



## CHAPTER 4

# EMERGING INFLATION PRESSURES

Cause for Alarm?



After declining in the first half of 2020, global inflation has rebounded quickly on recovering activity. While global inflation is likely to continue rising in the remainder of this year, inflation is expected to remain within target bands in most inflation-targeting countries. Among emerging market and developing economies (EMDEs) where recent price pressures may raise inflation above those economies' target ranges, such pressures may not warrant a monetary policy response—provided they are temporary and inflation expectations remain well-anchored. However, higher inflation may complicate the policy choices of EMDEs that are in danger of persistently breaching their inflation targets while also relying on expansionary policies to ensure a durable recovery. Measures to strengthen central bank credibility can help anchor inflation expectations in these economies. Unless risks from record-high debt are addressed, EMDEs remain vulnerable to financial market stress should investor risk sentiment deteriorate as a result of actual or perceived inflation pressures in advanced economies. Low-income countries are likely to experience rising aggregate and food price inflation in the remainder of this year, exacerbating food insecurity and threatening to increase poverty. Attempts to control food prices through price subsidies in many countries, or the re-emergence of protectionist policies could drive global prices higher and prove to be self-defeating.

## Introduction

The COVID-19 pandemic plunged the global economy into its deepest recession since the Second World War (World Bank 2020a; 2021a). Amid a collapse in demand and plunging oil prices, global consumer price inflation declined by 0.9 percentage point between January and May 2020, and this decline was about one-third more pronounced in inflation in advanced economies than in EMDEs.

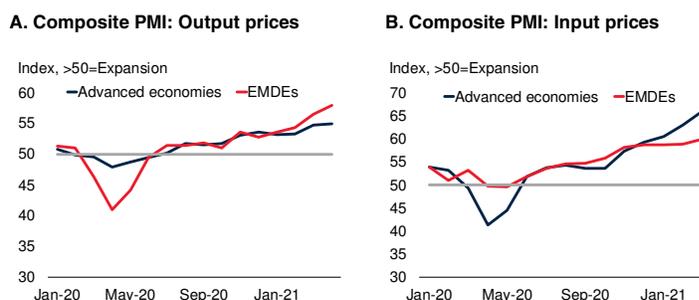
Since May 2020, however, inflation has gradually picked up. By April 2021, inflation had risen above pre-pandemic levels, in both advanced economies and EMDEs. The inflation pickup was broad-based and present in about four-fifths of countries, although the change in inflation varied widely, especially in EMDEs.

The 2020 global recession featured the most muted inflation decline and fastest subsequent inflation upturn of the five global recession episodes of the past 50 years (box 4.1). While this behavior partly reflects lower levels of inflation at the beginning of 2020, purchasing managers report growing pressures on input as well as output prices in 2021 (figure 4.1). Looking ahead, as the global economy gradually reopens, monetary and fiscal policies continue to be accommodative to support the global recovery, and pent-up demand may be about to be

*Note:* This chapter was prepared by Jongrim Ha, M. Ayhan Kose, and Franziska Ohnsorge.

**FIGURE 4.1 Price trends**

Firms report rising input as well as output prices.



Sources: Haver Analytics; World Bank.

*Note:* Subcomponent of composite purchasing managers index (PMI) for emerging markets ("EMDEs") and developed markets ("Advanced economies") for output prices and input prices. An index above 50 indicates price increases.

unleashed in advanced economies.<sup>1</sup> For major advanced economies, some have raised concerns that this confluence of factors may generate significant inflationary pressures (Blanchard and Pisani-Ferry 2020; Goodhart and Pradhan 2020; Landau 2021). Others, in contrast, see little reason for concern, at least for many advanced economies, because of the temporary nature of price pressures over the short-term as well as well-anchored inflation expectations and structural

<sup>1</sup> In the United States, CPI inflation has risen steadily since May 2020 to 4.2 percent in April 2021. In the euro area, inflation has risen since November 2020 and is now near the 2 percent target. Reflecting the recent inflation developments, short-term inflation expectations have also risen. In the United States, inflation expectations for 2021 are now at 2.8 percent, and in the euro area, they have risen to 1.7 percent with the inflation expectations above 2 percent in some economies (Czech Republic, Germany, and Norway). Medium-term inflation expectations, however, remain anchored around 2 percent.

factors still depressing inflation (Ball et al. 2021; Gopinath 2021).

If growing inflationary pressures cause financial market participants to become concerned about persistently higher inflation in advanced economies, they may reassess prospects for continued accommodative monetary policies by major central banks. This could trigger a significant rise in risk premia and borrowing costs. EMDEs are particularly vulnerable to such financial market disruptions because of their record high debt and a lagging economic recovery from the pandemic (chapter 1). In the event of financial market stress, sharp exchange rate depreciations and capital outflows may force them to abruptly tighten policies in a manner that could throttle their recoveries.

Even in the absence of dislocating financial market stress, EMDEs may face rising inflation as global price pressures feed into domestic inflation through input prices and exchange rate movements. A temporary increase in inflation may not warrant a monetary policy response. Again, if rapidly rising price pressures risk de-anchoring inflation expectations, EMDE central banks may be forced to tighten monetary policy before the recovery is fully entrenched.

Persistently higher inflation would erode discretionary incomes of the poorest households and may tip some back into poverty (Ha, Kose, and Ohnsorge 2019). This is a particularly serious risk for low-income countries (LICs; box 4.2). Since food accounts for a substantial share of consumption in these countries, recent increase in food prices have led to higher inflation and compounded the challenges confronting the poor during the pandemic.

Against this background, this chapter first briefly examines the evolution of global inflation over the past five decades and then asks the following questions:

- What have been the main drivers of recent developments in global inflation?
- How does the evolution of inflation during the 2020 global recession compare with that in earlier global recessions?

- What are prospects for global inflation?
- What are the policy implications of higher inflation for EMDEs?

The chapter contributes to the literature in four dimensions. First, it expands on existing studies by putting recent inflation developments into a historical context, drawing on a large inflation database that spans more than 80 countries and multiple inflation measures. It is the first study to compare the evolution of inflation during the 2020 global recession with those during previous global recessions. Second, it analyzes the driving forces of global inflation focusing on the 2020 global recession. To this end, it employs two approaches: a factor-augmented vector autoregression (FAVAR) model of global variables with a novel identification strategy, and an event study of global inflation around global recessions. Third, based on the discussion of various factors that determine inflation dynamics, and model-based conditional forecast, it examines prospects for inflation. Fourth, it discusses the policy implications of potentially growing inflationary pressures for EMDEs, including LICs. For the purposes of this chapter, inflation refers to year-on-year percent changes in headline consumer price index (CPI) inflation, but other inflation measures are also examined.

The main findings of the chapter are the following (figure 4.2).

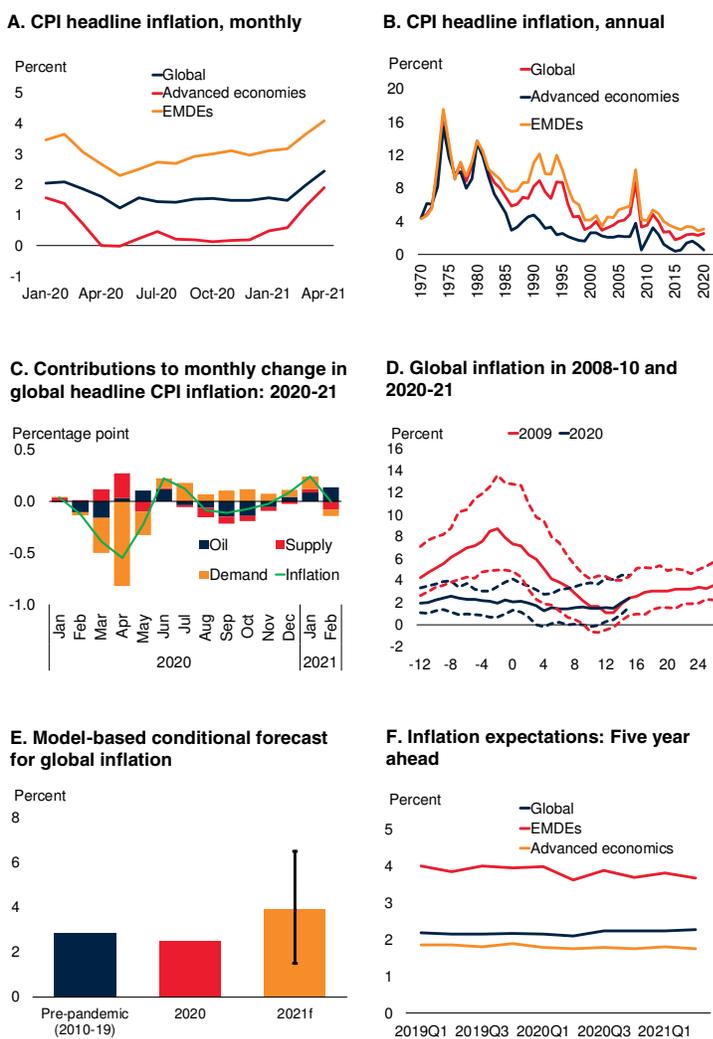
- *Shorter-lived decline but faster increase in inflation.* The decline in inflation during the 2020 global recession was the most muted and shortest-lived of any of the five global recessions over the past 50 years. Similarly, the increase in inflation since May 2020, amid a rebound in oil prices and global demand has been faster than after previous recessions, including after the 2009 global recession.
- *Dominant role of global demand in driving inflation.* The decline in global inflation from January-May 2020 was four-fifths driven by the collapse in global demand and another one-fifth driven by plunging oil prices, with some offsetting inflationary pressures from supply disruptions. This contrasts with the

2009 global recession in which the 13-month decline in global inflation that was three-fifths driven by plunging oil prices and only one-third driven by the contraction in global demand. In their rebounds, however, inflation developments after the end of two global recessions resembled each other: both were virtually entirely driven by sharp increases in global demand.

- Higher inflation in 2021 but stable short-term inflation expectations.* Model-based forecasts and current inflation expectations point to an increase in global inflation for 2021 as a whole of just over 1 percentage point. For virtually all advanced economies and one-half of inflation-targeting EMDEs, an increase of this magnitude would leave inflation within target ranges. However, for another one-half of inflation-targeting EMDEs, it would raise inflation above target ranges. If this increase is temporary and inflation expectations remain well-anchored, this may not warrant a monetary policy response. If, however, inflation expectations risk becoming unanchored, EMDE central banks may be compelled to tighten monetary policy more than would be appropriate for their economies' recoveries.
- Low and stable inflation over the long term.* For now, long-term expectations point to continued low and stable inflation. However, several structural forces (demographic changes, global supply chains) that have depressed inflation over the past five decades are beginning to fade amid trade tensions, population aging, and investment and productivity weakness. As they recede, increases in short-term inflation may become more persistent and, thus, threaten the anchoring of long-term inflation expectations.
- More pronounced challenges in LICs.* Inflation challenges are larger for LICs, partly because of pressures on food prices. In contrast to other EMDEs, inflation in LICs increased with the outbreak of COVID-19, largely as a result of food price increases. In the near term, further rises in global agricultural prices are likely to add to inflationary pressures in

**FIGURE 4.2 Inflationary pressures**

Following a modest decline during January-May 2020, global inflation has rebounded quickly. The inflation decline in early 2020 was more muted than after the 2007-09 global financial crisis, and it was also shorter-lived in part because of a faster recovery in global demand. Global inflation has declined and been low for several decades. Model-based forecasts are consistent with an inflation uptick in 2021 by just over 1 percentage point but this uptick may be short-lived. Long-term inflation expectations remain broadly unchanged.



Sources: Haver Analytics; Consensus Economics; IMF World Economic Outlook; World Bank.  
Note: Year-on-year inflation for 81 countries, of which 31 are advanced economies and 50 are EMDEs.

- A. Median of year-on-year headline consumer price index (CPI) inflation in a sample of 81 countries.
- B. Median of annual average headline CPI inflation in a sample of 155 countries.
- C. Contributions to change in year-on-year headline consumer price inflation from the previous month for 81 countries, of which 31 are advanced economies and 50 are EMDEs, based on FAVAR estimation in annex 4.1. Monthly data. Unexplained residual is omitted from the graph.
- D. Blue and red lines are medians, dotted lines are interquartile ranges. t=0 is September 2008 for 2009 and January 2020 for 2020.
- E. Conditional forecast of global inflation based on quarterly FAVAR model of global inflation, global GDP growth, and oil price growth. Vertical line indicates 16-84 confidence bands. See annex 4.1 for details.
- F. Median five-year-ahead consensus inflation expectations among 24 advanced economies and 23 EMDEs.

LICs. This, and potential pressures to finance large fiscal deficits can risk ingraining higher rates of inflation into expectations. Attempts to suppress food price inflation through price subsidies in many countries, or the re-emergence of protectionist policies, could drive global prices higher and prove to be self-defeating.

## Global inflation before the pandemic

Inflation has been declining around the world over the past half century. Global inflation fell from 16.9 percent in 1974 to 2.3 percent in 2019, up from its lowest point on record of 1.8 percent in 2015 after a long slide in oil prices (figure 4.3).<sup>2</sup> In EMDEs, inflation declined from a peak of 17.5 percent in 1974 to 2.9 percent in 2019. In LICs, inflation fell from 25.2 percent in 1994 to 3.5 percent in 2019. The trend decline started earlier (in the mid-1980s) in advanced economies than in EMDEs and LICs (in the mid-1990s).

In EMDEs, this disinflation process cut across all regions, including those with a history of persistently high inflation, such as Latin America and the Caribbean and Sub-Saharan Africa. The downward trend was evident in all inflation measures, including headline CPI, core CPI, PPI, and GDP deflator inflation. By the early 2000s, the disinflation was largely completed, although it resumed after the global financial crisis at a milder pace.

The widely shared disinflation in advanced economies has been attributed partly to changes in monetary policy regimes, including the increased focus on price stability, which took hold during the early 1980s (Cecchetti et al. 2007; Levin and Piger 2004). Other factors may have included sounder fiscal policies, deregulation, globalization, growing global labor forces, and, in the 1990s, accelerating productivity growth in parts of the world (Goodhart and Pradhan 2020; Rogoff 2003).

<sup>2</sup> Comparisons in this historical section are based on annual data of 155 countries.

In EMDEs, the introduction of inflation targeting, improvements in fiscal balances (prior to the 2007-09 financial crisis), greater exchange rate flexibility and macroeconomic stabilization programs helped lower inflation (Aizenman, Chinn, and Ito 2008; Mishkin and Schmidt-Hebbel 2007). Notwithstanding a pickup in the past 15 years, inflation expectations in EMDEs have become better-anchored and less responsive to inflation surprises (Kose et al. 2019).

## Inflation during the pandemic

Between January and May 2020, amid a collapse in demand and plunging oil prices, global inflation ticked down by 0.9 percentage point, and EMDE and advanced-economy inflation by 1.2 and 1.6 percentage point, respectively (figure 4.4). A surge in global and EMDE food inflation during January-April 2020 was more than offset by a collapse in oil prices (Dunn, Hood, and Driessen 2020; Shapiro 2020).

Starting in May 2020, however, inflation began to pick up, although it has remained low by historical standards. By April 2021, inflation had risen 0.3-0.6 percentage point above pre-pandemic levels, in both advanced economies and EMDEs. The initial surge in global food prices, the plunge in global oil prices, and the decline in global core inflation have also been unwound since May 2020. The magnitudes of the inflation pickup, however, varied, especially in EMDEs where the interquartile range of inflation widened by 1 percentage point between May 2020 and March 2021 before narrowing again in April 2021 as the inflation pickup broadened.

The decline in inflation during January-May 2020 followed by a rebound that was broad-based across countries, EMDE regions, and inflation measures. In almost three-quarters of countries, inflation declined between January-May 2020 but rose thereafter.<sup>3</sup> Although EMDE core inflation re-

<sup>3</sup> The pattern of inflation decline followed by a rebound to near pre-pandemic levels was seen in all EMDE regions except in East Asia and Pacific (EAP), although the decline was somewhat delayed in Middle East and North Africa (MNA) and Sub-Saharan Africa (SSA), in part because of rising food price inflation.

mained broadly stable, global core inflation declined by 0.6 percentage point during January-June 2020 before rising to within 0.2 percentage point of its pre-pandemic (January 2020) level.

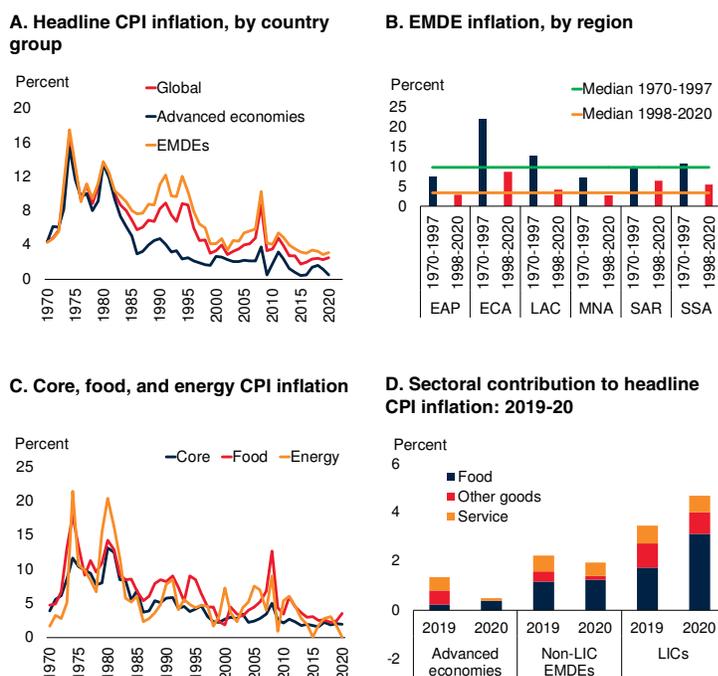
## Drivers of inflation during the pandemic

Plunges in aggregate demand, oil price declines, and supply disruptions contributed to global inflation developments in 2020. For EMDEs, global shocks were in part channeled into domestic inflation rates through exchange rate movements, compounding the effect of domestic supply shocks as lockdowns disrupted services activity and food supply chains.

- Plunge in aggregate demand.* Lockdowns and weaker consumer confidence triggered a collapse in demand (Dunn, Hood, and Driessen 2020). Reflecting the sharp declines in aggregate demand, global trade also plunged. Uncertainty about the spread of the pandemic, future economic conditions, and policy responses deterred private consumption and investments (Caggiano, Castelnovo, and Kima 2020; Leduc and Liu 2020a). Wages declined in response to higher unemployment: In the median country (among 44 countries), wages declined 5.4 percent (annualized) during the first half of 2020 and rebounded to pre-crisis levels in many countries in the second half. Global economic activity reached its trough in mid-2020 and subsequently recovered, supported by unprecedented policy measures. With the recovery in demand, accompanied by a shift from in-person to online purchases, retail sales bounced back, global trade rebounded, and demand for energy strengthened from mid-2020.
- Oil price collapse.* Between late-January and mid-April 2020, amid the pandemic-induced global recession, oil prices plunged by more than 60 percent as lockdowns disrupted the transport and travel that accounts for two-thirds of global energy consumption (Kabundi and Ohnsorge 2020; Wheeler et al. 2020).

## FIGURE 4.3 Global inflation

Since its peak in the mid-1970s, global inflation has been declining. The decline began in the mid-1980s among advanced economies before moving to EMDEs in the mid-1990s. This disinflation process cut across all EMDE regions and manifested in all inflation measures. During the COVID-19 pandemic, inflation in service and non-food goods sectors were subdued, while food inflation has increased.



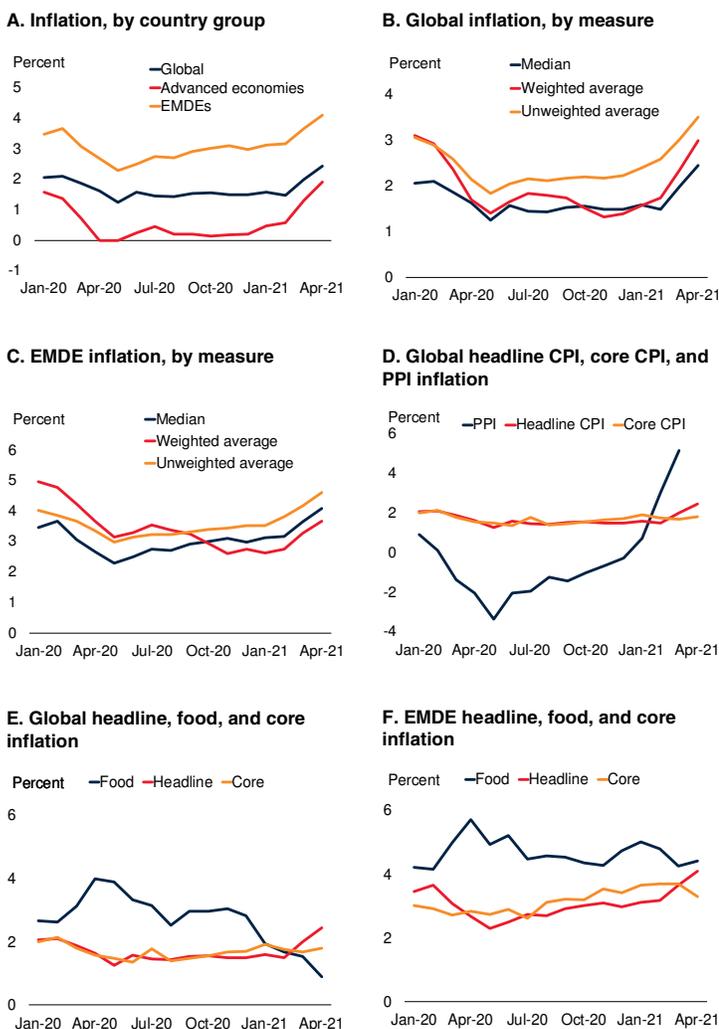
Sources: Havers Analytics; International Monetary Fund; World Bank.  
 Note: CPI = consumer price index; EMDEs = emerging market and developing economies.; LICs= low income countries. Cross-country medians unless otherwise specified.  
 A.-C. Based on a sample of 155 countries (30 advanced economies and 125 EMDEs). The values show headline CPI inflation or its sub-components.  
 B. EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MNA = Middle East and North Africa; SAR = South Asia; SSA = Sub-Saharan Africa.  
 D. Median headline CPI inflation (annual averages) in 12 sectors across 147 countries. Sectors are categorized following International Financial Statistics. Food indicates food and nonalcoholic beverages and alcoholic beverages, tobacco, and narcotics sectors. Other goods include clothing and footwear, housing, water, electricity, gas and other fuels, furnishings, household equipment and routine household maintenance sectors. Service sector includes health, transportation, communication, recreation, education, restaurants, and miscellaneous sectors.

For oil-importing countries and manufacturing, this lowered the cost of a critical input into economic activity. For oil-exporting countries, it reduced export and fiscal revenues and, in some, compelled authorities to curtail government spending. Oil prices recovered from May onwards and are now near their pre-pandemic level.

- Supply disruptions.* Especially early in the pandemic, lockdowns disrupted economic activity. Services sector activity was sharply

## FIGURE 4.4 Inflation during the pandemic

Global, advanced-economy and EMDE inflation slowed between January and May 2020 but then began to rebound. By April 2021, inflation had rebounded above pre-pandemic levels in both advanced economies and EMDEs, while inflation in the largest economies (the drivers of weighted average global inflation) was still somewhat below pre-pandemic levels.



Sources: Haver Analytics; World Bank.

Note: CPI = consumer price index; PPI = producer price index. Year-on-year inflation for 81 countries, of which 31 are advanced economies and 50 are EMDEs.

A. Group medians.

B.C. Weighted average uses 2020 real GDP weights (at 2010 prices and exchange rates).

D.-F. Year-on-year consumer price inflation for 81 countries, of which 31 are advanced economies and 50 are EMDEs. PPI inflation for 97 countries. Monthly data. Group medians.

curtailed as restrictions were imposed on transactions that required in-person interaction. In some countries, restrictions on international travel complicated migration of agricultural workers and lockdowns of markets disrupted the sale of produce (World Bank 2020a, 2020c, 2021b).

- Currency movements.* Larger depreciations during the pandemic, especially during the financial market stress and capital outflows of March and April 2020, were a key source of inflationary pressures in EMDEs (Banerjee et al. 2020). During the first half of 2020, currencies depreciated against the U.S. dollar by 10 percent or more in one-third of EMDEs before recouping some of their losses in the second half of 2020 (chapter 1). One-fifth of EMDEs ended 2020 with weaker exchange rates than at the start of the year. These depreciations fed into inflation: In EMDEs, a 10 percent depreciation has been estimated to raise consumer prices by about 1 percent over the following year (Ha, Stocker, and Yilmazkuday 2020). The strength of the exchange rate pass-through to inflation is particularly high in EMDEs when it is caused by global or domestic demand shocks or domestic supply shocks. Indeed, in EMDEs with 10 percent or higher currency depreciation, median inflation was 6.8 percent in 2020, about 3 percentage point higher than in other EMDEs.

- Food price volatility.* In some countries, supply disruptions, such as market and trade restrictions or curfews, appear to have affected domestic food supply chains, increasing wholesale and retail markups, and contributed to rising food price inflation (Husain et al. 2020; Swinnen and McDermott 2020).<sup>4</sup> Food price increases have been higher in countries with larger currency depreciations that raised prices of imported foods. Food supply instability during the pandemic has coincided with episodes of internal conflict in some EMDEs (Ide 2021). Food price increases have been particularly pronounced (2-3 percentage points above the median EMDE) in EMDEs with a history of higher food price inflation over the past decade (in particular in South Asia, and Sub-Saharan Africa) and in low-income countries (box 4.2).

<sup>4</sup> Using event studies, Ebrahimi, Igan, and Peria (2020) find that past epidemics, wars, and other disasters coincided with inflation increases, mainly driven by changes in food prices, although the increase was short-lived.

## BOX 4.1 Inflation during global recessions

*Some of the sharpest inflation movements over the past half century occurred around global recessions. During these episodes, inflation typically declined for several months, driven by the coincidence of several shocks, before recovering to a lower level than before the global recession. The 2020 global recession featured the most muted inflation decline and fastest subsequent inflation upturn among the five global recessions episodes over the past 50 years.*

### Introduction

Global inflation has steadily trended down since 1970. However, there were several notable departures from this downward trend associated with global recessions. During global recessions, global output collapsed, and oil prices plunged, thus lowering inflation (Baffes et al. 2015; Kose and Terrones 2015; Wheeler et al. 2020). Along the subsequent recovery path, some global recessions were followed by lasting supply weakness that compounded the inflationary pressures associated with the demand rebound. Against this backdrop, this box examines the following questions.

- How did inflation evolve during global recessions?
- What were the drivers of inflation during global recessions?

For the purposes of this box, global inflation is defined as the cross-country median of quarterly inflation rates of 25 advanced economies and 51 EMDEs during 1970-2020. To remove one-off factors, the four-quarter moving average of quarter-on-quarter annualized inflation is used as a proxy for trend inflation.<sup>a</sup> The analysis is restricted to CPI inflation for lack of a sufficiently large country sample for other inflation measures in the 1970s-1990s. Turning points of global business cycles before the outbreak of the COVID-19 pandemic are identified using global per capita gross domestic product (GDP) as in World Bank (2020b). Since 1970, there have been five global recessions with their troughs in 1975Q1, 1982Q4, 1991Q1, and 2009Q1, and 2020Q2. These recessions were associated with a wide range of adverse developments, including financial crises in advanced economies or EMDEs (Kose, Sugawara, and Terrones 2020).

*Note:* This box was prepared by Jongrim Ha, M. Ayhan Kose, and Franziska Ohnsorge.

a. The rolling average smooths out seasonal and short-term factors. Other studies often employed different measures of trend inflation that span somewhat longer horizons; Ball (1994) employed a nine-quarter centered rolling average to eliminate the irregular factors in inflation. If applied here, this would rule out a comparison with 2020 for lack of data. Therefore, the four-quarter trailing moving average of inflation is employed instead. The results are largely consistent using four-quarter centered rolling averages.

### Evolution of inflation during global recessions

Global recessions set off a decline in global inflation that lasted several quarters beyond the trough of the recession and well into the recoveries (figure B4.1.1). Global inflation declined by a cumulative 6.2 percentage points, on average, between the trough of the global recession and the subsequent trough of global inflation. The global recession in 2009 was accompanied by a somewhat shallower (5.1 percentage point, peak to trough) and shorter-lived inflation decline, in part reflecting lower inflation at the start of the recession. Four quarters after the trough of the 2009 global recession, global inflation began to pick up. This pickup was delayed by another 1-2 years after the 1991 and 1975 global recessions and by five more years in the 1982 global recession. After all global recessions other than 1991, global inflation subsequently stabilized at a lower rate than before the global recession, returning to a path of long-term trend disinflation.

The disinflation around global recessions was broad-based across country groups (for both headline CPI and GDP deflator inflation) and inflation measures (figure B4.1.2). That said, in the 1970s through 1990s, the inflation decline was steeper in advanced economies than EMDEs, partly due to the delayed disinflation in EMDEs with high inflation in early 1990s. From 2000, the decline in inflation around global recessions was much more pronounced in EMDEs. Data for other inflation measures, such as core CPI and PPI inflation, is only available for the 2009 and 2020 recessions. In both the global recession of 2009 and of 2020, global inflation declined by all measures of inflation, but the inflation decline was larger and more prolonged in 2009 for all measures of inflation.

### Drivers of inflation during global recessions

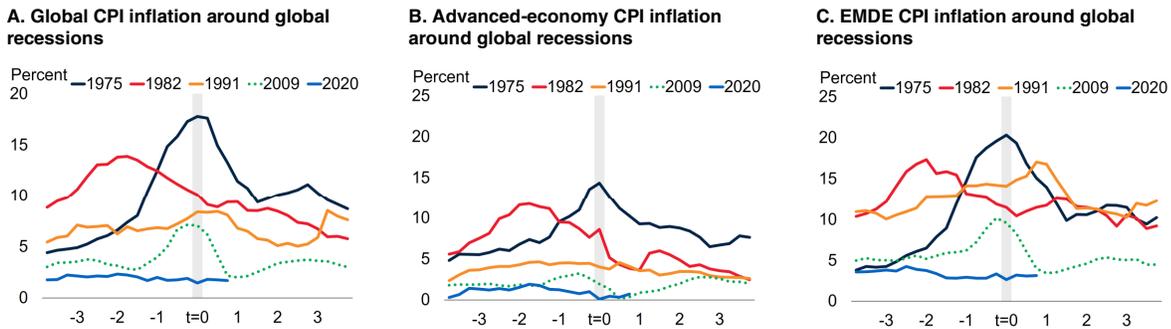
The inflation decline in the first five months of 2020 was predominantly demand-driven. With the exception of the 1991 global recession, disinflation in previous global recessions was driven by a broader range of factors (figure B4.1.3; Ha, Kose, and Ohnsorge 2019).

- The disinflation in the global recession of 1975 was predominantly driven by oil price shocks but also, in almost equal measures, by global supply and demand shocks. This was in part an unwinding of the surge in

**BOX 4.1 Inflation during global recessions (continued)**

**FIGURE B4.1.1 Headline CPI inflation around global recessions**

*Global recessions (in 1975, 1982, 1991, 2009, and 2020) have typically been associated with slowing global inflation.*

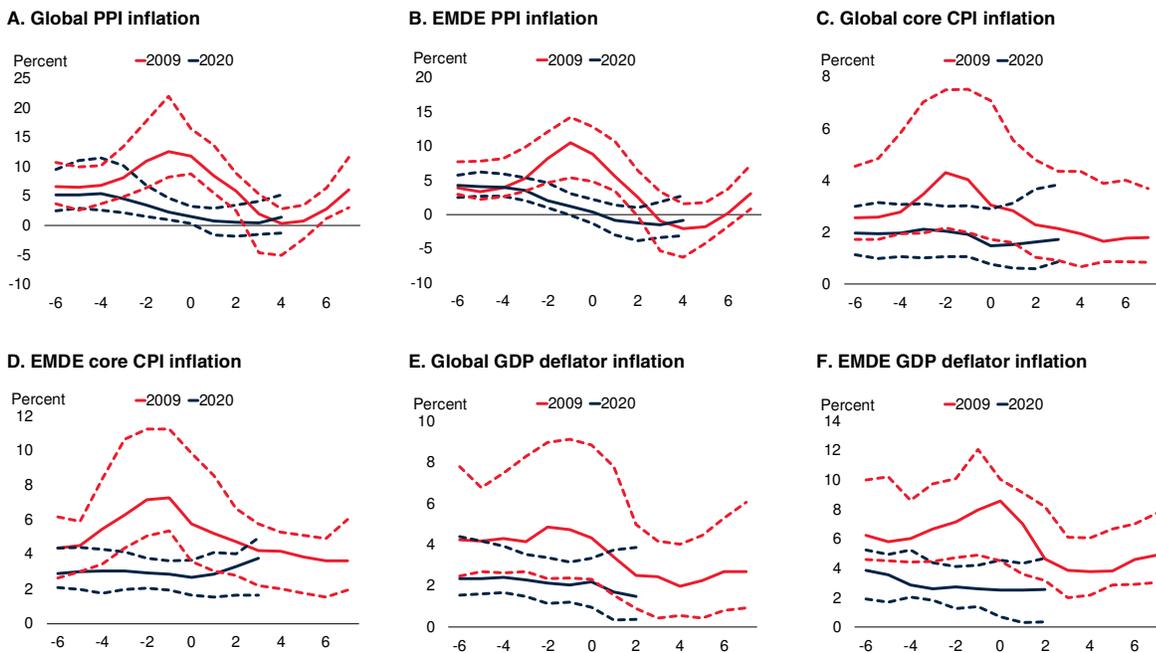


Sources: Kose, Sugawara, and Terrones (2020); World Bank (2020a, 2021a).

Note: Horizontal axes indicate years before and after the troughs of global recessions (shaded area, t = 0). Global inflation is defined as median trend inflation (4-quarter rolling average of quarterly annualized inflation) across 76 countries, consisting of 25 advanced economies and 51 EMDEs. Troughs of global recessions are identified using global per capita GDP and the algorithm in Harding and Pagan (2002) and are consistent with the results in Kose and Terrones (2015). Trough of global recession in 2020 is assumed to be at the second quarter of 2020. EMDEs = emerging market and developing economies.

**FIGURE B4.1.2 Evolution of inflation during 2009 and 2020 global recessions**

*All measures of global and EMDE inflation tend to decline with the onset of global recessions before picking up again. By all measures, the movements of global and EMDE inflation through the global recession of 2020 were more muted and shorter-lived than those during the global recession of 2009.*

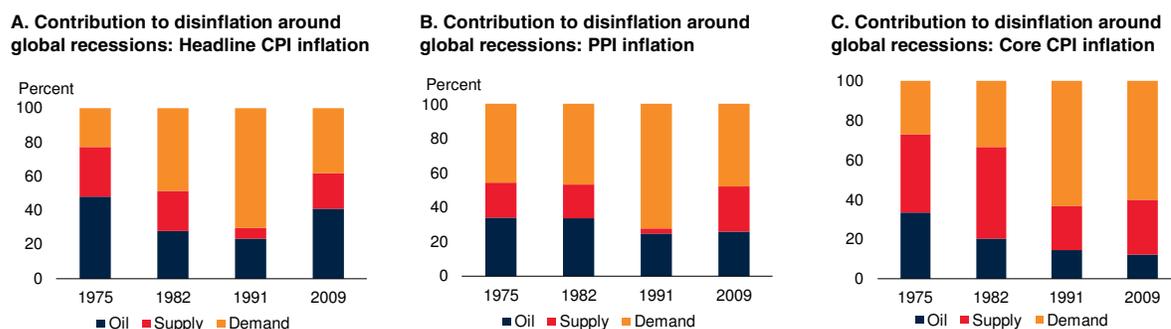


Sources: Kose, Sugawara, and Terrones (2020); World Bank (2020a, 2021a).

Note: Horizontal axes indicate quarters before and after the troughs of global recessions (t=0). Global inflation is defined as median trend inflation (four-quarter rolling average of quarterly inflation). Core inflation data are available for 51 countries, including 28 emerging market and developing economies (EMDEs), and producer price index (PPI) data are available for 85 countries, including 53 EMDEs, GDP deflator data are available for 81 countries, including 50 EMDEs. Troughs of global recessions are 2009Q1 and 2020Q2.

**BOX 4.1 Inflation during global recessions (continued)****FIGURE B4.1.3 Drivers of disinflation in past global recessions**

*Inflation in global recessions has been driven by different types of factors. In 1991, demand largely explained the collapse in inflation movements. In 1975 and 2009, oil price movements were the main source of inflation variation.*



Sources: Ha, Kose, and Ohnsorge (2019); Kose, Sugawara, and Terrones (2020).

Note: Historical decompositions of global inflation measures are estimated by the global FAVAR model for the sample period 1970-2017. Troughs of global recessions are identified using global per capita GDP and the algorithm in Harding and Pagan (2002) and are consistent with the results in

Kose and Terrones (2015). Charts show relative contribution of oil price, global demand, and global supply shocks to global disinflation from the trough of the global recession to the subsequent trough in global inflation.

inflation after the oil crisis in 1973-74 when oil prices quadrupled and an oil embargo disrupted transport and manufacturing.

- The disinflation in the 1982 global recession was driven by global demand shocks (one-half), global supply shocks (one-quarter) and global oil price shocks (one-quarter). This disinflation was in part the intended response to the monetary policy tightening in major advanced economies, after the oil price crisis of 1979 (following the Iranian revolution) led to a surge in inflation.
- The disinflation in the 1991 global recession was predominantly global demand driven as financial crises or credit crunches in several advanced economies culminated in a global recession.
- The disinflation at the height of the global recession of 2009 (2008Q4 and 2009Q1) was driven by both demand and oil price shocks in broadly equal measure. Despite coordinated global fiscal and monetary policy support, the global financial crisis caused a deep global recession that was accompanied by a two-thirds plunge in oil prices in the five months from July 2008.

Again, with the exception of the global recession of 1991, the predominance of demand shocks in driving down core

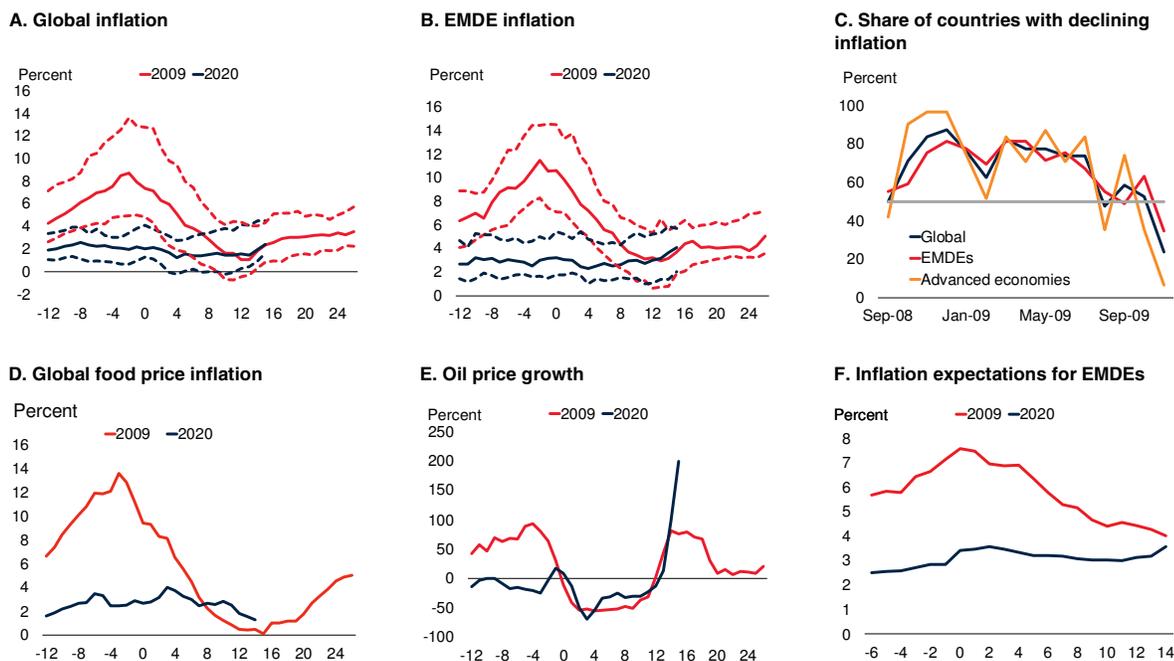
CPI and PPI inflation during the 2020 pandemic contrasts with the sources of disinflation in previous recessions.

- In 1975, oil price shocks and demand shocks were the main source of PPI disinflation and oil price shocks and supply shocks the main source of core CPI disinflation. Disinflation at that time mainly reflected an unwinding of earlier shocks—the oil price spike of 1974 and the inflationary impact of wage and consumer price controls being lifted, accompanied by the collapse of the Bretton Woods fixed exchange rate system in 1971. The large role of oil price shocks in core CPI inflation dynamics—notwithstanding the exclusion of energy from the core inflation aggregate—in the 1970s may also have reflected poorly anchored inflation expectations once the nominal anchor of the Bretton Woods fixed exchange rate regimes was lost (Ha et al. 2019b).
- In 1982, supply and demand shocks were the main source of core CPI disinflation and demand shocks the main source of PPI disinflation. Again, disinflation in part reflected a drawn-out unwinding of earlier shocks. By the late 1970s, inflation expectations had become unanchored in some advanced economies and inflation-wage spirals became entrenched in major advanced economies while output growth stagnated at a low level (Bryan 2021). The doubling of oil prices in 1979 added fuel

### BOX 4.1 Inflation during global recessions (continued)

#### FIGURE B4.1.4 Inflation in 2008-10 and 2020-21

In the pandemic-induced global recession of 2020, inflation declined less and rebounded faster than in the financial-crisis-induced global recession of 2009.



Sources: Consensus Economic; Haver Analytics; World Bank.

Note: Year-on-year monthly inflation for 81 countries, of which 31 are advanced economies and 50 are emerging market and developing economies (EMDEs). t=0 is September 2008 for 2009 and January 2020 for 2020.

A.B. Blue and red lines are medians, dotted lines are interquartile ranges.

C. Share of all countries, advanced economies and EMDEs in which year-on-year inflation slowed from one month to the next. Gray line shows 50 percent.

D. Median.

E. Year-on-year growth in the average of Brent, Dubai, and WTI oil prices.

F. Consensus inflation expectation for 2009 ("2009") and 2021 ("2020") for 48 EMDEs.

to inflation pressures. The monetary tightening across advanced economies in the early 1980s helped stabilize inflation expectations while also causing recessions.

- In 2009, negative oil price shocks and global demand shocks contributed, in almost equal measure, to declines in global PPI inflation while core CPI inflation remained broadly stable as negative demand shocks were offset by negative supply shocks. Well-anchored inflation expectations from the early 2000s helped stabilize inflation despite adverse demand shocks.

#### Inflation during the last two global recessions

A more granular comparison, using monthly data for 31 advanced economies and 50 EMDEs for 2001-2021, is

possible for the global recessions of 2009 and 2020. This exercise also shows that the global inflation decline during the global recession of 2020 has been more muted and shorter-lived than during the global recession of 2009 (figure B4.1.4). This may reflect the fact that the global recovery from the 2020 recession was swifter than that of any previous global recession in the past eight decades, despite the global recession being the most severe since the Second World War (box 1.1).

Inflation declined by 0.9 percentage point globally and 1.2 percentage point in EMDEs from January 2020 before reaching its trough in May 2020—five months after the beginning of the global pandemic. In contrast, inflation declined by 6.3 percentage points globally and 7.6 percentage points in EMDEs from September 2008 to its trough in October 2009—13 months after the bankruptcy

### BOX 4.1 Inflation during global recessions (*continued*)

of Lehman Brothers that set off the global financial crisis. Whereas inflation started rising in the majority of countries five months after the onset of the pandemic, in May 2020, it only started rising in the majority of countries a year after the onset of the global financial crisis, in October 2009. The global recession of 2009 itself featured a shallower and shorter-lived inflation decline than previous global recessions.

The decline in global inflation from January-May 2020 was four-fifths driven by the collapse in global demand and another one-fifth driven by plunging oil prices, with some offsetting inflationary pressures from supply disruptions. This contrasts with the global financial crisis in which the 13-month decline in global as well as EMDE inflation was about one-half driven by plunging oil prices and only one-third driven by the contraction in global demand. The greater role of global demand in the inflation decline in 2020 than in previous global recessions may reflect the sheer severity of the recession of 2020 (World Bank 2021a). In their rebounds, however, global and EMDE inflation developments after the two global recessions of 2009 and 2020 resembled each other: both were virtually entirely driven by increases in global demand.

Short-term (one-year-ahead) inflation expectations inched down by 0.3 percentage point globally between March and

May 2020 before stabilizing again at 2.0 percent for the remainder of 2020. They only rose by 0.2 percentage point in March 2021 as it became apparent that the recovery was proceeding faster than anticipated and new policy support measures were approved (chapter 1). In EMDEs, inflation expectations declined by 0.5 percentage point throughout 2020 until a 0.4 percentage point uptick in March 2021. These minor movements of short-term inflation expectations stand in sharp contrast to the 2.1 percentage point decline globally and 2.6 percentage point decline in EMDEs in the 14 months following September 2008, through the global recession of 2009. Long-term inflation expectations also remained stable in 2020, both globally and in EMDEs—for EMDEs, in contrast to the 1.0 percentage point decline in the 18 months following September 2008. This in part reflected a view that the disruptions caused by the pandemic were temporary in nature and may have helped dampen fluctuations in global inflation.

### Conclusion

Global recessions are associated with sharp movements in inflation. The 2020 global recession featured the most muted and least protracted inflation decline. This may have reflected lower initial inflation but, in 2020, also deployment of unprecedented policy support and a rapid economic recovery.

## Relative importance of drivers of inflation

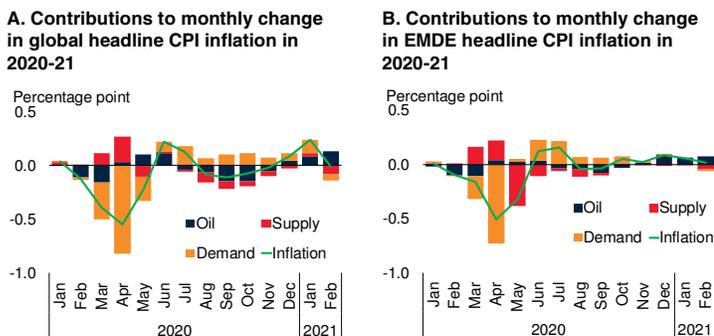
To disentangle the quantitative importance of some of these forces, a factor-augmented VAR (FAVAR) model with sign and narrative restrictions is estimated. The model is applied to three global variables—inflation, output growth, and oil price growth—all expressed in month-on-month growth rates. Global inflation and output growth are proxied by the common global factor estimated using a dynamic factor model of cross-country inflation and industrial production growth, respectively (annex 4.1). The dynamic factor model includes monthly data for 30 advanced economies and 51 EMDEs for 2001-2021. The global oil price is based on the average of Dubai, West Texas Intermediate, and Brent oil

prices, as reported in the World Bank's *Pink Sheet* of commodity prices. The exercise is repeated for advanced economies and EMDEs separately, and for headline CPI inflation, core CPI inflation, and PPI inflation. The PPI tends to have larger tradables content than the headline CPI, whereas the core CPI tends to have smaller tradables content than the headline CPI (Ha, Kose, and Ohnsorge 2019). The estimation results suggest a sequence of changing disinflationary forces in January-May 2020 that were subsequently unwound.

- *January-May 2020.* Between January and May, four-fifths of the decline in global inflation reflected the collapse in global demand as consumption and investment collapsed amid lockdowns and uncertainty about policies and growth prospects. Another

### FIGURE 4.5 Drivers of inflation in 2020-21

In February and March 2020, an oil price plunge dampened global inflation; in March-May 2020, the demand collapse caused by a deep recession further lowered inflation, although supply disruptions offset some of the disinflationary pressures. These forces were unwound by mid-2020.



Source: World Bank.

Note: Contributions to changes in year-on-year headline consumer price inflation from the previous month for 81 countries, of which 31 are advanced economies and 50 are emerging market and developing economies (EMDEs), based on factor-augmented vector autoregression (FAVAR) estimation over the period of 2001-21 in annex 4.1. Monthly data. Unexplained residual is omitted from the graph. "Oil," "Supply," and "Demand" indicate oil price shocks, global supply shocks, and global demand shocks, respectively.

one-fifth reflected the plunge in oil prices. Both globally and for EMDEs, disinflationary effects from collapsing demand and oil prices were partly offset by the inflationary effect of supply disruptions such as disruptions to firm operations and global shipping caused by pandemic restrictions to domestic economic activity and international travel (figure 4.5). Within this five-month period, however, the forces affecting inflation shifted. In February and March 2020, the decline in global inflation was in almost equal measure due to the plunge in oil prices and a collapse in global demand, but the disinflationary impact of the collapse in global demand intensified in April.<sup>5</sup>

- *May 2020-February 2021.* The collapse in demand and oil prices as well as supply disruptions began to unwind as consumers,

firms, and investors began to adjust their behavior and operations. From May, as international trade and global manufacturing activity rebounded, supply factors began to lower inflation (figure 4.5). A sharp rebound in demand, however, raised inflation as consumption shifted from in-person to online transactions. For the period from May 2020 to February 2021, demand pressures accounted for virtually all of the increase in global inflation and these were partially offset by improved supply conditions. For EMDEs, the recovery in oil prices from mid-2020 contributed one-third as much as the recovery in demand to the uptick in inflation.

## Prospects for inflation

### Short-term inflation prospects

The global recession of 2020 was unusually severe but short (chapter 1; box 1.1; box 4.1). This was also reflected in inflation developments. The accompanying inflation decline was unusually muted and short-lived. Looking ahead, some factors point to an increase in inflation over the near term but stable low inflation over the long term. However, shocks may interact with large-scale policy support to deliver higher inflation and inflation volatility over a 2-3-year horizon (Baldwin and di Mauro 2020; Blanchard 2020). Uncertainty about future inflation is also reflected in wide disagreement among survey respondents on future inflation prospects, which could be a sign of growing risk of inflation expectations becoming unanchored (Ebrahimy, Igan, and Peria 2020; Williamson 2021). A FAVAR model is used to project global, advanced-economy and EMDE inflation in coming months that would be consistent with the growth and oil price forecasts presented in chapter 1.

Global output growth is expected to exceed 5 percent in 2021 and oil prices are expected to rise over the year as a whole (Chapter 1). This suggests an increase in global inflation by 1.4 percentage points in 2021 (from 2.5 percent in 2020 to 3.9 percent in 2021; figure 4.6). The model-predicted global inflation of 3.9 percent in 2021 is com-

<sup>5</sup>The predominant role of demand shocks and some offsetting role of supply shocks during the pandemic were also found in some recent studies; see, for instance, Bekaert, Engstrom, and Ermolov (2020) for the United States, and Baleer et al. (2020) and O'Brien, Dumoncel, and Gonçalves (2021) for the euro area.

parable to average inflation during 2011-13 after the global financial crisis.

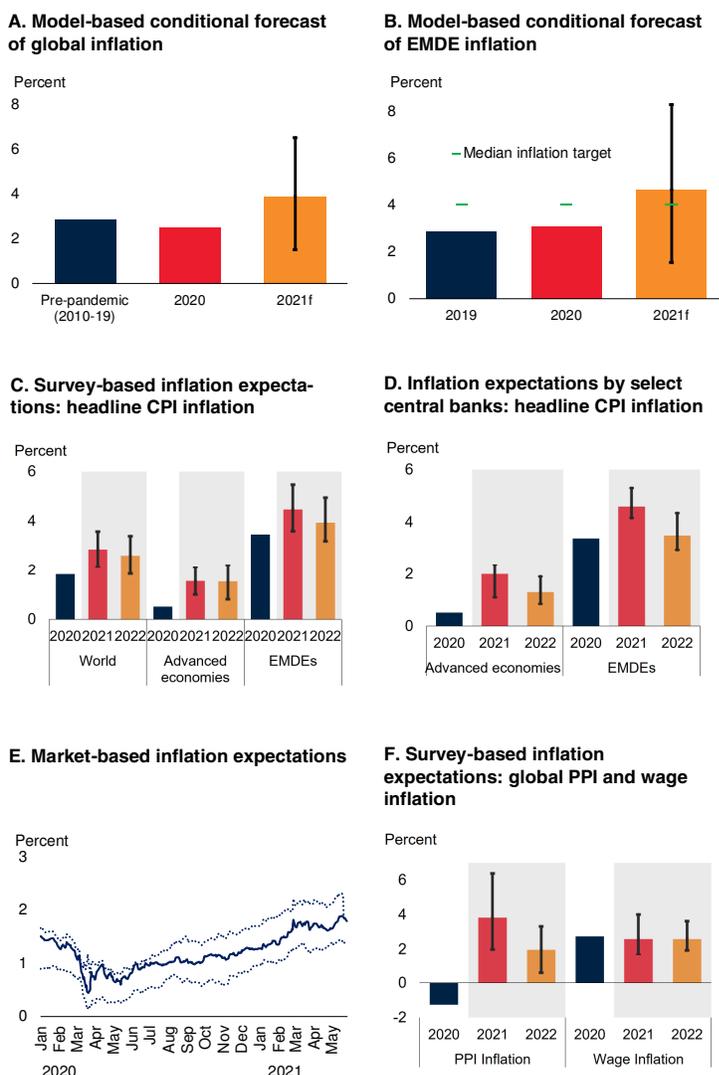
If a similar exercise has been conducted in January 2009, with the benefit of hindsight for output growth and oil price movements, it would have yielded a projected decline in global inflation of 3.3 percentage points for 2009—just below the actual decline of 4.5 percentage points. A similar exercise conducted in 2011 would have predicted an upturn in global inflation of 0.8 percentage point in 2011, which was just below actual inflation decline (1.3 percent), followed by an inflation decline of 0.5 percentage point in 2012, which was also just below actual declines (0.9 percentage point).

For advanced economies, growth and oil price forecasts are consistent with inflation rising to 1.8 percent in 2021 (from 0.5 percent in 2020)—still below the target rate of 2 percent in many advanced economies but a touch above the 1.4 percent average over the 2010s. For virtually all advanced economies, the model-predicted moderate inflation rise would bring inflation closer to inflation targets. A similar exercise conducted in January 2009 would have forecast a decline in advanced-economy inflation of 2.4 percentage point for 2009, again below the 3.4 percentage-point decline in inflation between 2008 and 2009 that actually materialized.

For EMDEs, growth and oil price forecasts would be consistent with inflation rising to 4.6 percent from 3.1 percent, well above the average over the 2010s of 3.8 percent. It would be just a touch above the mid-range (3.8 percent), but still below the 5.1 percent upper bound of the average inflation-targeting EMDE’s target range. For the one-half of inflation-targeting EMDEs with inflation well below target, the model-predicted moderate inflation rise also would bring inflation closer to target. For another one-half of inflation-targeting EMDEs, however, a rise in inflation of this magnitude would put inflation above target. This may not warrant a policy response provided the inflation pickup is temporary. Should it, however, risk de-anchoring inflation expectations, it could become a monetary policy challenge that may hold back the recovery. In some EMDEs,

**FIGURE 4.6 Prospects for inflation**

*Inflation has risen since the second half of 2020 in both advanced economies and EMDEs. Conditional forecasts of global inflation suggest that global inflation will increase by around 1.4 percentage point in 2021. Survey- and market-based inflation expectations also point to a moderate rise in global inflation in near future.*



Sources: Haver Analytics; Consensus Economics; World Bank.  
 Note: EMDEs = emerging market and developing economies; PPI = producer price index.  
 A. Conditional forecast of global inflation based on quarterly FAVAR model of global inflation, global GDP growth, and oil price growth. Vertical line indicates 16-84 confidence bands. See annex 4.1 for details.  
 B. Based on median inflation in 125 EMDEs and inflation target in 30 inflation-targeting EMDEs. 2021 inflation is based on the conditional forecast of EMDE inflation. Vertical line indicates 16-84 confidence bands.  
 C. Average headline CPI inflation expectations for 2021-22 based on surveys of May 2021 in 57 countries (31 advanced economies and 26 EMDEs). 2020 indicates actual inflation rates. Vertical lines indicate maximum and minimal responses.  
 D. Median headline CPI inflation expectations for 2021-22 based on surveys of G7 economies and seven large EMDEs (Brazil, China, Mexico, India, Indonesia, Russian Federation, Turkey).  
 E. Median implied breakeven inflation, measured as the spreads between nominal and real 5-year treasury bond yields in 7 advanced economies (Australia, Canada, Germany, the Republic of Korea, New Zealand, United Kingdom, and United States). Dotted lines indicate inter-quartile range.  
 F. Median Producer Prices Index (PPI) and wage inflation expectations for 2021-22 based on surveys of 9 and 23 economies, respectively. 2020 indicates actual inflation rates. Vertical lines indicate maximum and minimal responses.

## BOX 4.2 Food price volatility and inflation in low-income countries

*Inflation in low-income countries (LICs) increased in the run-up to, and following, the outbreak of COVID-19. The rise has been largely driven by increases in food prices and currency depreciations. Higher prices for food, which accounts for about half of consumption in LICs, threaten to increase poverty. In the near term, further rises in global agricultural prices are likely to add to inflationary pressures in LICs. Subsequently, an expected stabilization of commodity prices and moderate demand growth are likely to result in a gradual decline in consumer price inflation in these economies. A more persistent rise in agricultural commodity prices, or pressure to finance large fiscal deficits, could risk ingraining higher inflation into expectations and may warrant tighter monetary policy. In addition, attempts to lower food price inflation through price subsidies in a large number of countries, or the re-emergence of protectionist policies, could drive global prices higher and prove to be self-defeating.*

### Introduction

Inflation in low-income countries (LICs) has declined over the past three decades. The COVID-19 pandemic has been associated with a sharp growth slowdown in LICs, accompanied by rising consumer price inflation. The inflation pickup in 2020 predominantly reflected rising food price inflation. Rising inflation, particularly when driven by sharp increases in food prices, raises poverty, increases malnutrition, and curtails the consumption of essential services such as education and health care (IDA 2020; Laborde, Lakatos, and Martin 2019; World Bank 2011a). In addition, LICs face larger challenges in controlling inflation than other emerging market and developing economies (EMDEs) due to weaker policy frameworks and less developed financial systems; higher volatility of output and demand; and the larger influence of global commodity prices, particularly agricultural prices (Ha et al. 2019b).

The persistence of the recent rise in LIC inflation will depend upon the persistence of its drivers and the response of policy makers. The inflationary impact of one-off rises in commodity prices or currency depreciation may dissipate provided inflation expectations remain anchored and institutional credibility is sufficient. However, further upward momentum for commodity prices, or overly accommodative monetary policy, perhaps influenced by fiscal objectives, could lead to more persistent increases in inflation.

In light of these challenges, this box addresses the following questions:

- How has inflation evolved in LICs during the pandemic?
- What are the prospects for inflation in LICs?

- What are the implications of rising inflation for food security?

### Recent inflation developments in LICs

**Inflation before the pandemic.** LICs have made large strides in price stabilization over the past three decades, lowering inflation from 25 percent in 1994 to 3.4 percent in 2019 as policy frameworks improved and demands for deficit financing on central banks were reigned in (Ha, Kose, and Ohnsorge 2019). Nevertheless, inflation has been persistently higher in LICs than in other EMDEs, at 4.4 percent since 2018, compared to just 2.7 percent in EMDEs (figure B4.2.1.A).<sup>a</sup> Historically, higher rates of inflation in LICs have been attributed to monetary financing of deficits and frequent negative supply shocks (Baldini and Poplawski-Ribeiro 2011; Weidmann 2013). More recently, inflation in LICs accelerated ahead of the outbreak of the pandemic as a result of a sharp increase in global food price inflation that started from the second half of 2019, rising from 3.5 percent in May 2019, to 3.9 percent in January 2020, before national lockdowns became widespread.

**Rising inflation in 2020 in LICs.** Whereas inflation in advanced economies and EMDEs fell after the widespread implementation of restrictions on movement across the world, median inflation in LICs rose from 3.9 percent in January 2020 to a new peak at 5.6 percent in April 2020 (figure B4.2.1.B). The pickup in inflation over this period affected the majority of LICs and ranged up to 5 percentage points. Since September 2020, inflation has somewhat moderated to approximately its level in 2019. As a result, LIC inflation for 2020 as a whole increased by 1.1 percentage points from the previous year, although remains about a percentage point below its average over 2015-2019.

*Note:* This box was prepared by Jongrim Ha and Gene Kindberg-Hanlon. It rests on monthly data for consumer price inflation in 20 economies that have been classified as LICs at least once since 2019.

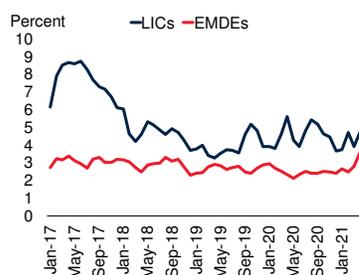
a. See World Bank (2018) for the long-term trend of inflation in LICs over the last five decades.

**BOX 4.2 Food price volatility and inflation in low-income countries (continued)**

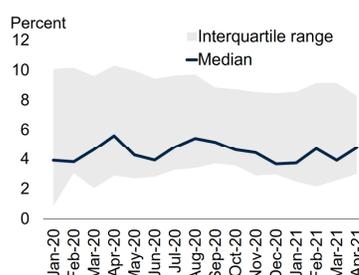
**FIGURE B4.2.1 Inflation developments in LICs**

*Inflation has on average been higher in LICs relative to other EMDEs. In contrast to inflation in other EMDEs, inflation in LICs increased in both the months ahead of, and following, the announcement of widespread lockdown measures in March 2020. For 2020 as a whole, inflation in LICs rose by 1.1 percentage points as a result of rapid inflation of the price of food, which accounts for nearly half of consumption in LICs. A recent surge in agricultural commodity prices may add to inflationary pressures in LICs in the near term.*

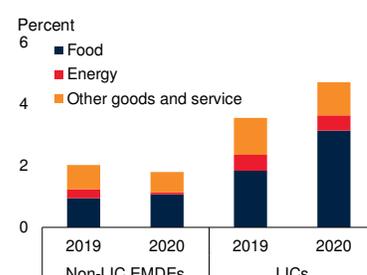
**A. Median inflation in LICs and EMDEs: 2017-21**



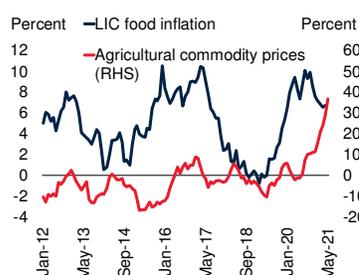
**B. Inflation in LICs: 2020-21**



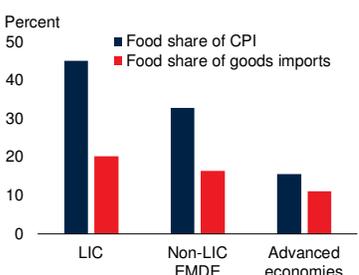
**C. Contribution of food and energy prices to inflation**



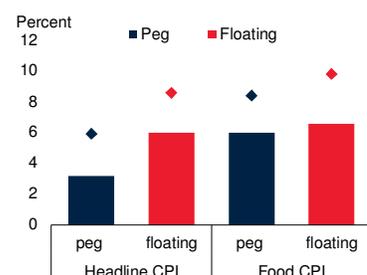
**D. Agricultural commodity prices and food price inflation in LICs**



**E. Share of food in goods imports and consumption**



**F. Exchange rate adjustment and inflation**



Sources: Havers Analytics; International Monetary Fund; National sources; World Bank.

Note: EMDEs = emerging market and developing economies; LICs = low-income countries.

A, B. Based on headline consumer price inflation for up to 20 LICs and 80 EMDEs.

C. Sectoral headline consumer price index (CPI) inflation rates are based on median across 111 countries in 12 sectors. Sectors are categorized following International Financial Statistics. Food indicates food and nonalcoholic beverages and alcoholic beverages, tobacco, and narcotics sectors. Energy indicates housing, water, electricity, gas and other fuels. Other goods include clothing and footwear, furnishings, household equipment and routine household maintenance sectors. Service sector includes health, transportation, communication, recreation, education, restaurants, and miscellaneous sectors.

D. Average food and nonalcoholic beverage price inflation in up to 10 LICs and annual growth in the nominal agricultural commodity price (from the World Bank's Pink Sheet).

E. Weight of food and nonalcoholic beverages in the CPI and share of total merchandise imports.

F. Bars (diamonds) indicate headline and food CPI inflation in 19 LICs based on simple median (simple average) by de facto exchange rate regime as defined in Klein and Shambaugh (2010). Peg indicates LICs with fixed exchange rates.

**Rising agricultural commodity prices.** One of the primary drivers of the rise in consumer prices ahead of and following the COVID-19 pandemic was rising food prices.<sup>b</sup> In 2020, food prices contributed 1.3 percentage points to inflation in LICs, explaining most of the increase in headline inflation from 2019; this compares with an

increase in the contribution of just 0.2 percentage point in other EMDEs. In contrast, the contribution of the energy sector and other goods and services was little changed or declined in LICs in 2020 (figure B4.2.1.C).

Agricultural commodity prices rose sharply in 2020, driven largely by increasing prices of meals and oils (+16 percent) and grains (+5 percent) (figure B4.2.1.D). Strong demand, some weather-related supply disruptions, and the threat and enactment of export restrictions in some major

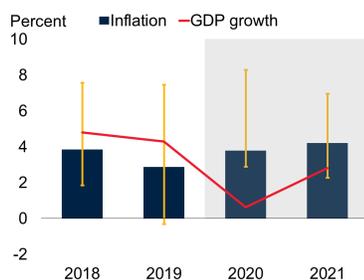
b. In April 2020, rice prices rose 32 percent above April 2019 levels. By November 2020, wheat prices were 11 percent higher, while soybean prices were 33 percent higher than in November 2019.

## BOX 4.2 Food price volatility and inflation in low-income countries (continued)

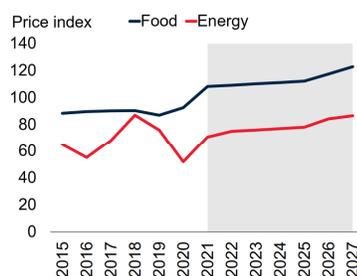
### FIGURE B4.2.2 Outlook for inflation in LICs

Following a sharp slowdown in growth in 2020, LICs are expected to experience a modest recovery in 2021-23. LIC inflation is expected to rise in 2021 as a result of the recent acceleration in food prices. The dispersion of forecasts remains large, however. Global agricultural prices are forecast to remain elevated in the coming years, amid continued high demand for staples, but the pace of growth will slow as COVID-related disruption, including trade restrictions, dissipates. Inflation is subsequently likely to moderate in 2022 owing to weak domestic demand.

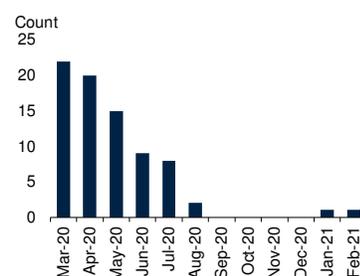
#### A. GDP growth and inflation forecast



#### B. Commodity price forecasts



#### C. Food export restrictions in place



Sources: International Monetary Fund; Labord, Mamun, and Parent (2020); World Bank.

A. Median and interquartile range of consumer price growth forecasts among 19 LICs in the IMF's April 2021 *World Economic Outlook* and World Bank's June 2021 *Global Economic Prospects* forecast for GDP growth in LICs.

B. Nominal commodity price forecasts in the World Bank's April 2021 *Commodity Market Outlook*.

C. Number of restrictions on the export or import of food in place. Data on announcements available to end-November 2020.

grain producers added to price pressures. In LICs, food accounts for about half of consumption baskets and 20 percent of goods imports, a larger share than in other EMDEs (figure B4.2.1.E). There is therefore a strong relationship between globally determined agricultural commodity prices and LIC inflation; the correlation between agricultural prices and food price inflation in LICs is about 40 percent.

**Exchange rate depreciation.** Alongside rising agricultural commodity prices, exchange rates in some LICs depreciated at the start of the pandemic. Between December 2019 and April 2020, exchange rates in LICs depreciated by between 1 and 8 percent. The pass-through of depreciation into inflation tends to be stronger in LICs than in other EMDEs (Ha et al. 2019a). Indeed, inflation in LICs with floating exchange-rate regimes was two percentage points higher than in LICs with fixed exchange rate regimes in 2020 (figure B4.2.1.F).<sup>c</sup>

**Price pressures due to conflict, and policy uncertainty.** In fragile and conflict-affected LICs (including Chad and

Haiti) and those experiencing high levels of political uncertainty (Ethiopia), inflation was higher by two percentage points on average in 2020 than in other LICs. Food supply insecurity during the pandemic coincided with episodes of natural disasters and large-scale internal violence, including civil wars, in some LICs (FSIN and GNAFC 2021; WFP and FAO 2021).<sup>d</sup>

### Inflation prospects in LICs

Inflation in LICs is likely to face offsetting pressures in the future. The recovery in LICs is expected to be subdued with growth returning only to its pre-COVID average and per capita incomes still below pre-pandemic levels in 2022. On the upside in the near term, the recent pickup in global agricultural and energy prices may pass more fully through to LIC inflation in the remainder of 2021. Overall, LICs are likely to face rising aggregate and food price inflation in 2021, which is expected to subsequently gradually decline. However, the outlook is highly

c. This is based on a de facto exchange regime as defined in Klein and Shambaugh (2010).

d. Conflict is estimated to be the main driver of food insecurity for over 120 million people in 2020 (FSIN and GNAFC 2021).

## BOX 4.2 Food price volatility and inflation in low-income countries (continued)

uncertain and will depend on a range of factors, including the monetary policy response.<sup>e</sup>

**Weak recovery in output.** LICs are expected to experience a modest recovery in 2021–22. Until 2022, growth is expected to be weaker than average growth during 2010–19 (figure B4.2.2.A; box 1.3). In line with a weak recovery in demand, domestic price pressures are likely to remain subdued, such that inflation will decline as the effects of commodity price increases fade.

**Recent rapid rise in agricultural prices.** Agricultural commodity prices have grown rapidly; as of May 2021, agricultural commodity prices were 37 percent higher than a year ago, the fastest price increase since 2011. The historically rapid pass-through from commodity prices to domestic food price inflation, along with the prospect of a modest recovery in demand, and oil price increases suggests a further increase, albeit moderate, in LICs inflation in the remainder of 2021 (figure B4.2.2.B; chapter 1). Absent other shocks, a stabilization of agricultural prices later in 2021 may allow for a slowdown in LIC inflation in 2022 and beyond.

### Food security: The implications of rising food prices during the pandemic

In the near term, rising food prices and accelerating aggregate inflation are likely to compound increasing food insecurity in LICs. In addition to rising food prices and inflation, lost income due to the pandemic, ongoing or intensifying conflicts or political instability has led to a surge in food insecurity in 2020 and 2021. The number of people experiencing a food shortage crisis increased from 135 million in 2019 to about 165 million people in 2020 (FSIN and GNAFC 2021; WFP and FAO 2021). Many cases of rising food insecurity are in LICs (table 4.1).

**Food supply disruptions.** Globally, food price inflation increased, from 2.4 percent in 2019 to 3.5 percent in 2020 reflecting higher commodity prices, domestic supply disruptions, outright hoarding, and depreciations that raised the price of imported foods. Pandemic-related restrictions on movement and labor supply damaged food production and distribution (IFPRI 2021). Export and import restrictions contributed to food supply disruptions, although most restrictions are no longer in force (figure

B4.2.2.C). Food price increases also followed previous pandemics and other natural disasters (Ebrahimy, Igan, and Peria 2020). LICs are particularly vulnerable to these disruptions, as poor transport links prevent the adaptation of supply chains, and food comprises a large share of household consumption (Bleaney and Francisco 2018; Cachia 2014; Ha, Kose, and Ohnsorge 2019). As a result, poorer households—which are more prevalent in LICs than in other EMDEs—may suffer greater welfare losses from food and other types of inflation than wealthier households. An erosion of their real incomes and assets through inflation could tip these households into extreme poverty.<sup>f</sup>

**Potential spillovers of food prices to inflation in other sectors.** Higher and more volatile inflation in LICs than in other EMDEs partly reflects the poorer anchoring of inflation expectations that allow fluctuations in food prices to spill over into inflation in other sectors.<sup>g</sup> In addition, exchange rates in LICs tend to be more volatile than those in other EMDEs, in part reflecting the greater frequency of supply shocks in LICs (World Bank 2020b). With inflation expectations poorly anchored, households in LICs are less able to protect the real value of their income and assets from the impact of persistent and elevated inflation (Ha et al. 2019b; World Bank 2020b).

**Shocks to income.** In addition to rising prices of staple foods, poorer households experienced a severe negative income shock due to COVID-19. The number of people living on less than \$1.90 a day is estimated to have risen by 119–124 million in 2020 (Lakner et al. 2021). In some cases, the large concentration of production in agriculture in LICs can result in boosts to household income following rises in agricultural prices. However, the net impact of higher prices has been found to result in increasing poverty among LIC households, including during the last major rise in agricultural commodity prices in 2010–11 (Ivanic and Martin 2008; Ivanic, Martin, and Zaman 2012).<sup>h</sup>

e. This is consistent with the prospects for global and EMDE inflation based on survey-based inflation expectations and central-bank forecasts.

f. The literature provides empirical evidence that higher inflation is associated higher income inequality, or with a lower share of income held by the poor (Datt and Ravallion 1998; Siami-Namini and Hudson 2019).

g. The effectiveness of monetary policy in LICs remains limited—arising from higher economic volatility and pervasive use of administered pricing, conflicts among central bank policy objectives, and limited analytical capacity at central banks (Mishra and Monteil 2013; World Bank 2020b).

h. Longer term, rises in food prices have been found to boost wages and profits in food producers as output adjusts (Ivanic and Martin 2014).

## BOX 4.2 Food price volatility and inflation in low-income countries (continued)

### Policy options

High inflation in LICs, driven by rising food prices, COVID-related supply disruptions, and to some extent, currency depreciation, is likely to increase poverty in LICs. A key objective for policy makers could be to ensure that rising inflation rates do not lead to a de-anchoring of inflation expectations and the further erosion of real household income. Subsidies or price controls to reduce the burden of rising food prices may appear attractive but carry the risk of increased strains on the fiscal balance of highly indebted governments, and also risk adding further upward pressure on global agricultural prices.

**Response to more persistent or broad-based price rises.** While many LICs responded to the pandemic by cutting policy rates in 2020, some LICs (Mozambique, Tajikistan) started to raise interest rates in 2021. In LICs with large economic slack and below-target inflation, continued monetary easing and fiscal support can help the recovery gain traction and raise inflation towards the target. Furthermore, in LICs where inflation rises above target due to temporary commodity price rises but noncommodity goods and services inflation remains weak, there may be continued scope for accommodative monetary policy. In 2020, there was little evidence of a broad-based increase in non-commodity inflation in LICs, although this could rapidly change (figure B4.2.1.C). In LICs where the economic recovery from the pandemic is further advanced, or where there appears to be a broad-based or persistent increase in commodity prices, authorities could consider monetary policy tightening.

**Monetary policy independence and credibility.** Inflation in LICs has fallen substantially in recent decades, mirroring a broader decline in inflation in EMDEs more generally. Nevertheless, monetary policy transmission in LICs remains limited (Mishra and Montiel 2013). LICs could continue to improve monetary policy frameworks to prevent rises in inflation from becoming ingrained and persistent. By stabilizing output fluctuations that disproportionately hurt the poor, the adoption of a credible monetary policy regime that maintains low and stable inflation may help reduce poverty and inequality (Romer and Romer 1999).

In part, historical falls in inflation in LICs were achieved through reduced demand for deficit monetization as debt burdens and deficits in LICs declined after the 1980s (Ha, Kose, and Ohnsorge 2019). Rising debt burdens and fiscal deficits in LICs in the run-up to, and following, the COVID-19 pandemic may increase risks that monetization is pursued to a greater degree once again, in particular in an environment of rising global and domestic interest rates.

Average debt-to-GDP ratios in LICs increased by 6 percentage points in 2020, while average debt-to-GDP ratios currently stand at nearly 70 percent. While they are expected to gradually decline from 2021 onwards, further adverse shocks could result in rising deficit financing requirements (World Bank 2021a).

**Risks of food price subsidies and export restrictions.** Previous food price spikes led to large increases in poverty, with the 2010-11 price spike estimated to have increased the global number of those in poverty by 8.3 million (Laborde, Lakatos, and Martin 2019). The recent increase in agricultural commodity prices, a 37 percent annual increase, is the largest since 2011 when inflation peaked at 39 percent. Even before the COVID-19 crisis, many LICs imposed price controls on food products, although the share of food subjected to controls in consumption baskets is small (Guénette 2020). Many governments have turned to subsidies and export restrictions to lower domestic food prices in previous food price spikes; however, these insulating policies can often exacerbate global price spikes, increasing the demand for food (subsidies) or reducing their supply (export restrictions). In 2011, insulating policies were estimated to have contributed 25-40 percent of the increase in global maize and wheat prices (Laborde, Lakatos, and Martin 2019). Export restrictions imposed in 2020 in South Asia contributed to logistical bottlenecks and resulted in rising prices for key food staples for the region as a whole (World Bank 2021c). Countercyclical purchases of nonperishable agricultural commodities when prices are low, and targeted, rather than blanket subsidies, are less likely to contribute to higher global food prices.

**Measures to reduce food insecurity.** To reduce the impact of rising food prices and the repercussion of COVID-19 for food security, a range of measures can be taken, including scaling up social safety net programs and ensuring the distribution of, and access to, food. Targeted social protection measures, such as cash and food transfers, may mitigate the impacts of the pandemic on food security with fewer adverse impacts on global food prices than price and export controls. Such measures have been substantially increased since the start of the pandemic in EMDEs and some LICs (Gentilini et al. 2020). However, LICs may face larger challenges than other EMDEs in delivering and developing sources of revenue for these transfers, requiring technical and financial assistance. International support for improved logistical capabilities and to ensure the climate resilience of local food supply can contribute to both near- and longer-term food security in LICs (IDA 2020).

inflation may rise even further if they are subject to above-average depreciation pressures or food price increases.<sup>6</sup>

Consistent with the model-based inflation forecasts, survey-based consumer price inflation expectations suggest that global inflation is expected to rise by about 1 percentage point in 2021, from its low rate in 2020 (figure 4.6). The expected inflation rise is broad-based, in both advanced economies and EMDEs. It is also anticipated for PPI inflation, although not for wage inflation: Consensus forecasts point to an increase in global PPI inflation (defined as median across 9 countries) to about 4 percent in 2021 (from -1 percent in 2020; figure 4.6).<sup>7</sup> Forecasts of headline CPI inflation by major central banks also suggest a moderate increase in inflation in 2021 (by 1.5 percentage points in G7 economies and 1.2 percentage points in seven large EMDEs). Finally, although the data are limited to a few advanced economies, market-based inflation expectations point to a similar conclusion: break-even implied inflation (measured as the spreads between nominal and real 5-year bond yields) has risen moderately since April 2020 and recovered to pre-pandemic level by January 2021.

### Longer-term inflation prospects

The pandemic-induced global recession was preceded by a decade of extremely low global inflation (2 percent) as well as low advanced-economy and EMDE inflation. This stands in contrast to previous global recessions when pre-recession global inflation ranged from 6 percent (2008) to 16 percent (1975). This may account for the more muted inflation response in the 2020 global recession than in earlier ones.

<sup>6</sup>A similar exercise conducted in January 2009 would have yielded a forecast of a decline in EMDE inflation by 6.9 percentage point for 2009, above the actual decline of 5.2 percentage points in 2009. In some EMDEs, inflation may rise even further if they are subject to above-average depreciation pressures or food price pressures. A similar exercise conducted in January 2009 based on January forecasts for output and oil prices would have yielded a forecast of a decline in EMDE inflation by 3.7 percentage point for 2009, also less than the actual decline of 5.2 percentage points in 2009.

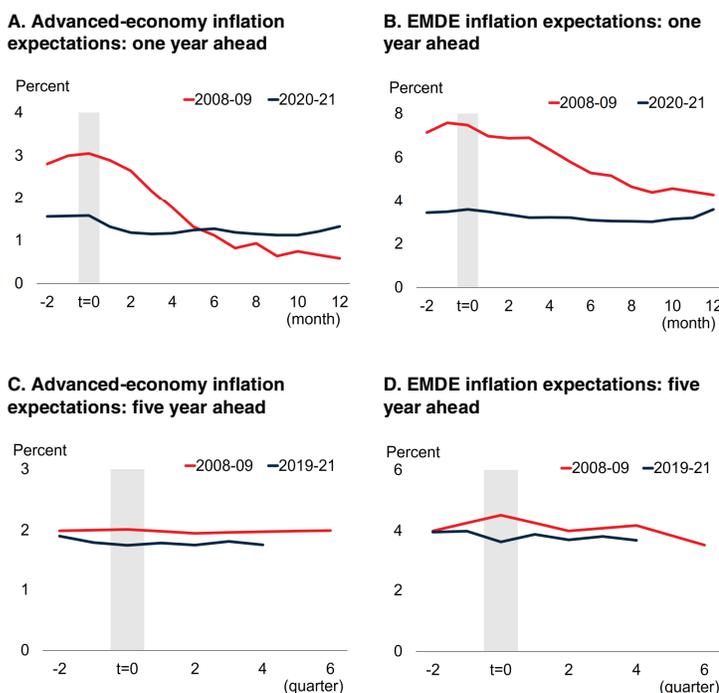
<sup>7</sup>In contrast, global wage inflation (defined as median across 23 economies) is expected to remain broadly stable in 2020–22.

This points to longer-term structural factors in depressing global inflation. Provided they continue to exert their influence, these factors may also dampen any post-pandemic uptick in inflation. Well-anchored inflation expectations, greater price transparency, and growing automation may continue to dampen inflation. In contrast, turning demographic trends, stabilizing global value chains, potential demand pressures, and weaker fiscal positions may increase inflation pressures.

- *Well-anchored inflation expectations.* In contrast to short-term inflation expectations, long-term inflation expectations have been broadly stable through the pandemic and continue to forecast global, advanced-economy, and EMDE inflation at 2.3, 1.8, and 3.7 percent, respectively, half a decade from now (figure 4.7). Such robust anchoring of inflation expectations in part reflected the introduction of more resilient macroeconomic policy frameworks such as inflation targeting, fiscal rules, and greater exchange rate flexibility in EMDEs (Ha, Kose, and Ohnsorge 2019). The median EMDE inflation target has remained steady at around 4 percent since the mid-2010s but the number of EMDEs meeting their targets has risen (Ha et al. 2019b). If, however, inflation expectations start de-anchoring from central banks' targets, inflation can rise in unexpected ways in the medium-term (Armantier et al. 2021).
- *Greater price transparency.* During the pandemic, consumers have switched to online shopping from in-store shopping. To the extent that e-retail helps increase price transparency and competition, this may extend the downward pressure on prices (Charbonneau et al. 2017). If this price adjustment stretches over several years, it may appear to be disinflation. Conversely, growing market power of online retailers may increase profit margins and may mute any disinflation effects from greater transparency (Charbonneau et al. 2017).
- *Automation.* The pandemic may induce a move by firms to increase automation to lift productivity and reduce their need to fill

### FIGURE 4.7 Inflation expectations in 2008-10 and 2020-21

Inflation expectations during 2020-21 fell less than during the global financial crisis. Five-year-ahead inflation expectations have remained stable throughout 2020-21.



Sources: Consensus Economics; World Bank.

Note: Median short-term (A, B) or long-term (C, D) inflation expectations among 33 advanced economies (A, C) and 51 EMDEs (B, D). Shaded areas (t = 0) indicate the outbreak of COVID-19 pandemic (March 2020) and the Global Financial Crisis (September 2008).

vacancies as job markets tighten in the recovery (Ding and Molina 2020; Leduc and Liu 2020b). This may continue and deepen a long-term trend in advanced economies, where increased automation and labor market flexibility may have held down wage growth over the past decade (Haldane 2018, 2021).

- *Global value chains.* Global value chains have contributed to lower inflation through greater competition (Andrews, Gal, and Witheridge 2018; de Soyres and Franco 2019). Over the past decade, maturing global value chains appear to have contributed to slowing trade growth (chapter 3; World Bank 2020d). If global value chains were to outright reshore rather than relocate to other countries, this could reverse some of the disinflationary pressures over the past several decades.

- *Demographics.* Over the past five decades, deflationary pressures demographic trends have begun to wane; this could result in inflationary pressures in the next few years. Over the past three decades, the entry of China and Eastern Europe into the world's trading system combined with rapid population growth to limit input cost increases and lower inflation (Goodhart and Pradhan 2020). The disinflationary benefits reaped from this process may, however, now be at an inflection point as the share of the working-age population stabilizes even in EMDEs (World Bank 2018).

- *Unprecedented policy support.* During the pandemic, many central banks in advanced economies resumed or expanded large-scale asset purchases, and central banks in about two dozen EMDEs launched asset purchase programs (Rebucci, Hartley, and Jiménez 2020; World Bank 2021a). The literature generally suggests that monetary easing, both conventional and unconventional, typically boosts aggregate demand and inflation with a lag of 1-3 years, with somewhat clearer evidence for advanced economies than for EMDEs (Ha, Kose, and Ohnsorge 2019; World Bank 2021a).<sup>8</sup> In addition, many countries have put in place unprecedented fiscal support programs (chapter 1; Miles and Scott 2020). If these unprecedented policy measures are not unwound before demand runs well ahead of potential output, inflation could pick up. This inflation pickup could be temporary once excess demand pressures recede, provided that inflation expectations remain well-anchored.

- *Weak fiscal positions.* Government fiscal positions have deteriorated markedly since the start of the pandemic and are unlikely to

<sup>8</sup>While the design of unconventional monetary policy after the global financial crisis and global recession of 2009 meant that most of the injections remained within the banking system in the form of excess reserves and did not filter through to the broader money aggregates that matter for inflation, in the COVID-induced recession, measures have instead taken the form of injecting support that raised the broader measures of money (Goodhart and Pradhan 2020).

return to pre-pandemic levels in the next two years (chapter 1). The average EMDE will continue to run a fiscal deficit in excess of 3 percent of GDP in 2022 and 2023; EMDE government debt has risen to a record high of 66 percent of GDP in 2020. Several EMDEs have implemented asset purchases that may further tighten links between fiscal and monetary policy. Where such purchases continue to grow and fiscal positions are weak, central banks may be subject to political pressure to ease government financing conditions, deepening perceptions of monetary financing of fiscal deficits and further skewing secondary markets (Mandelman 20201; World Bank 2021a). These developments could further increase price pressures and de-anchor long-run inflation expectations.

## Policy implications

Inflation has rebounded quickly from an unusually muted decline during the global recession of 2020, despite this recession being the deepest since the Second World War. This has reflected the rapid rebound in aggregate demand, supported by unprecedented macroeconomic policy measures.

Model-based forecasts and inflation expectations point to a short-term increase in inflation of just over 1 percentage point. For virtually all advanced economies and about one-half of EMDEs, an increase of this magnitude would leave inflation within target ranges but, for another one-half of EMDEs, it would raise inflation above target ranges. Over the longer-term, however, well-anchored long-term inflation expectations point to continued low and stable inflation. As long as expectations remain well-anchored and any inflation increase—even above target ranges—is temporary, there may not be a need for a monetary policy response.

The short-term increase in inflation might extend over the longer term if policy makers are unable to keep inflation expectations anchored. Structural forces—such as demographics, growing globalization, and improvements in policy frameworks—

supported disinflation over the past decade. However, if the recovery from the pandemic coincides with a turning point in some of these forces, the expected inflation pickup in 2021 may extend and, in EMDEs, could risk de-anchoring inflation expectations. Concerns over poorly anchored inflation expectations and the possibility of permanently higher inflation may compel EMDE central banks to tighten monetary policy earlier, or more strongly, than warranted by their cyclical positions.

Similar policy responses may also become necessary in some EMDEs if concerns about advanced-economy inflation prospects causes investors to reassess inflation risks and result in a sudden increase in global borrowing costs. In EMDEs with flexible exchange rates and limited financial vulnerabilities to exchange rate movements, currency depreciation may help buffer some of the impact of tightening financial conditions on activity (Gourinchas 2018). In other EMDEs, however, financial stability concerns may force central banks to tighten monetary policy more than warranted by the strength of their economies' recovery. In part due to concerns about financial stability, a number of EMDE central banks that had implemented expansionary monetary policy in 2020 have begun to tighten policy in 2021.

Anchoring inflation expectations will be critical in preserving central banks' room to maneuver even during periods of financial stress. To achieve this, several policy options are available.

- *Monetary, fiscal, and macroprudential policies.* In inflation-targeting EMDEs with large economic slack and below-target inflation, monetary easing and fiscal support can help the recovery gain traction and raise inflation towards the target. In EMDEs where the economic recovery from the pandemic is further advanced, a more nuanced design of monetary policy will be necessary. While it may be premature to withdraw monetary and fiscal support, it would be prudent to prepare now for the possibility of future inflation risks materializing, especially those related to exchange market disruptions. Central banks can embark on an opportunistic buildup of

foreign exchange reserves, heighten foreign currency risk monitoring, and strengthen macroprudential policies in anticipation of possible capital outflows once advanced economies begin to withdraw accommodative policies.

- *Central bank transparency.* Better-anchored inflation expectations will help stabilize inflation over the next few years. To minimize the extent to which fluctuations in energy and food prices will spill over to headline inflation and affect household and corporate inflation expectations, central banks will need to clearly communicate their inflation target and improve policy transparency (box 4.2; Baldwin and di Mauro 2020). Enhancing central bank transparency help anchor inflation expectations (Gelos, Rawat, and Ye 2020; Kose et al. 2019). In EMDEs that employ unconventional policies, including asset purchase programs, forward guidance, transparent objectives and operational details can help maintain investor confidence (World Bank 2021a).
- *Ensure accurate measurement of inflation.* Sharp changes in the composition of consumer spending, such as that took place during the pandemic, may distort inflation estimates (Cavallo 2020).<sup>9</sup> Many prices have become unobservable, either because the shops are closed or because field collection is not possible during the lockdown. Supply disruptions may create perceptions of scarcity, even if not accompanied by actual price increases (Baker et al. 2020; Coibion, Gorodnichenko, and Weber 2020). A new challenge is the collection of prices for an increasing number of services that are offered digitally or remotely. Central banks may need

to consider the possibility that actual inflation is considerably higher or lower than official estimates and avoid policy overshoots that might result (Lane 2020; Tenreyro 2020). Statistical agencies could develop a supplementary index whose weights reflect new spending patterns emerging as a result of the pandemic to give policy makers a more accurate picture of the prices that consumers are currently paying (Reinsdorf 2020).

## ANNEX 4.1 Methodology and database

This annex presents a novel factor-augmented vector autoregression (FAVAR) model. The empirical framework is based on recent studies that employ standard sign-restricted VAR models to explore the drivers of global inflation (Charnavoki and Dolado 2014; Ha et al. 2019c), or more generally, the Philips-curve framework (Forbes 2019). However, it deviates from these approaches in three ways to accommodate the circumstances of the 2020 pandemic.

First, the model employs higher frequency (monthly) data rather than quarterly or annual data, to minimize the concerns over the endogeneity among variables. The use of monthly data is particularly important when the pace of recessions and recoveries differs. That said, monthly data is available only for a smaller set of countries for services activity. Therefore, the exercise with monthly data relies on industrial production series, which rebounded faster than services from the global recession of 2020 (box 1.4). For the historical comparison with global recessions before 2001, when sufficiently comprehensive monthly data is unavailable, the model employs quarterly GDP data. The main findings for the comparison between the global recession of 2020 and earlier ones are consistent, regardless of the choice of monthly or quarterly data.

Second, on top of the standard sign restrictions, an additional set of narrative restrictions is imposed for the periods of large oil price

<sup>9</sup>Using data from credit and debit transactions in the United States to update the official basket weights and estimate the impact on the CPI, Cavallo (2020) finds that the “COVID inflation,” which reflected changes in consumption baskets after the pandemic, could have been higher than the official CPI for both headline and core indices in 2020. In addition, by applying the methodology to 17 other countries, the study also finds that, official CPI inflation after the pandemic could have been underestimated by 0.4 percentage point on average in 13 economies, while, in five countries, the official inflation could have been overestimated by 0.3 percentage point.

fluctuations. The sign restrictions are not sufficient to identify the structural shocks, in particular in the presence of multiple large shocks. Third, the model allows for time-varying volatility in the global variables.

### Model specification

The model consists of three global variables: global inflation, global output growth, and oil price growth. All variables are detrended such that, effectively global output proxies the output gap. Global output growth and global inflation are proxied by the global industrial production growth and global inflation factors estimated separately using the following dynamic factor models:

$$Y_t^i = \beta_{global} f_t^{Y,global} + e_t^{Y,i}$$

$$\pi_t^i = \beta_{global} f_t^{\pi,global} + e_t^{\pi,i}$$

where  $Y_t^i$  and  $\pi_t^i$  are output growth and inflation in country  $i$  in month  $t$ , respectively, while  $f_t^{\pi,global}$  and  $f_t^{Y,global}$  are the global factors for inflation and output growth in month  $t$ , respectively. In its structural form, the FAVAR model is represented by:

$$B_o Z_t = \alpha + \sum_{i=1}^L B_i Z_{t-i} + \varepsilon_t$$

where  $\varepsilon_t$  is a vector of orthogonal structural innovations, and  $Z_t$  consists of global inflation, global output growth, and oil price growth. The vector  $\varepsilon_t$  consists of a shock to the global supply of goods and services (“*global supply shock*”), a shock to the global demand for goods and services (“*global demand shock*”), and a shock to oil prices (“*oil price shock*”).

While the traditional VAR model assumes that the variance-covariance matrix of residuals are constant over time, this assumption could be problematic in this analysis, given the exceptionally large macroeconomic volatility induced by the COVID-19 pandemic (Lenza and Primiceri 2020; Primiceri and Tambalotti 2020). To resolve the issue, the model assumes stochastic volatility of structural shocks—the residuals are independently but not identically distributed across time. Their variance-covariance is allowed to be period-specific, hence rendering volatility stochastic and

introducing heteroskedasticity (Carriero et al. 2019).<sup>10</sup>

### Identification of shocks

**Sign restrictions.** The chapter follows the methodology in Charnavoki and Dolado (2014) and Ha et al. (2019c) in using sign restrictions to identify the global shocks.<sup>11</sup> Postulating that  $B_0^{-1}$  as a recursive structure such that the reduced form errors ( $u_t$ ) can be decomposed according to  $u_t = B_0^{-1} \varepsilon_t$ , as follows:

$$\begin{bmatrix} u_t^{Y,global} \\ u_t^{OilPrice} \\ u_t^{\pi,global} \end{bmatrix} = \begin{bmatrix} + & - & + \\ + & + & + \\ + & + & - \end{bmatrix} \begin{bmatrix} \varepsilon_t^{GlobalDemand} \\ \varepsilon_t^{OilPrice} \\ \varepsilon_t^{GlobalSupply} \end{bmatrix}$$

- A positive *global demand shock* is assumed to increase global output growth, global inflation, and oil price growth.
- A positive *global non-oil supply shock* (hereafter “*global supply shock*”) is assumed to raise global output and oil price growth but reduce global inflation.
- A positive *oil price shock* is defined as raising oil prices and global inflation but depressing global output growth.

**Narrative restrictions.** Since oil price shocks are the main drivers of variations in global inflation, the identification of oil price shocks deserves further robustness checks. In particular, similar to Antolín-Díaz Rubio-Ramírez (2018), these identified oil price shocks (or historical decompositions of the shocks) can further be constrained to ensure that they agree with the established narrative account of historical episodes. The narrative sign restrictions are imposed by considering the subset of successful draws in Bayesian estimation that result in negative oil price shocks (or negative historical contributions

<sup>10</sup> As a robustness check, the conventional model with fixed shock variances is estimated.

<sup>11</sup> See also Melolinna (2015) and Gambetti, Pappa, and Canova (2005) for the identification. Note that Kilian and Murphy (2012) argue that sign restrictions may not in all instances correctly identify shocks. The narrative restrictions used here help the identification.

to oil prices) during key historical episodes since 2000 identified in Baffes et al. (2015) and Wheeler et al. (2020):

- Structural oil price shocks are negative in January 2015 and March 2020.
- Historical contributions of oil price shocks to oil prices are negative in January 2015 and March 2020.
- Historical contributions of oil price shocks to oil prices are more sizeable (in absolute values) than other global shocks in January 2015.

### Bayesian estimation

The model is estimated by using monthly data with four lags, as is standard in the literature. In the Bayesian estimation, the estimation first searches for 10,000 successful draws from at least 15,000 iterations with 5,000 burn-ins; the results reported are based on the median of these 10,000 successful draws, along with 16-84 percent confidence intervals. The estimation process is standard Gibbs sampling except that the volatility of residuals is endogenously determined.

To reflect a sudden change in the volatility in variables around global recessions and oil price shocks, stochastic volatility is assumed to have random inertia—this introduces an extension of the standard stochastic volatility model by turning it into an endogenous variable integrated to the Bayesian estimation process.<sup>12</sup> In the model, the inertia of stochastic volatility is endogenously estimated, allowing for variable-specific inertia (Cogley and Sargent 2005).

### Database

The sample for the monthly estimation includes data for up to 30 advanced economies and 55 EMDEs for 2001-2021. Global output growth is

the global common factor of month-on-month, seasonally adjusted industrial production growth. Global inflation is defined as the global common factor of month-on-month headline CPI inflation. The estimation is repeated using core inflation and producer price index inflation, similarly defined. Oil price growth is the month-on-month growth rate of nominal oil prices (average of Dubai, West Texas Intermediate, and Brent).

The sample for the quarterly estimation includes data for up to 35 advanced economies and 52 EMDEs for 1970-2020. Inflation is defined as the common factor of quarter-on-quarter detrended CPI inflation; oil price growth is defined as quarter-on-quarter nominal oil price changes; output growth is defined as the common factor of quarter-on-quarter real GDP growth.

### Robustness exercises

Since the FAVAR estimation in this chapter rests on various assumptions about the relationships among endogenous variables, several robustness checks on the assumptions are performed. The main results are robust to the following changes:

- Alternative frequency of data (quarterly instead of monthly) and output growth (GDP instead of industrial production);
- Alternative measures of global inflation and global output in the estimation: (i) global inflation and output factors estimated with an identical group of countries and (ii) median output growth and inflation rates among countries;
- Alternative measures of oil prices: real oil prices and nominal energy prices;
- A standard VAR model specification as an alternative to the stochastic volatility model.

### Conditional forecast of global inflation

Global inflation in 2021 is forecast conditional on the FAVAR estimates over 2001-20 and the baseline forecast scenario of chapter 1. In the estimation, quarterly data are employed to directly reflect GDP growth (instead of industrial

<sup>12</sup>The standard stochastic volatility components model can have two limitations. First, the value of the autoregressive coefficient has to be predetermined. For instance, volatility in GDP growth may increase during a period of crisis, but it will clearly return to a lower, long-run value once the crisis is over. Second, the inertia in volatility is assumed to be common to all the variables included in the model.

production) and to reduce the degree of uncertainty in the forecasting. Median draws and 16-84 percentile are reported. The exercise suggests that global inflation may rise by 1.4 percentage points in 2021 globally, 1.5 percentage points in EMDEs and 1.3 percentage points in advanced economies.

Had a similar exercise been conducted in January 2009, based on forecasts developed in the January 2009 edition of the *Global Economic Prospects* report, it would have yielded a forecast of a decline in global inflation by 1.7 percentage points for 2009—considerably less than the actual decline in global inflation of 4.5 percentage points in 2009. The steeper-than-forecast actual inflation decline in part reflected a more severe-than-forecast global recession, in which global growth was -1.8 percent instead of the anticipated 0.9 percent, and lower-

than-expected oil prices, which declined to \$61.8 per barrel in 2009 instead of the anticipated \$74.5 per barrel (World Bank 2009).

A forecast exercise conducted in 2011 based on the baseline scenario presented in the January 2011 edition of the *Global Economic Prospects* report, would have yielded a predicted upturn in global inflation by 1.3 percentage points in 2011, that was broadly in line with actual inflation outturns, followed by an inflation decline of 1.4 percentage point in 2012 that was also broadly in line with actual outturns (World Bank 2011b). The exercise would have yielded a forecast of a decline in advanced-economy inflation by 0.7 percentage point for 2009, again considerably less than the 3.4 percentage point decline in inflation between 2008 and 2009 that actually materialized.

**TABLE 4.1 LICs with highest food insecure populations**

Country	Population with high food insecurity	Drivers (additional to high global food prices)
Congo, Dem. Rep.	21.8M	Conflict and violence; economic shocks and COVID-19 disruption; weather extremes; agricultural pests and diseases.
Republic of Yemen	13.5M	Conflict and violence; economic shocks and COVID-19 disruption; Weather extremes.
Afghanistan	13.2M	Conflict and violence; economic shocks and COVID-19 disruption; Weather extremes.
Syrian Arab Republic	12.4M	Conflict and violence; economic shocks and COVID-19 disruption; weather extremes.
Sudan	9.6M	Conflict and violence; economic shocks and COVID-19 disruption; weather extremes.
Ethiopia	8.6M	Conflict and violence; economic shocks and COVID-19 disruption; weather extremes; agricultural pests and diseases.
South Sudan	6.5M	Conflict and violence; economic crisis; economic shocks and COVID-19 disruption; weather extremes.
Zimbabwe	4.3M	Economic shocks and COVID-19 disruption; weather extremes; agricultural pests and diseases.
Haiti	4.1M	Conflict and violence; economic crisis; economic shocks and COVID-19 disruption; weather extremes.

Source: FSIN and GNAFC (2021).

Note: Number of people in Integrated Food Security Phase Classification (IPC) and Cadre Harmonise (CH) Phase 3 or above in 2020.

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