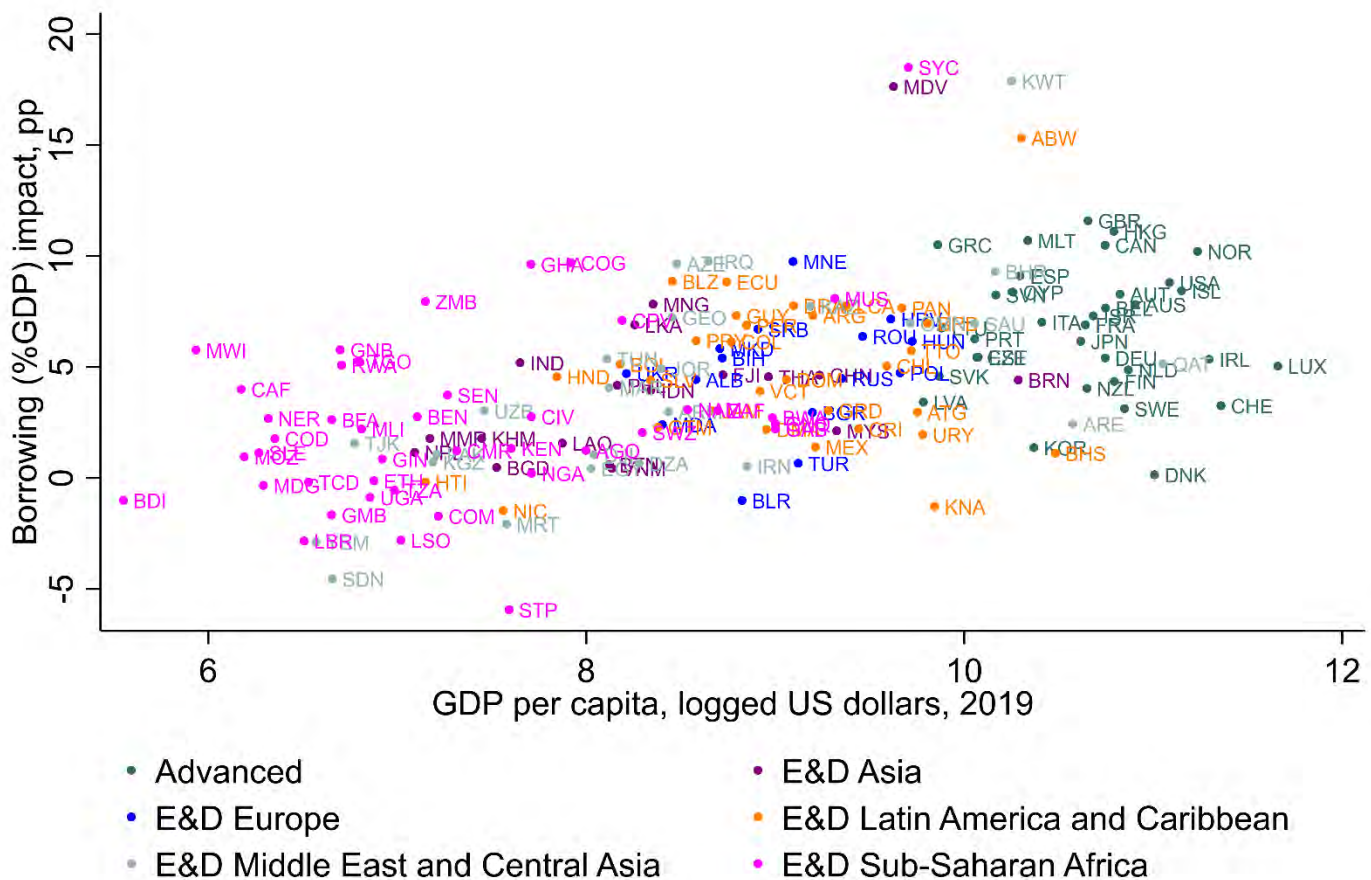
Sources: IMF and authors' calculations

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 COVID-19 on the growth rate of the monetary base by region. The monetary base is typically defined as currency in circulation plus bank reserves. The impact of COVID-19 on the monetary base growth rate was positive across regions, ranging from 2.39 percentage points in E&D Middle East & Central Asia to 43.05 percentage points in advanced countries.

The middle panels of Table 4 show the impact of the COVID-19 shock 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, let us 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 & Caribbean experiencing the most significant change at 11.87 percentage points and E&D Asia experiencing the smallest change at (a still

substantial) 4.44 percentage points. Advanced countries are among those regions that increased M2 the most, with an impact of 11.39 percentage points.

The last panel of table 4 shows the impact of COVID-19 on annual inflation. Advanced countries, E&D Asia, and E&D Latin America & Caribbean experienced a negative impact on inflation, ranging from -1.30 to -0.05 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, Middle East & Central Asia, and Sub-Saharan Africa, all experienced positive shocks to inflation ranging from 0.70 to 3.01 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	-1.30
E&D Europe	18.82	19.91	7.19	0.70
E&D Latin America & Caribbean	12.07	24.62	11.87	-0.05
E&D Middle East & Central Asia	2.39	7.36	5.23	0.83
E&D Sub-Saharan Africa	10.77	9.39	10.67	3.01

Sources: IMF, Haver Analytics, Refinitiv Eikon, and Authors' Calculations.

Notes: (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 A.3 for further detail on monetary aggregate forecast errors and Appendix A.4 for further detail on inflation forecast errors. (iv) The monetary base generally includes currency in circulation and bank reserves. (v) For monetary base, we use the monetary base and population values for the Euro area within the Advanced group. (vi) Inflation impact truncated at -25% and 25%. Monetary aggregate impacts truncated at the 5th and 95th percentiles. (vii) All values are end-of-period and growth rates are annual.

3.5. Trade

As discussed in the introduction, the COVID-19 shock hurt international trade in 2020. Table 5 shows the impact of COVID-19 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 -16.31 percentage points in E&D Asia to -10.67 percentage points in E&D Europe. The impact on real exports ranged from -15.90 percentage points in E&D Sub-Saharan Africa to -9.42 percentage points in E&D Europe. Advanced countries also suffered a significant adverse impact on international trade, 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.

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
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

<u>Sources</u>: IMF, Penn World Tables, and authors' calculations.

<u>Notes</u>: (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 A.4 for further detail on forecast errors.

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; E&D Asia is the most affected, with real GDP 10.73 percent below its pre-pandemic trend. Notably, advanced countries are also lagging, with real GDP 3.26 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.[8] 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 prior to the pandemic. The impact of the COVID-19 shock on inflation ranged from -1.38 percent in E&D Asia 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.[9] The impact is quite spread out, with both positive and negative cases, particularly as we move down the income distribution.

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

Table 6: 2020-21 COVID-19 impact on real GDP and prices by region

	Real GDP	Prices
Advanced	-3.26	1.30
E&D Asia (excl. China & India)	-10.73	-1.38
E&D Europe	-1.07	6.09
E&D Latin America & Caribbean	-4.67	4.89
E&D Middle East & Central Asia	-4.59	1.91
E&D Sub-Saharan Africa	-4.41	6.46

Sources: World Bank, IMF, Penn World Tables, and authors' calculations.

Notes: (i) Averages are weighted by population, see appendix for further details. (ii) If either the forecast or actual values are missing, then the country is excluded from the sample.

Figure 7: COVID-19 2020-21 Impact on Real GDP by Country
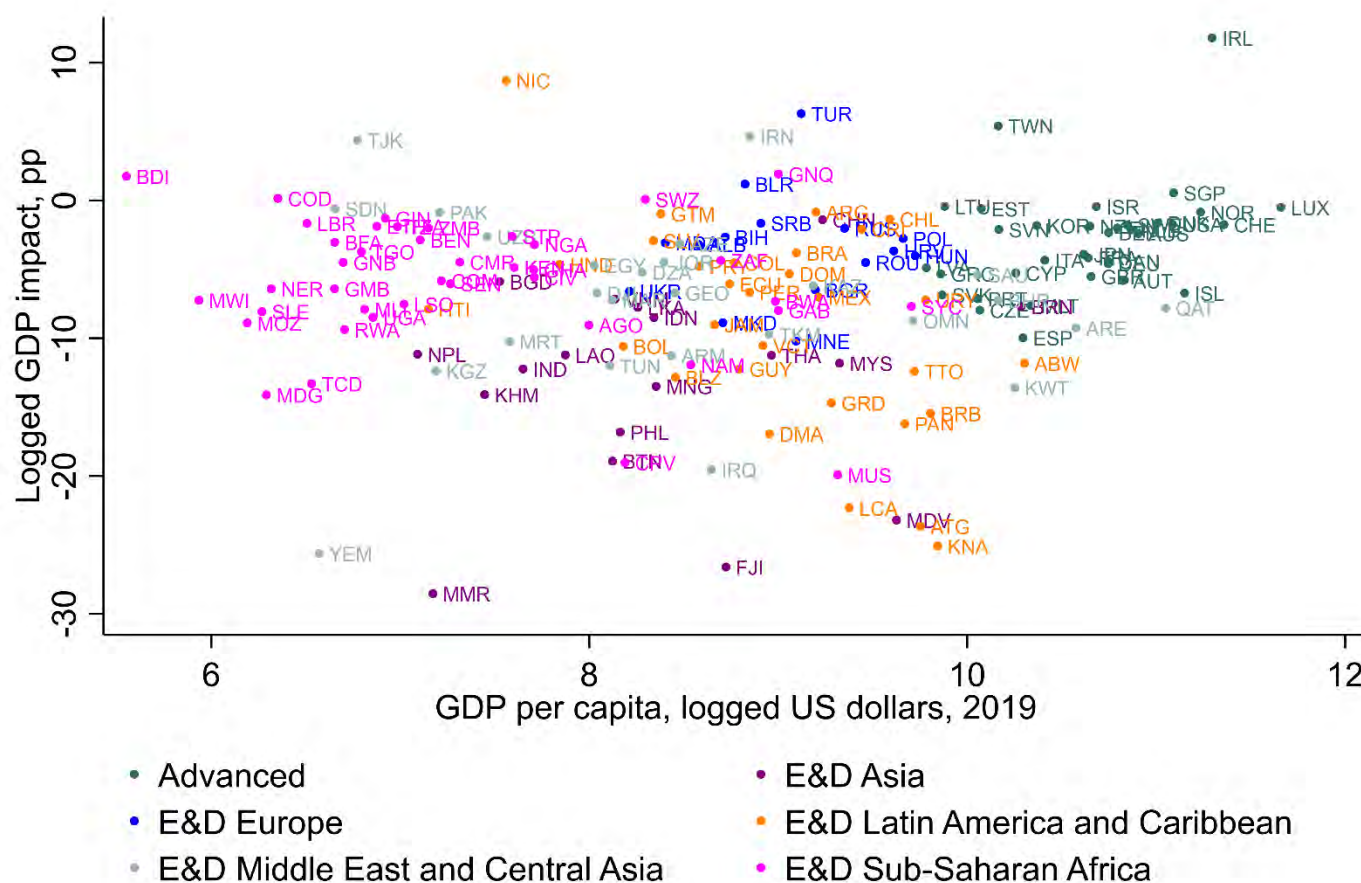
Sources: IMF and authors' calculations

Figure 8: COVID-19 2020-21 Impact on Inflation by Country
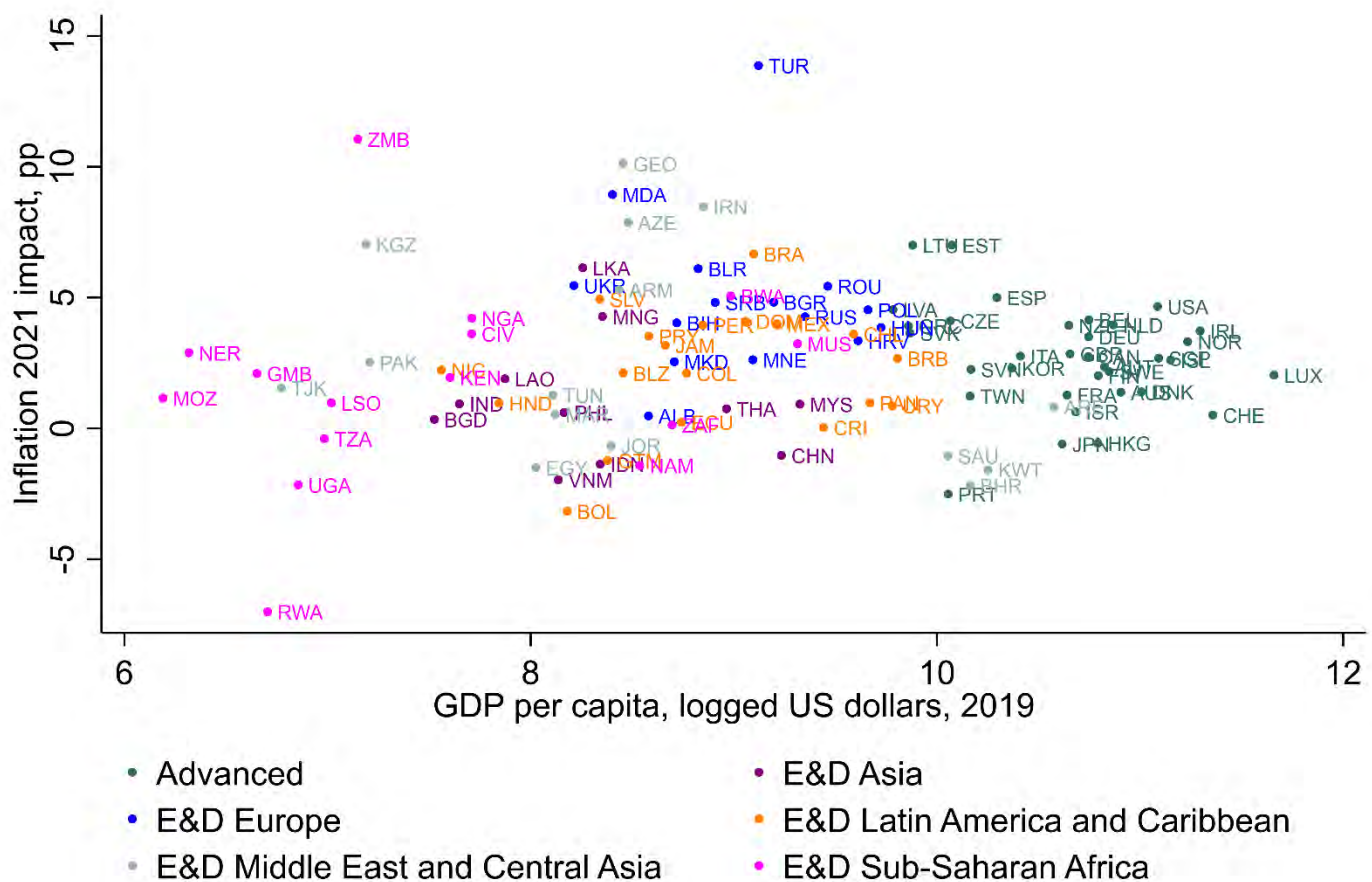
Sources: IMF and authors' calculations

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. [10] Latin America & Caribbean, a region with many middle-income countries, suffered the most in terms of output growth and employment. The impact on government revenue was either negative or slightly positive, but generally small. On the other hand, with the exception of E&D Middle East & 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 had a positive impact

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[10] Country level impact tables can be found online:
https://docs.google.com/spreadsheets/d/1c4qFjKV5bJdSG84FGB1n3_4RIHIlOhd4/edit?usp=sharing&ouid=113829206249579719546&rtpof=true&sd=true

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 while others negatively. By 2021, the impact of stimulus measures on prices started to materialize worldwide, with the notable exception of E&D Asia. Lastly, real output in 2021 was still below its pre-pandemic trend in all regions, with E&D Asia lagging significantly behind.

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Appendix

Table A1: 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 listed are missing data for 1 or more variables of interest

Data Source Notes:

Access here: [World Economic Outlook Databases (imf.org)](imf.org)

GDP (percent change): Annual percentages of constant price GDP are year-on-year changes; 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]

-   If the national statistics office compiles on non-calendar years (e.g. solar year in Afghanistan) then the IMF converts the data to calendar year

GDP (constant local currency): 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]

-   If the national statistics office compiles on non-calendar years (e.g. solar year in Afghanistan) then the IMF converts the data to calendar year

Revenue consists of taxes, social contributions, grants receivable, and other revenue. Revenue increases government's net worth, which is the difference between its assets and liabilities (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 incurrence of liabilities.

-   Compiled on fiscal year basis

Primary net lending/borrowing is net lending (+)/borrowing (-) plus net interest payable/paid (interest expense minus interest revenue).

-   multiplied by -1 so positive indicates borrowing here

Total expenditure 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: Annual percentages of end-of-period consumer prices are year-on-year changes.

Imports: Includes goods and services. Percent change of volume of imports refers to the aggregate change in the quantities of total imports whose characteristics are unchanged. The 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: Includes goods and services. Percent change of volume of exports refers to the aggregate change in the quantities of total exports whose characteristics are unchanged. The 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]

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Monetary Aggregates: Values of **Monetary Base, M1** and **M2** are from each country's central bank and 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 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 4th quarter values for each year.

Employment: The employment to population ratio used in the tables is from World Bank and available at a yearly frequency. The observations are the percent of employment to population for persons 15+ (modeled ILO estimate).

Access here: https://data.worldbank.org/indicator/SL.EMP.TOTL.SP.ZS?view=chart

GDP time-series: Quarterly data are seasonally adjusted, in real local currency from Haver Analytics. Specifically, we use the International Financial Statistics (IFS), EMERGE (data for emerging and developing countries), and Organization for Economic Co-operation (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 1.

Trade time-series: We obtain quarterly, seasonally adjusted import and export values (of goods) in total U.S. dollar amount 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 1. The OECD series are from the BOP6 category on stats.OECD.org

A.2 Tables:

In the tables, we drop China, India, Lebanon, Sudan, Syria, Suriname, and Zimbabwe from the sample. Because the tables are population weighted, India's and China's large populations skew the numbers for Emerging and Developing Asia. Additionally, some variables are not available for China. The other countries were facing economic turmoil/high inflationary pressures prior to/regardless of COVID-19 and so are dropped from the sample.

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 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 CPI (Consumer Price Index) values to get 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 logged actual end-of-period 2021 CPI.

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 3. This number is taken as a forecast for expected change in 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 employment to population ratio and the forecasted change in employment to population ratio.

Monetary aggregates 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.

A.3 Monetary aggregates and employment forecasting robustness check:

To check the robustness of our moving average forecasts for variables not included in the WEO reports, we forecast M1, M2, monetary base, and employment for 2018 and 2019 using three methods:

1. Fixed effects forecasts
    a. 3-year horizon
    b. For the monetary aggregate forecasts, observations with values greater than the 95th percentile or less than the 5th percentile are dropped.
2. Moving average forecasts
3. Random walk forecasts

Table A.3.1 shows the mean square errors for each forecast type and each of the 3 variables of interest. Likewise, A.3.2 shows the median absolute errors for each forecast type.

## Table A.3.1: Mean square forecast errors – 2018 and 2019

	Change in employment to population ratio	M1 growth rate (end of period)	M2 growth rate (end of period)	MB growth rate (end of period)
FE reg 2015 - 2018	0.66	49.59	30.25	115.00
MA 2018	0.70	76.55	62.89	177.86
RW 2018	0.70	91.41	78.40	225.38
FE reg 2016 - 2019	0.42	36.59	22.38	96.93
MA 2019	0.44	77.50	29.53	169.53
RW 2019	0.44	253.40	41.83	192.75

Table A.3.2: Median absolute forecast errors – 2018 and 2019

	Change in employment to population ratio	M1 growth rate (end of period)	M2 growth rate (end of period)	MB growth rate (end of period)
FE reg 2015 - 2018	0.26	4.85	2.93	6.95
MA 2018	0.26	5.31	3.46	8.05
RW 2018	0.26	5.15	4.22	7.64
FE reg 2016 - 2019	0.26	4.00	2.74	6.29
MA 2019	0.27	3.49	2.96	6.83
RW 2019	0.27	4.27	3.25	6.60

Figure A.3.1: Employment to Population Ratio Forecasts

Change in Employment to Population Ratio - Forecasts
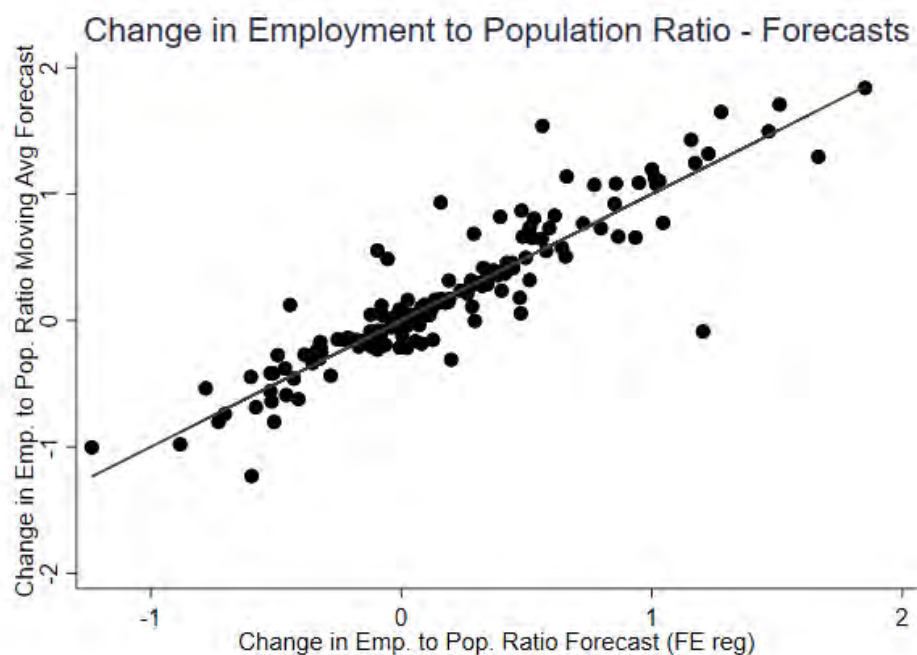
Sources: IMF, World Bank, and authors' calculations

Figure A.3.2: M1 Growth Rate (%) Forecasts

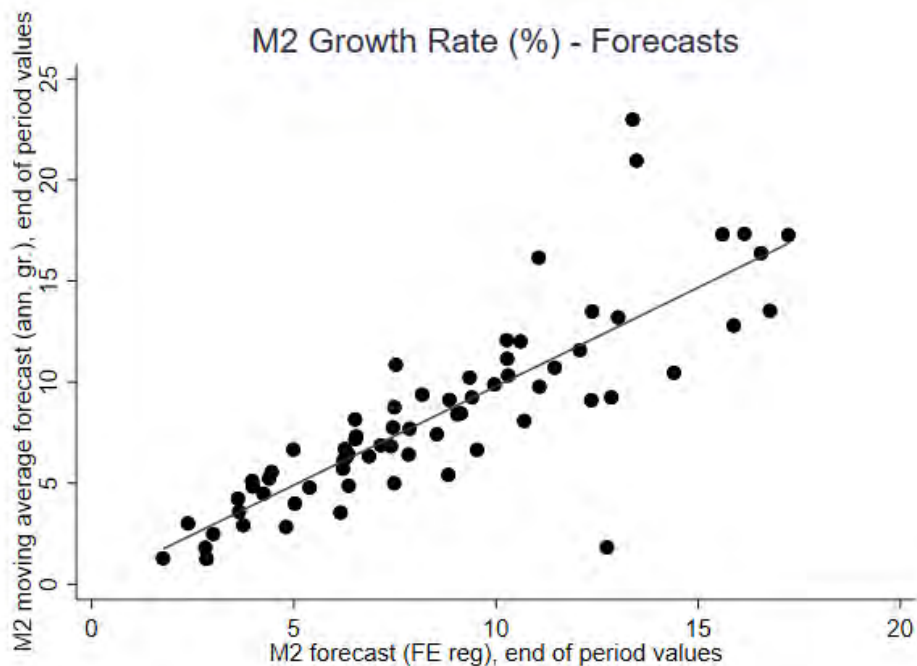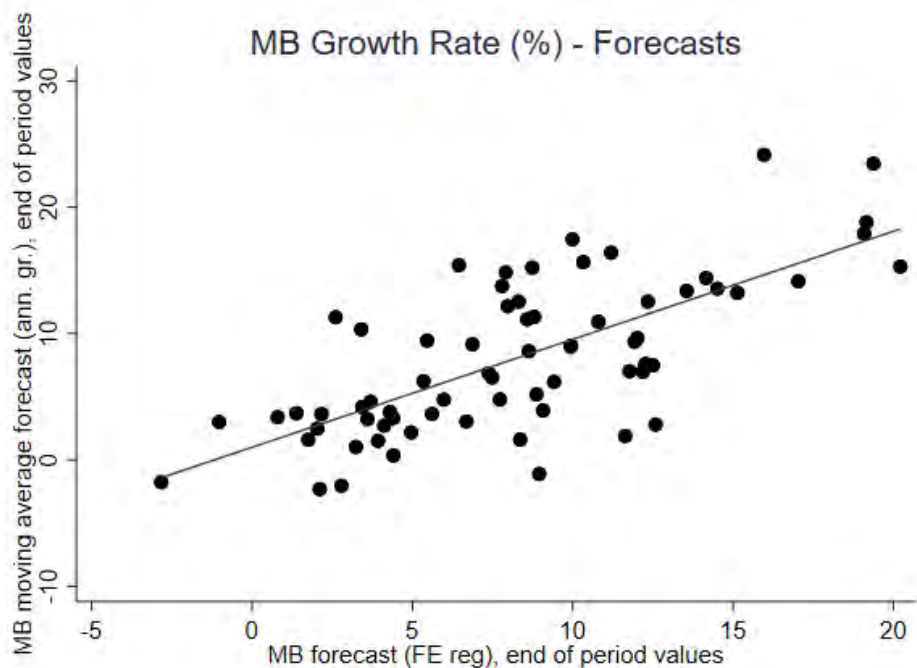
M1 Growth Rate (%) - Forecasts
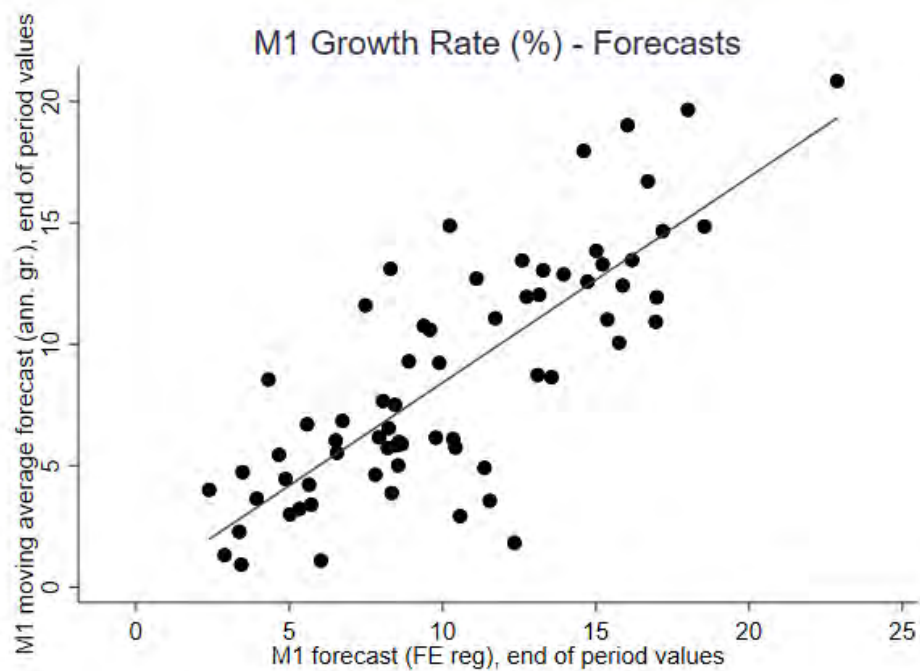
Sources: IMF, Haver Analytics, Refinitiv Eikon, and authors' calculations

Figure A.3.3: M2 Growth Rate (%) Forecasts

Sources: IMF, Haver Analytics, Refinitiv Eikon, and authors' calculations

Figure A.3.4: Monetary Base Growth Rate (%) Forecasts

Sources: IMF, Haver Analytics, Refinitiv Eikon, and authors' calculations

A.4 WEO Forecast Errors:

One concern about methodology is the accuracy of the WEO forecast in 2019. If the WEO report has consistently optimistic or pessimistic forecasts, then our impact measure will be biased. There is evidence of optimism bias in the WEO reports (Ismail, Perrelli, and Yang 2020, Timmermann 2007). Figure A.4.1 shows forecast errors for real GDP growth, end-of-period inflation, revenue (% GDP), expenditure (%GDP), government net borrowing (% GDP), imports (% change y-o-y), and exports (% change y-o-y). The observations are broken into country-level averages for 2007-2010, 2011 – 2019 The forecast error is the difference between the value for the variable in year *n* from the October 2021 WEO report and the forecast value from the October WEO report in the year *n-1*. Panel (a) shows the GDP forecasts in the pre-COVID-19 timeframe centered around 0, with negligible forecast errors for about half of the observations. The Great Financial Crisis/Great Recession timeframe, 2007-2010, has slightly more optimism bias in the errors, but overall, the errors are still close to zero. In 2020, 95% of the errors are negative, meaning that most countries experienced lower-than expected GDP growth. Thus, the real GDP growth COVID-19 impact results presented in the paper are not only due to routine forecast errors. Panels (b)-(g) present the errors for the remaining WEO variables used in this paper. The forecast errors for inflation, presented in panel (b) skew slightly more negative in 2020 than previous years. Revenue, expenditure, and net borrowing are not available in the 2007-2010 timeframe. Government expenditure, net borrowing, and export errors for 2020 are skewed more positive than the prior period, so we can determine that the COVID-19 impact for these variables is also not entirely due to forecast errors. Likewise, import errors are skewed more negative than prior period, indicating that the COVID-19 impact reported is not only due to general forecast error. Revenue is the only variable in which the COVID-19 errors have a similar distribution to the pre-COVID period forecast errors.

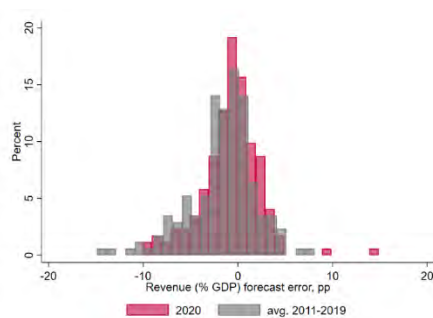# Figure A.4.1: Forecast errors over time

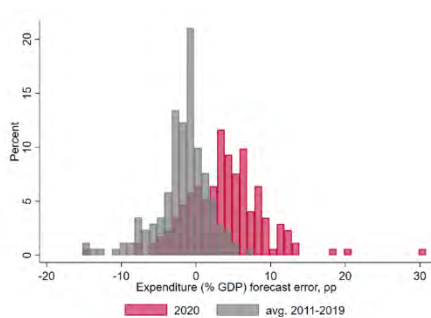(a) Real GDP growth rate
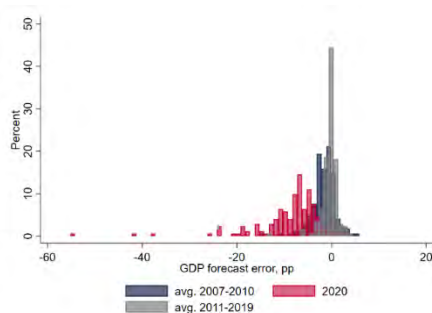
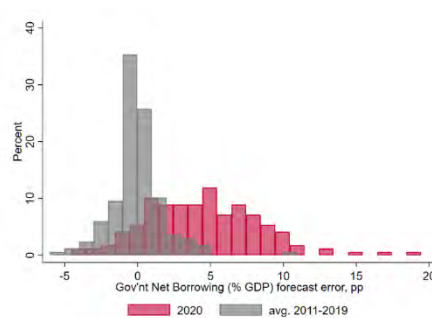(b) End-of-period inflation
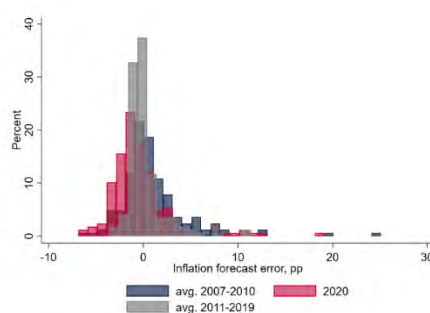
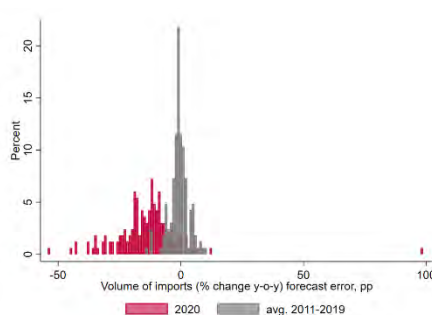(c) Government revenue (% GDP)

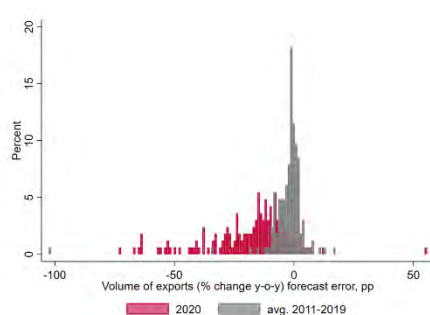(d) Government expenditure (% GDP)

(e) Government net borrowing (% GDP)

(f) Imports % change y-o-y

(g) Exports % change y-o-y

Sources: IMF WEO Reports 2006-2021 vintages