CHAPTER 3

Sources of Inflation: Global and Domestic Drivers

This chapter examines the key drivers of fluctuations in global and domestic inflation. It finds, first, that global demand shocks and oil price shocks have been the main drivers of variations in global inflation. Global demand shocks have become increasingly more important in explaining global inflation movements since 2001. Second, domestic shocks have explained the lion's share of domestic inflation variation. Domestic supply shocks have accounted for a larger share of inflation variance than other domestic shocks, but their importance has declined since the 1970s and 1980s. Global shocks have been responsible for around one-quarter of the variation in domestic inflation. Third, global shocks have contributed more to domestic inflation variation in advanced economies than in emerging market and developing economies. They have been a more important source of domestic inflation movements in countries with stronger global trade and financial linkages, greater dependence on commodity imports, and fixed exchange rate regimes.

Introduction

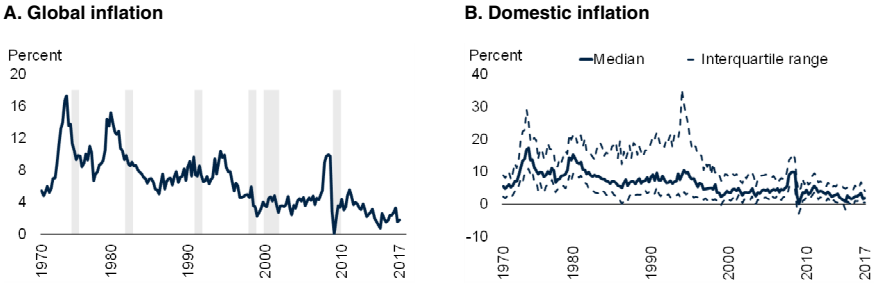
Since 1970, global inflation—defined here as the median of national inflation rates—has undergone considerable swings around a pronounced downward trend. These swings in inflation have often been associated with cyclical fluctuations in the global economy or sharp movements in oil prices (Figure 3.1). Between the early 1970s and the mid-1990s, inflation rose in many emerging market and developing economies (EMDEs) amid jumps in oil prices, currency crises, and price liberalization programs that followed economic collapse (especially in the countries of the former Soviet Union) (Chapter 1). Conversely, short-lived oil price plunges in the mid-1980s and early 1990s were accompanied by declines in inflation in advanced economies and EMDEs.

The period since the global financial crisis has been marked by an unusually pronounced and broad-based disinflation around the world. About 80 percent of countries worldwide experienced disinflation in 2008-09 and 75 percent of EMDEs experienced another bout of disinflation in the 2010s—the highest proportions since the 1980s. Roughly 80 percent of advanced economies and 40 percent of EMDEs experienced outright deflation—also exceptionally high proportions (Figure 3.2).

Note: This chapter was prepared by Jongrim Ha, M. Ayhan Kose, Franziska Ohnsorge, and Hakan Yilmazkuday. Annex 3.1 was prepared by Wee Chian Koh. Background materials for the literature review were provided by Atsushi Kawamoto.

FIGURE 3.1 Global and domestic inflation

Since 1970, global inflation has undergone considerable swings around a pronounced downward trend. These swings often coincided with global recessions or slowdowns and recoveries or large oil price fluctuations.



Source: OECD; Haver Analytics; World Bank.
A. Global inflation is defined as median quarter-on-quarter annualized inflation among 168 economies. Shaded areas indicate global recessions and slowdowns (Annex 3.2)
B. Median and interquartile range of quarter-on-quarter annualized inflation among 168 economies.
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A growing body of research has examined the roles played by a wide range of global and domestic shocks in driving fluctuations in domestic inflation. The theoretical literature has extended the closed-economy macroeconomic models to open-economy settings that establish links between global shocks and movements in domestic inflation.[1] Empirical studies have estimated the roles played by different types of global and domestic disturbances in explaining domestic inflation variation. The results from studies using Phillips curve models have been mixed, whereas studies using vector autoregression (VAR)–based methodologies have generally identified sizable contributions of global shocks to domestic inflation. Studies for the Euro Area have found a particularly important role for the commodity price plunge of 2014-16 (Annex 3.1). This research program has typically focused on one shock or transmission channel without quantifying its importance relative to other shocks. Moreover, although the literature has established the importance of a global factor in driving domestic inflation, it has not provided a detailed analysis of the underlying drivers of global and domestic inflation. Although global demand, supply, and oil price shocks have all been mentioned as important drivers of global inflation, their quantitative importance has not been examined in a unified setup.

Against this background, this chapter studies the main drivers of movements in global and domestic inflation. The chapter addresses the following questions:

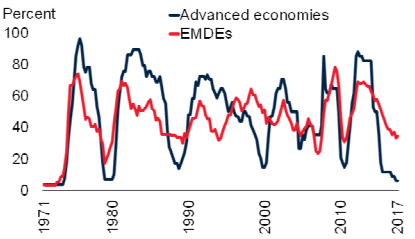
[1] For theoretical studies, see Kabukçuoğlu and Martínez-García (2018), Gali and Monacelli (2008), and Martínez-García and Wynne (2010). For empirical work, see Rogoff (2003), Borio and Filardo (2007), Bianchi and Civelli (2015), Altansukh et al. (2017), and Eickmeier and Kühnlenz (2016).

FIGURE 3.2 Countries with disinflation and deflation

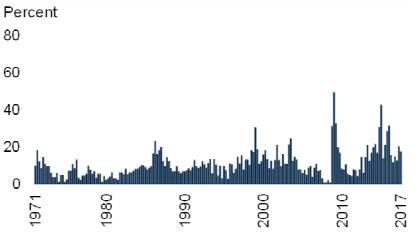
Inflation has been on a pronounced and broad-based downward trend since the mid-1970s. The share of countries with slowing inflation has closely tracked global economic downturns and oil price plunges. Advanced economies are more likely than EMDEs to face disinflation during downturns. Exceptionally high proportions of advanced economies (more than three-quarters) and EMDEs (more than half) were in outright deflation at some point during 2010-17.

A. Share of countries with disinflation episodes

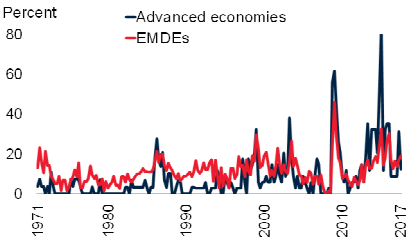
B. Share of countries with disinflation episodes: Advanced economies and EMDEs



C. Share of countries with deflation



D. Share of countries with deflation: Advanced economies and EMDEs



Source: World Bank.
Note: Deflation is defined as negative inflation; disinflation is defined as declining (but still positive) inflation.
A.B. Figures are based on 841 disinflation episodes, defined as in Annex 3.2, in 168 countries (of which 134 are EMDEs) between 1970:1 and 2017:3.
C.D. Deflation is defined as negative quarter-on-quarter inflation rates. Figures are based on data for 168 countries.
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- What have been the main drivers of *global* inflation?
- What have been the main drivers of *domestic* inflation?
- How have the main drivers of domestic inflation differed by country characteristics?

This is the first study in the literature to present a comprehensive examination of the roles of the main drivers of global and domestic inflation for a large panel of countries over several decades. The chapter makes the following contributions to the literature:

Rich model, rich set of shocks. The chapter is the first study to examine, in a single, consistent framework, global and domestic inflation and global and domestic sources of variation in domestic inflation. It estimates a series of factor-augmented vector autoregression (FAVAR) models to quantify the roles of global demand, global supply, oil prices, and a wide range of domestic shocks in driving global and domestic inflation. Domestic shocks include domestic demand, domestic supply, monetary policy, and exchange rate shocks.

Global sample and long series. The chapter is the first to employ data for a large and globally diverse sample of countries (55 countries, including 26 EMDEs) that allows an analysis of inflation dynamics in advanced economies and EMDEs over a long period (1970-2017).

- **Historical context.** The chapter employs event studies to analyze the movements in global and domestic inflation during major economic events since 1970. By putting the post-crisis disinflation into historical context, the chapter highlights its exceptional severity.

- **Country characteristics.** In addition, the chapter considers a wide range of country characteristics that are associated with the differing contributions of global and domestic shocks to domestic inflation variability.

The chapter's principal conclusions are as follows:

- The past decade witnessed a pronounced and broad-based disinflation that depressed global inflation well below its (downward) trend. Exceptionally large fractions of advanced economies (more than three-quarters) and EMDEs (more than one-half) were in outright deflation at some point during 2010-17. Rapid decelerations or accelerations in global inflation have tended to coincide with turning points in the global business cycle or sharp movements in global oil prices.

- Global demand and oil price shocks have each accounted for 40 percent of the variation in *global* inflation since 1970. The relative importance of global demand shocks has increased since the Great Moderation (1986-2000), to account for 60 percent of global inflation variation during 2001-17. The 2014-16 oil price plunge, however, was a major source of post-crisis global disinflation.

- On average during the past four to five decades, *domestic* shocks accounted for about three-quarters of domestic inflation variation. The most important domestic shocks were supply shocks. They accounted for more of domestic inflation variation than any other domestic shocks and about as much as all

global shocks combined. Since 2001, however, the role of domestic supply shocks has declined. Global demand and oil price shocks were the main source of *global* shocks' contributions to *domestic* inflation variation. During 1970-2017, they accounted for about 14 and 8 percent, respectively, of domestic inflation variation whereas global supply shocks played a minor role. Since 2001, however, in part as a result of the global financial crisis and the 2014-16 oil price plunge, the contributions of global demand and oil price shocks have increased to 22 and 17 percent, respectively, of domestic inflation variation.

- The contribution of global shocks to domestic inflation variation was larger in advanced economies and countries with higher trade and financial openness, fixed exchange rate regimes, and greater reliance on commodity imports. In EMDEs, the median contribution of global shocks to domestic inflation variance in countries with fixed exchange rate regimes and greater trade and financial openness was more than twice that in other EMDEs.

The next section examines the behavior of inflation during major events of the past four to five decades and puts the current episode of broad-based disinflation in historical context. The following section examines the main drivers of global inflation, in particular, global demand, global supply, and oil price shocks. The subsequent two sections estimate the roles of global and domestic shocks in driving movements in domestic inflation. The final section concludes with a discussion of policy implications and directions for future research.

Evolution of global and domestic inflation

It is important to distinguish at the outset between disinflation and deflation. *Disinflation* refers to a period of slowing, but still positive, inflation.[2] *Deflation* refers to a decrease in the overall price level, or a negative inflation rate.

Over the past half-century, global inflation has experienced significant movements. Some of these were disinflation episodes that were generally associated with global recessions, economic slowdowns, or large declines in global oil prices. For the purposes of this historical exploration, global inflation is defined as the median of the national trend inflation rates of 25 advanced economies and 40 EMDEs during 1970-2017.[3]

[2] Federal Reserve Bank of San Francisco (1999); Rogoff (2003); Goodfriend and King (2005); Coibion and Gorodnichenko (2015); Cogley, Matthes, and Sbordone (2015).

[3] In the event study, global inflation is defined as median inflation among 65 countries. The trend is defined as the nine-quarter centered moving average, as in Ball (1994). For the econometric model below, global inflation is estimated using a dynamic factor model. The estimation of a global factor model requires a balanced sample, which restricts the sample size.

Identification of global events. Turning points of global business cycles are identified using global per capita gross domestic product (GDP) and the algorithm in Harding and Pagan (2002). The method identifies four troughs of global business cycles or global recessions in 1975, 1982, 1991, and 2009 (Annex 3.2). These recessions were associated with a wide range of adverse developments, including financial crises in advanced economies or EMDEs (Kose and Terrones 2015). Global slowdowns, not involving declines in per capita GDP, took place during the Asian financial crisis in 1998 and the U.S. contraction in 2001. In contrast, peaks of global business cycles or global expansions are observed in 1973, 1981, 1990, and 2008.

Since the 1970s, there have been six oil price plunges. In 1986, 1990-91, 1997-98, 2001, 2008, and 2014-16, oil prices dropped by more than 30 percent over a seven-month period (Baffes et al. 2015). Conversely, there have been 14 oil price spikes (of which nine were reversed within two quarters), periods in which oil prices jumped by more than 30 percent over a seven-month period. Many of these episodes were associated with conflict (for example, the first Gulf War in the early 1990s or the Libyan conflict in the mid-2000s) or geopolitical tensions (for example, the Iranian Revolution in the 1970s).

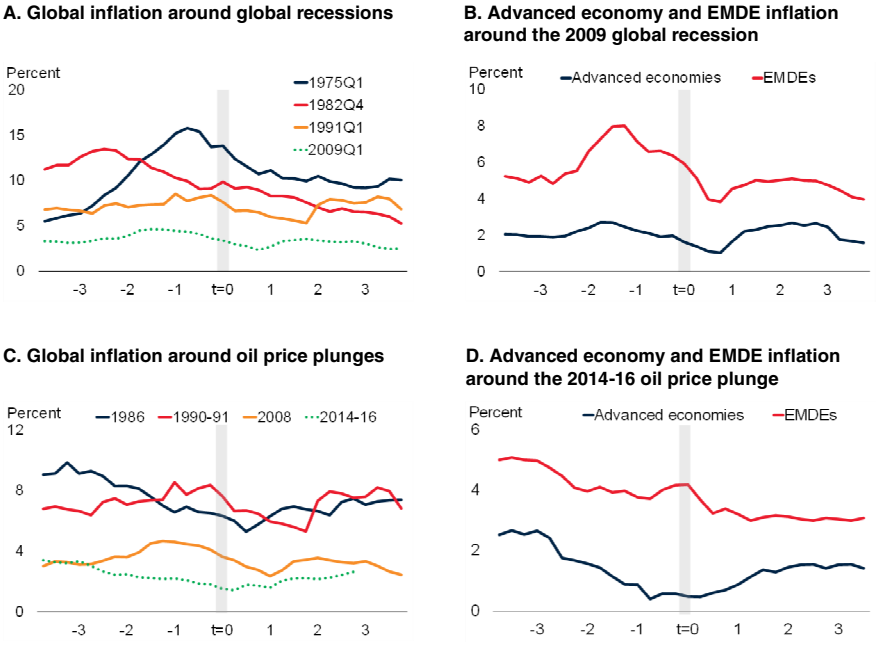
Global disinflation during global recessions. Global inflation has fallen following sharp declines in global output, with a lag of one to three years. During global recessions, median global trend inflation declined 3 percentage points, on average, between the year before the trough of the global recession and the year after. The most recent global recession, in 2009, was followed by a pronounced drop in inflation (2.3 percentage points on a median basis, from 4.7 percent initial inflation). The disinflation was more than twice as steep among EMDEs as among advanced economies, but from a higher starting rate. Despite a quick rebound in both groups after 2009, inflation remained low throughout the 2010s—around 5 percent in EMDEs and 2 percent in advanced economies (Figure 3.3).

Global inflation around global expansions. With few exceptions, global trend inflation increased in the run-up to peaks of global expansions, with a slowdown after the business cycle turned (Figure 3.4). In the two years preceding the business cycle peak, median trend inflation rose by about 2.2 percentage points, on average, over all cyclical peaks since 1970. In the run-up to the most recent global business cycle peak in 2008:2, EMDE inflation rose considerably faster (by about 2 percentage points) than advanced economy inflation (0.2 percentage point) in the two years before the peak. These inflation accelerations were followed by steep subsequent declines during global recessions or slowdowns.

Global disinflation during oil price plunges. Two of the six oil price plunges since 1970—1985-86 and 2014-16—largely reflected supply decisions by the

FIGURE 3.3 Global inflation around global recessions and oil price plunges

Global recessions and oil price plunges were typically associated with slowing global inflation.



Source: World Bank; Baffes et al. 2015.

Note: Horizontal axes indicate years before and after the troughs of global recessions or local troughs of the short-term oil price cycle, as defined in Annex 3.2 (shaded area, t = 0). Global inflation is defined as median trend inflation (nine-quarter moving average) across 65 countries (balanced samples), consisting of 25 advanced economies and 40 EMDEs.

EMDEs = emerging market and developing economies; GDP = gross domestic product.

A.B. 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).

C.D. There were six oil price plunges of more than 30 percent (1986, 1990-91, 1997-98, 2001, 2008, and 2014-16) (Baffes et al. 2015). Panel C shows the four episodes with the largest oil price plunges.

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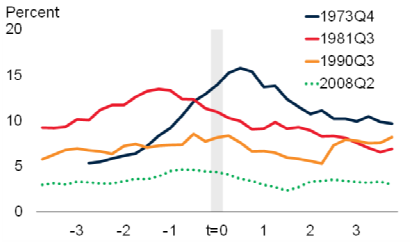
Organization of the Petroleum Exporting Countries (OPEC). The organization raised output limits when faced with growing oil supply from non-OPEC producers in Mexico and the North Sea in the 1980s and the U.S. shale oil industry in the 2000s. The other four episodes predominantly reflected weak demand amid global recessions or slowdowns (World Bank 2015). On average during all six episodes, median global inflation slowed by around 1 percentage point between the year before the trough of oil prices and the year after. The 2014-16 oil price plunge was followed by a modest fall in global trend inflation, which was already low. In the two years to the trough of the most recent oil price plunge of 2014-16, the decline in EMDE inflation was broadly on par with that in advanced economy inflation.

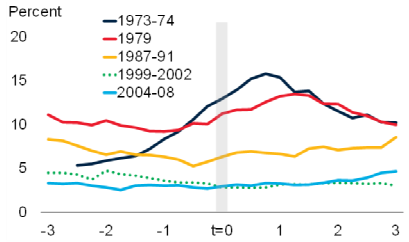
FIGURE 3.4 Global inflation around global business cycle peaks and oil price spikes

Peaks of global expansions and oil price spikes were typically associated with rising global inflation.

A. Global inflation around global expansions



B. Global inflation around oil price spikes



Source: World Bank; Baffes et al. 2015.
Note: Horizontal axes indicate years before and after peaks of global expansions or peaks of the short-term oil price cycle, as defined in Annex 3.2 (shaded area, t = 0). Global inflation is defined as median trend inflation across 65 countries, including 25 advanced economies and 40 EMDEs. EMDEs = emerging market and developing economies; GDP = gross domestic product.
A. Peaks of global expansions are identified using global per capita GDP and the algorithm in Harding and Pagan (2002).
B. There were five oil price spikes of more than 30 percent over a seven-month period that were not reversed within two quarters (1973-74, 1979, 1987-91, 1999-2002, 2004-08).
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Global inflation around oil price spikes. Following oil price spikes, global trend inflation rose, on average across the spikes, by 2.4 percentage points within a year. The impact of the supply-driven oil price spikes in the 1970s and 1980s was much more pronounced (3.5 percentage points, on average, within a year) than the impact of the largely demand-driven oil price increases of the 1990s and 2000s (1.1 percentage points, on average, within a year). The steady rise in oil prices during 2004:3-2008:2 (when oil prices tripled) was associated with only a modest increase in trend inflation (about 1.4 percentage points), which mostly reflected sharply rising inflation in EMDEs.

Drivers of global inflation

The event study discussion above suggests that global inflation has exhibited significant movements over the global business cycle and oil price swings. Global business cycles are driven by shocks related to global supply and demand, and oil price shocks. This section quantifies the contributions of these shocks to global inflation variation.

Methodology

Model and data. A FAVAR model is estimated with three global variables—global inflation, global output growth, and global oil price growth—all expressed in quarter-on-quarter growth rates over 1970-2017, in seasonally adjusted annualized terms, with two lags (Annex 3.3).

Global inflation is defined as the common factor for detrended headline consumer price index (CPI) inflation estimated using a dynamic factor model. In parallel, the global output factor is defined as the common factor for real GDP growth estimated in a separate dynamic factor model (Figure 3.5). The database for quarterly inflation and output includes the largest country sample possible over the period 1970- 2017.[4] Global oil price growth is proxied by quarter-on-quarter growth rates of the nominal price of oil in U.S. dollar terms (average of Dubai, West Texas Intermediate, and Brent prices), as in Baffes et al. (2015).

Evolution of the global inflation and output factors. The global inflation factor was highly volatile until the 1990s (Figure 3.5). It stabilized at low levels in the 1990s and early 2000s before declining further during the global financial crisis and remaining low throughout the post-crisis period. In line with the event study above, the global inflation factor typically declined during global recessions and slowdowns. It fell sharply during the global financial crisis and after the 1975 and 1991 global recessions. Similarly, the global output factor registered significant declines during global recessions and slowed during global slowdowns. Oil price spikes during the 1970s and early 1980s, as well as before the global financial crisis, coincided with rising global inflation.

Identification of shocks. Global demand shocks, global supply shocks, and oil-price shocks are identified using a set of sign restrictions on interactions between these three variables during the first four quarters of impulse responses.[5] The restrictions to identify the structural shocks are consistent with theoretical predictions (Fry and Pagan 2011) and follow other empirical studies in the literature, although earlier studies differ in the types of variables and structural shocks on which they focus.

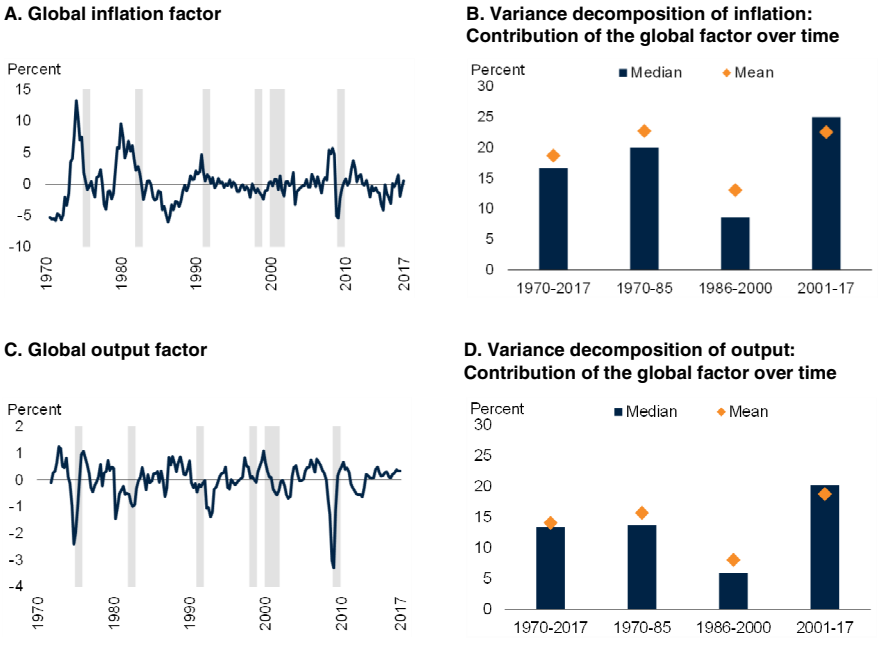
- A positive *global demand shock* is assumed to increase global output growth, global inflation, and oil price growth. This is consistent with similar assumptions in earlier work. Melolinna (2015) assumes that a demand shock raises output, inflation, and domestic interest rates. Charnavoki and Dolado (2014) assume that a demand shock raises output, inflation, and commodity prices. Gambetti, Pappa, and Canova (2005) assume that a

[4] The selection of countries included in the estimation of the global inflation and output growth factors reflects data availability. A balanced set of inflation series is available for 47 countries between 1970 and 2017 (accounting for 67 percent of global GDP in 2017), and that of output series is available for 29 countries (accounting for 66 percent of global GDP in 2017). The results are robust to using a smaller set of countries (25 countries, accounting for 63 percent of global GDP in 2017) with available data for inflation and output growth. The global inflation factor behaves in line with (detrended) median or average inflation, and the results are robust to defining global inflation as cross-country median or average inflation. The results are also robust to using real oil prices or nominal energy prices (Annex 3.3).

[5] The results are robust to imposing these sign restrictions for two quarters.

FIGURE 3.5 Global inflation and global output growth

Inflation comovement (captured by the contribution of a global factor to inflation variance) has been stronger than output growth comovement. For inflation and output growth, this comovement declined between 1970-85 and 1986-2000 but subsequently rebounded.



Source: World Bank.
Note: Global inflation and output factors are de-meaned. Shaded areas indicate global recessions and slowdowns (1975, 1982, 1991, 1998, 2000-01, and 2009).
A.B. The global inflation factor is extracted from 47 detrended national inflation rates using a dynamic factor model.
B.D. Variance shares of inflation (B) and output growth (D) accounted for by the global inflation factor (B) or global output factor (D) are unweighted cross-country averages or medians.
C.D. Global output growth factor is extracted from 29 detrended national output growth rates using a dynamic factor model.
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demand shock raises output, inflation and commodity prices. Gambetti, Pappa, and Canova (2005) assume that a (government) demand shock raises output, inflation, domestic interest rates, and money demand. Ferroni and Mojon (2014) assume that a positive global demand shock raises output, global inflation, and commodity prices and appreciates the exchange rates of five Group of Seven (G7) economies and the Euro Area. The results presented here are robust to imposing an additional (positive) sign restriction on domestic interest rates.

- 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. This is consistent with assumptions used by other studies.

Charnavoki and Dolado (2014) assume that a negative non-commodity supply shock raises input cost, reduces output and commodity prices, and raises inflation. Gambetti, Pappa, and Canova (2005) assume that a positive supply (technology) shock raises output but reduces inflation, domestic interest rates, and money demand. Ferroni and Mojon (2014) assume that a positive supply shock raises output, reduces inflation, and appreciates the exchange rates of five G7 economies and the Euro Area.

- A positive *oil price shock* is defined as raising oil prices and global inflation but depressing global output growth. This assumption also closely follows other studies. Melolinna (2015), Charnavoki and Dolado (2014), and Ferroni and Mojon (2014) assume that a positive cost (commodity price) shock reduces output and raises commodity prices and inflation. Baumeister and Peersman (2013) assume that a negative oil supply shock that raises the price of oil reduces output and oil consumption.

Correlates of global shocks

The model identifies a series of global demand, global supply, and oil price shocks from 1972 onward (Figure 3.6). These shocks have often been associated with turning points in the global business cycle and sharp movements in oil prices.

Global demand shocks. Negative global demand shocks were associated with global recessions (1982, 1991, and 2009) and slowdowns (1998 and 2000-01). Large positive global demand shocks often coincided with the year before the global economy began to slide into a global recession or slowdown.

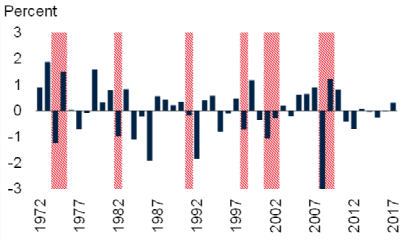
Oil price shocks. Positive oil price shocks were associated with oil supply disruptions during the mid-1970s (1973-74), the Iranian Revolution (1979), the Iran-Iraq War (1979-80), the First Persian Gulf War (1990), Venezuelan unrest (2002-03), as well as militant attacks on pipelines in Iraq and Nigeria and legal disputes over oil production in República Bolivariana de Venezuela (2007-08) (Hamilton 2011; Baffes et al. 2015). Negative oil price shocks were associated with the major OPEC decision to end production restraint amid the development of new sources of oil supply (1986), the normalization of oil prices after the First Persian Gulf War (1991), the global slowdown around the Asian financial crisis (1997-98), and U.S. recessions (1990-91 and 2001). In 2014-16, OPEC's decision to abandon production restraint amid rising output from unconventional sources also constituted a negative oil price shock (Baffes et al. 2015).[6]

[6] Changes in global demand can also trigger oil price movements, such as the collapse in oil prices during the global recession of 2009. In the framework used here, these would be captured as global demand shocks.

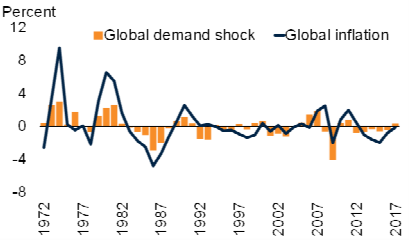
FIGURE 3.6 Global demand, supply, and oil price shocks

Negative global demand shocks have been associated with global recessions and slowdowns. Negative oil price and global supply shocks have been associated with major supply disruptions and changes in OPEC policy. Negative global supply shocks have been associated with the disruptions following the oil price spikes of 1973 and 1979 and the global recessions or slowdowns in 1998, 2001, and 2009.

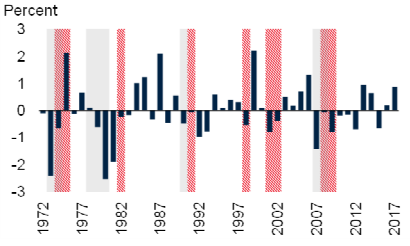
A. Global demand shocks



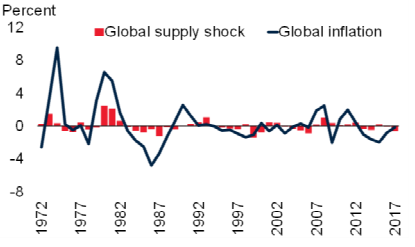
B. Historical contribution of global demand shocks to global inflation



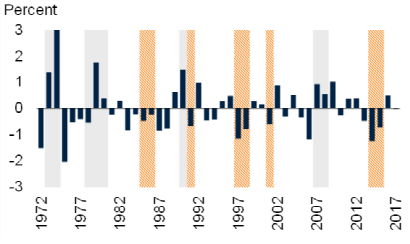
C. Global supply shocks



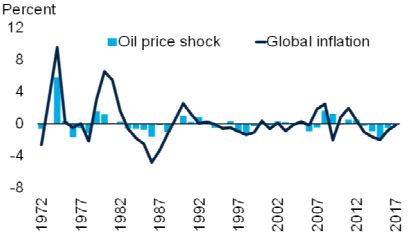
D. Historical contribution of global supply shocks to global inflation



E. Oil price shocks



F. Historical contribution of oil price shocks to global inflation



Source: World Bank.

Note: The structural shocks and their historical contributions are estimated with the global factor-augmented vector autoregression model discussed in Annex 3.3. OPEC = Organization of the Petroleum Exporting Countries.

A.C. Red-shaded areas indicate periods around global recessions and slowdowns (1975, 1982, 1991, 1998, 2000-01, and 2009).

C.E. Grey-shaded areas indicate periods around oil price spikes (1973-74, 1979, 1987-91, 1999-2002, and 2004-08).

E. Orange-shaded areas indicate periods around oil price plunges (1986, 1990-91, 1997-98, 2001, 2008, and 2014-16).

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Global supply shocks. The widespread rise in inflation during the 1970s and early 1980s has been partly attributed to negative global supply shocks that compounded the impact of oil price shocks (Charnavoki and Dolado 2014). In the 1990s, global supply shocks were modest. The global economic recovery starting in the late 1990s into the mid-2000s, however, has been attributed to positive global supply shocks associated with rising productivity linked to advances in information technology and widespread trade liberalization programs in EMDEs (Charnavoki and Dolado 2014).

Role of global shocks in global CPI inflation

Impact of global shocks on global inflation. A positive one-standard-deviation global demand shock (corresponding to a 1.2 percentage point increase in annual global output growth) raised annual global inflation by 0.9 percentage point after one quarter and, cumulatively, by 5 percentage points after two years (Figure 3.7).[7] Similarly, a positive one-standard-deviation oil price shock (corresponding to an increase in annual oil price growth of around 70 percentage points) raised annual global inflation by 4.4 percentage points after two years. Although global supply shocks were modest over the sample period, a positive one-standard-deviation global supply shock reduced annual global inflation by 2.6 percentage points within two years.

Contributions of global shocks to global inflation variation. Global demand shocks and oil price shocks, in almost equal measure, have been the main drivers of global inflation variation since the 1970s (Figure 3.8). These two types of shocks together have accounted for about 80 percent of the variation in global inflation since the 1970s, each contributing about 40 percent. In contrast to global inflation, the variance of global output growth has been driven mostly by global demand shocks (accounting for 60 percent of growth variance during the full sample period), with a more modest role for oil price shocks (accounting for 22 percent of growth variation). As would be expected, fluctuations in oil prices mostly reflect shocks specific to oil prices (accounting for 76 percent of oil price variation) over the sample period.[8]

Evolution of contributions of global shocks to global inflation variation. Global shocks differed in their variability over the three subperiods. This, as well

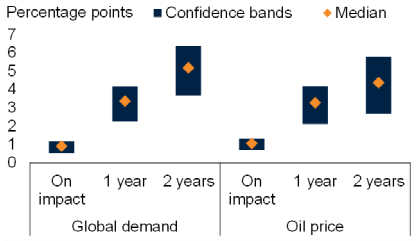
[7] The direction of the impact of global shocks on inflation is determined by the sign restrictions for the first four quarters, but their magnitude and persistence remain of interest.

[8] These numbers refer to the variance decompositions for one-year-ahead forecast errors of global inflation. Over a medium- to long-term (5-10 years) forecasting horizon, the variance contribution of the global demand shocks (44 percent) is slightly greater than that of oil price shocks (38 percent), since global demand shocks are somewhat more persistent than oil price shocks. This is consistent with the results of Melolinna (2015) for the Euro Area, the United Kingdom, and the United States. Melolinna (2015) finds similar responses of inflation to global shocks over the past four decades.

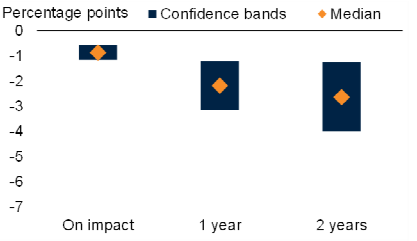
FIGURE 3.7 Impact of global shocks on global inflation

A positive one-standard-deviation global demand shock raised global inflation by 0.9 percentage point within one quarter and, cumulatively, by 5 percentage points within two years. A positive one-standard-deviation oil price shock raised global inflation by 4.4 percentage points within two years. A positive one-standard-deviation global supply shock reduced global inflation by 2.6 percentage points within two years.

A. Impulse response of global inflation: Global demand and oil price shocks



B. Impulse response of global inflation: Global supply shocks



Source: World Bank.
Note: The results are estimated with the global factor-augmented vector autoregression model discussed in Annex 3.3. The cumulative impulse response of global inflation to a one-standard-deviation increase in global oil prices (corresponding to 70 percentage points higher oil price growth), global supply, or global demand (corresponding to 1.2 percentage points higher output growth) on impact, after one year, and after two years. Orange diamonds indicate the median responses and blue or red bars indicate the 16th-84th percentile confidence intervals.
Click here to download data and charts.

as the changing responses of global inflation to these shocks, was reflected in shifts in the contribution of global shocks to global inflation variability over time. In particular, the contribution of supply shocks to global inflation variability has receded over time, while that of global demand shocks has strengthened (Figure 3.8). Global supply shocks were the main source (42 percent) of, in this case modest, global inflation variability during 1986-2000. Since 2001, however, the variance share of global supply shocks has fallen to 7 percent.

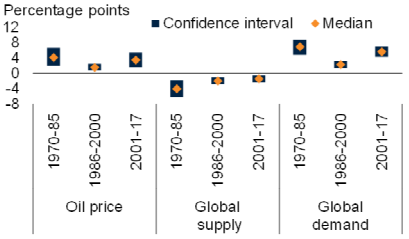
Conversely, the contribution of global demand shocks to global inflation variability has grown to 60 percent since 2001, partly reflecting the global recession of 2009 and the global slowdown of 2001. During the past decade, 2008-17, global demand shocks accounted for three-quarters of global inflation variation. However, the 2014-16 oil price plunge had a significant impact on global inflation: oil price shocks have accounted for 57 percent of global inflation variability since 2010, whereas global demand shocks have accounted for only 30 percent.[9]

[9] This is in line with ECB (2015); Sussman and Zohar (2015); and Berganza, Borallo, and del Río (2016). For instance, ECB (2015) estimates that the decline in Euro Area headline CPI inflation to zero in 2015, from 1.4 percent in 2013, was mostly driven by energy price developments.

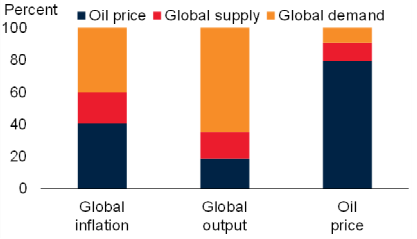
FIGURE 3.8 Impact of global shocks on global inflation over time

Oil price shocks and global demand shocks, in approximately equal measure, have been the main sources of short-term variations in global inflation since the 1970s. The role of supply shocks receded in the two most recent decades, while that of global demand shocks strengthened. Since 2010, oil price shocks have been the main driver of global headline inflation.

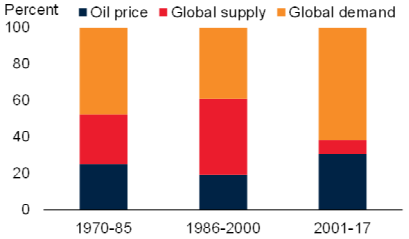
A. Impulse response of global inflation



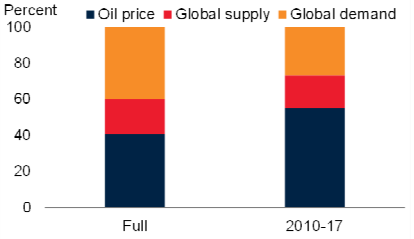
B. Variance decompositions of global inflation, output growth, and oil prices



C. Variance decompositions of global inflation over time



D. Variance decompositions of global inflation since 2010



Source: World Bank.
Note: Cumulative impulse responses to one-standard-deviation shocks after two years (A) and variance decompositions (B-D) estimated by the global factor-augmented vector autoregression model discussed in Annex 3.3.
A. Cumulative response of global inflation after two years to a one-standard-deviation increase in global oil prices (corresponding to 70 percentage points higher oil price growth), global supply, or global demand (corresponding to 1.2 percentage points higher output growth). Confidence interval indicates 16th-84th percentiles.
D. Full sample period indicates 1970-2017.
Click here to download data and charts.

Role of global shocks in different measures of global inflation

The importance of oil prices for inflation partly reflects the sizable share of energy in consumer baskets and, therefore, headline CPI inflation (Altansukh et al. 2017). On average, energy accounts for around 20 percent of headline CPI weights.[10] To explore the role of energy and other tradables in the contribution of global shocks to inflation, the same FAVAR exercise is conducted for global core CPI inflation and global producer price inflation. Producer price indexes

[10] This estimate is based on the average share of housing, water, electricity, gas, and other fuels in CPI baskets for 71 advanced economies and EMDEs (source: OECD).

(PPIs) tend to have a larger tradables content than headline CPI indexes, whereas core CPI indexes tend to have a smaller tradables content than headline CPI indexes (Chapter 2).[11]

Impact of global shocks on global core and PPI inflation. Global PPI inflation is more sensitive to global demand shocks than global headline and CPI inflation. A positive one-standard-deviation global demand shock would raise global PPI inflation by almost twice as much as it raises global CPI—headline or core—inflation over the following two years (Figure 3.9). Global PPI inflation appears to be also somewhat (one-and-a-half to two times) more sensitive, albeit not statistically significantly more, to oil price shocks than global CPI—headline or core—inflation. All three measures respond broadly similarly to a global supply shock.

Relative contributions of global shocks to inflation variability. The contribution of global demand shocks to global inflation variation was similar across all three measures (45-50 percent), but the relative contributions of oil prices and global supply shocks differed (Figure 3.9). The smaller energy content may account for the modest contribution of oil price shocks to global core CPI inflation variation (20 percent)—about half the contribution to headline CPI inflation variation. Less affected by energy and other tradables price shocks, core CPI inflation reflects an important role for global supply shocks: global productivity shocks or their cross-country spillovers, as captured by global supply shocks, appear to have been the main source of variation in core CPI inflation (38 percent), more than twice as much as for PPI inflation (14 percent) and headline CPI inflation. Over the past four to five decades, the impact of global demand, supply, and oil price shocks on global core inflation has become steadily more muted, with global demand shocks being the predominant source of global shocks. This may reflect better anchoring of inflation expectations associated with the shift toward more resilient monetary policy frameworks (Chapter 4).

Drivers of domestic inflation

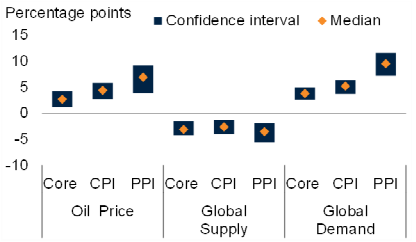
The previous section establishes that global demand shocks and oil price shocks have been the main drivers of the variation in *global* inflation. This section examines the roles of global shocks along with domestic shocks in explaining the variation in *domestic* inflation.

[11] For example, the share of tradable goods and services in the United States is the greatest for the PPI (54 percent), followed by headline CPI (53 percent) and core CPI (15 percent, U.S. Bureau of Labor Statistics).

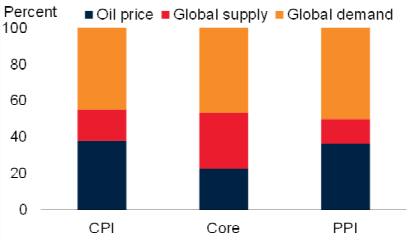
FIGURE 3.9 Impact of global shocks on global inflation: Various inflation measures

Global PPI inflation responds more strongly than other inflation measures to global demand and oil price shocks. Oil price shocks contributed about 20 percent—half as much as for headline inflation—to global core inflation variance. Meanwhile, the variance share of supply shocks in total variation in core CPI is larger than in other measures of inflation.

A. Impulse responses of headline CPI, core CPI and PPI inflation



B. Variance decompositions of headline CPI, core CPI and PPI inflation



Source: World Bank.
Note: Cumulative impulse responses to positive one-standard-deviation shocks after two years (A) and variance decompositions (B) are estimated by the global factor-augmented vector autoregression model discussed in Annex 3.3, for the full sample period 1970-2017. CPI = consumer price index; PPI = producer price index.
A. Blue bars indicate 16th-84th percentile confidence intervals.
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Methodology

Model and data. The FAVAR model above is expanded to include four country-specific variables, along with three global variables (global inflation, global real output growth, and oil prices): headline CPI inflation, output growth, nominal interest rates (three-month Treasury bill rates or monetary policy rates), and nominal effective exchange rates. The extension of the model here follows earlier work by Forbes, Hjortsoe, and Nenova (2017, 2018) and Conti, Neri, and Nobili (2015). All the variables are seasonally adjusted quarterly growth rates (except interest rates) between 1970 and 2017. The model is estimated on a country-by-country basis for 29 advanced economies and 26 EMDEs. For details of the model and data set, see Annex 3.3.

Identification of shocks. On top of the three global shocks (global demand, global supply, and oil price shocks) identified in the global block of the FAVAR model, four types of domestic shocks are specified: domestic supply, domestic demand, monetary policy, and exchange rate shocks.[12] The shocks are identified under the following assumptions:

[12] Gambetti, Pappa, and Canova (2005), for instance, show that a combination of technology, demand, and monetary shocks explains variations in the persistence and volatility of inflation in G7 countries.

- For global inflation, global output growth, and oil price growth, the same sign restrictions described in the previous section are imposed.
- Global variables are assumed to affect country-specific variables contemporaneously (without any sign restrictions), but the feedback from country-specific variables to global variables is assumed to be delayed by at least one quarter (block zero restriction).

To identify domestic shocks, a set of sign restrictions is imposed on the contemporaneous impulse responses of country-specific variables (Annex 3.3):[13]

- A positive *domestic demand shock* is assumed to raise domestic output growth and inflation. This is consistent with, but less restrictive than, the sign restrictions of Gambetti, Pappa, and Canova (2005), who also impose the assumption that a positive demand shock raises money demand; Forbes, Hjortsoe, and Nenova (2018) and Conti, Neri, and Nobili (2015), who also impose the assumptions that a demand shock raises interest rates and appreciates the domestic currency; and Ferroni and Mojon (2014), who also assume that a positive demand shock depreciates the domestic currency. The results presented here are robust to an additional positive sign restriction on the response within one quarter of short-term interest rates to an increase in the positive domestic demand shock.
- A positive domestic supply shock raises domestic output growth but reduces inflation. This is consistent with the sign restrictions of Forbes, Hjoertsoe, and Nenova (2018) and Gambetti, Pappa, and Canova (2005), who also impose a restriction that a positive supply shock reduces interest rates and money demand, and of Ferroni and Mojon (2014), who also assume that a positive supply shock appreciates the exchange rate.
- A contractionary (positive) *monetary policy* (or *short-term rate*) *shock* triggers nominal effective appreciation, lower output growth, and lower inflation. This is consistent with the sign restrictions of Forbes, Hjoertsoe, and Nenova (2018) and Conti, Neri and Nobili (2015). Gambetti, Pappa, and Canova (2005) impose a restriction that a monetary policy shock that raises interest rates lowers output, inflation, and money demand.
- The impact of a positive *exchange rate shock* (corresponding to an appreciation of the domestic currency) is unrestricted. Forbes, Hjoertsoe, and Nenova (2018) impose the restriction that a positive exchange rate

[13] Conti, Neri, and Nobili (2015) and Canova and Paustian (2011) argue that sign restrictions imposed on the contemporaneous relationships among variables are robust to several types of model misspecification. The results here are also robust to imposing sign restrictions for two quarters, as in Forbes, Hjortsoe, and Nenova (2017).

shock reduces inflation and interest rates. Other authors do not impose sign restrictions on responses to exchange rate shocks (Ferroni and Mojon 2014; Conti, Neri, and Nobili 2015; Gambetti, Pappa, and Canova 2008; Melolinna 2015).

The sign restrictions imposed in this chapter are therefore standard except in the identification of domestic demand shocks and exchange rate shocks. Some studies put sign restrictions on the impact of domestic demand shocks on domestic interest rates (or monetary policy rates), and others do not. For lack of a clear economic motivation for imposing this restriction on all the countries, this chapter refrains from imposing sign restrictions. That said, the results are robust to the imposition of additional sign restrictions, as done in several other studies (Annex 3.3). Separately, the sign restrictions used here could lead to ambiguity between domestic monetary shocks and domestic demand shocks (Fry and Pagan 2011). In practice, however, the number of Bayesian draws that are subject to such ambiguity (that is, where all variables have exactly the same directional response to the two shocks) is less than 1 percent for virtually all countries. Finally, also for lack of economic motivation, no sign restrictions are imposed on exchange rate responses. This could also potentially create ambiguity between exchange rates and other shocks. However, the results are robust to eliminating any potentially ambiguous draws.

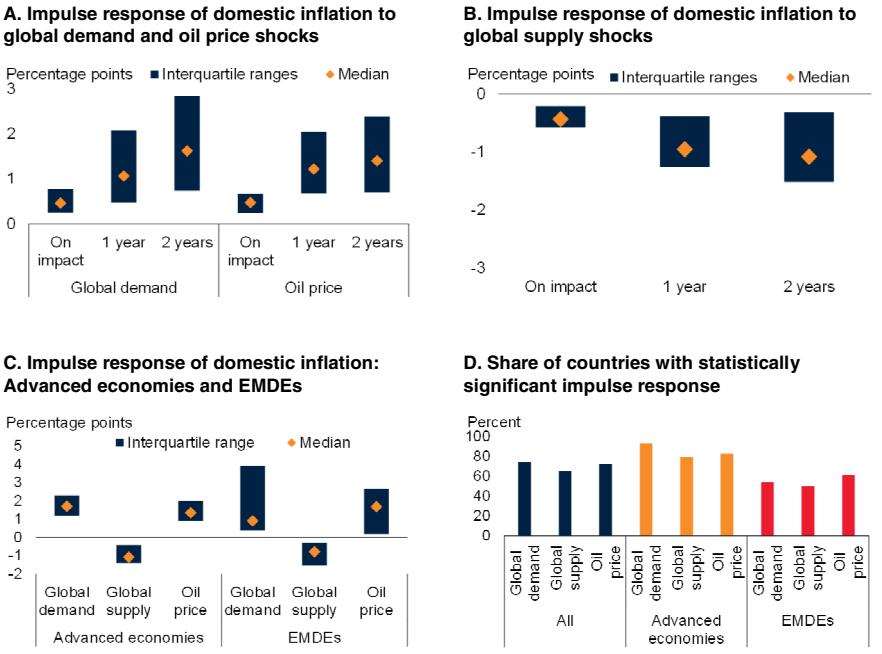
Role of global shocks in domestic inflation

Overall impact of global shocks on domestic inflation. Global shocks had a significant impact on domestic inflation, although the impact was somewhat more muted than for global inflation (Figure 3.10). A negative one-standard-deviation global demand shock (about one-third the size of the average negative demand shock of 2008-09) or oil price shock (about the size of the average negative oil price shock of 2014-15) was associated with lower inflation in the median country by 0.5 percentage point after a quarter and around 1.5 percentage points after two years on a cumulative basis. A negative one-standard-deviation global supply shock raised domestic inflation by around 0.4 percentage point after a quarter, and 1.1 percentage points after two years.

Broad-based impact of global shocks on domestic inflation. The impact of global shocks on domestic inflation was statistically significant for most countries. In 90 percent of the countries, domestic inflation responded significantly within a quarter to global demand, global supply, and oil price shocks. In three-quarters of the countries, the cumulative responses of domestic inflation after two years to global demand shocks were statistically significant. In more than 60 percent of the countries, the cumulative responses to global supply or oil price shocks after two years were statistically significant (Figure 3.10).

FIGURE 3.10 Impact of global shocks on domestic inflation

Domestic inflation responded strongly—and in the majority of countries statistically significantly—to global shocks.



Source: World Bank.

Note: The results are based on the country-specific factor-augmented vector autoregression models discussed in Annex 3.3, estimated for 29 advanced economies and 26 EMDEs for 1970-2017. EMDEs = emerging market and developing economies.

A.-C. The figures present cumulative impulse responses after two years of domestic inflation to positive one-standard-deviation global shocks. Orange diamonds indicate medians and blue or red bars indicate the 25th-75th percentiles of country-specific impulse responses.

D. Share of countries in each group with statistically significant (within 16-84 percent confidence band) cumulative response after two years to a one-standard-deviation shock to global demand, supply, and oil prices.

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Impact of global shocks on domestic inflation in advanced economies and EMDEs. The impulse responses of domestic inflation to global shocks were comparable across the two groups of countries, although they ranged much more widely among EMDEs than advanced economies (Figure 3.10). Inflation in the median country in both groups increased by around 1.5 percentage points two years after a positive one-standard-deviation oil price shock and decreased by around 1 percentage point two years after a positive one-standard-deviation global supply shock.[14] The response of domestic inflation after two years in the

[14] Using a panel of 72 countries, Choi et al. (2018) also find similar point estimates for advanced economies and EMDEs, although the effect of oil price shocks is more precisely estimated for advanced economies than for EMDEs.

median EMDE to a positive one-standard-deviation global demand shock was somewhat smaller (1 percentage point) than in the median advanced economy (1.8 percentage points). However, the range of impact among EMDEs was much wider (from 0.5 to 4 percentage points), such that the difference between advanced economies and EMDEs was not statistically significant.

Relative contribution of global shocks to domestic inflation variation. In the full sample period, global shocks accounted for over a quarter of domestic inflation variance (27 percent) in the median country, but with wide heterogeneity (contributions ranging from 0 to 70 percent).[15] As found by other studies (Conti, Neri, and Nobili 2015; Parker 2018), the main global shocks transmitted to domestic inflation were global demand shocks and oil price shocks. In the median country, they accounted for 14 and 8 percent, respectively, of domestic inflation variation (Figure 3.11).

Consistent with the results presented in Chapter 2, the contribution of global shocks to domestic inflation variation was considerably larger (33 percent median) in advanced economies—with global demand shocks and oil price shocks important—than in EMDEs (14 percent). The greater contribution of global shocks to advanced economy inflation may reflect their stronger global trade and financial linkages, more deeply integrated supply chains, more diversified export bases, and more similar monetary policy regimes. EMDEs are a more heterogeneous group of countries that may be expected to respond in a widely heterogeneous manner to external shocks (Cárdenas and Levy-Yeyati 2011).

Evolution of the role of global shocks in domestic inflation

Country-specific FAVAR models are estimated over the three subperiods of 1970-85, 1986-2000, and 2001-17. The results suggest that the role of global shocks in domestic inflation has strengthened considerably since 2001 in an era of rapidly deepening global trade and financial integration (Chapter 1).

Evolution of the impact of global shocks on domestic inflation. The response of domestic inflation to global shocks has risen since 2001, after falling slightly during 1986-2000 (Figure 3.11). The impulse responses of domestic inflation to oil price shocks during 2001-17 were similar to those in the 1970s and early 1980s, after falling to virtually nil during 1986-2000. The impulse responses to global demand shocks were larger during 2001-17 than during 1986-2000 but somewhat more moderate than those during 1970-85, although not statistically

[15] In Chapter 2, the global inflation factor accounts for 12 percent of domestic inflation variation during 1970-2017. This share cannot be easily compared with the results reported here because of the differences in samples and methodologies. The estimation in Chapter 2 reflects a much larger sample than here where the estimation requires quarterly data.

significantly so. Finally, since the mid-1980s, the impulse responses to global supply shocks have been modest, and significantly smaller than during the 1970s and early 1980s.

Evolution of the relative contribution of global shocks to domestic inflation variation. The contribution of global shocks to domestic inflation variation depends on the responsiveness of domestic inflation to global shocks and the magnitude and frequency of global shocks.[16] Since 2001, the contribution of global shocks to domestic inflation variation has grown significantly (to 43 percent, from 20-23 percent previously), and in all country groupings (to more than one-half in advanced economies and one-quarter in EMDEs), as a result of considerably larger global demand and oil price shocks. To a large extent, this may reflect the impacts of the global financial crisis, propagated through global supply chains and trade networks, and the 2014-16 oil price plunge (Baffes et al. 2015; Nguyen et al. 2017). Nevertheless, the contribution of global supply shocks has decreased over time, from 10 percent during 1970-85 to less than 5 percent since 1986.

Domestic drivers of domestic inflation

Notwithstanding the increase since 2001 in the contribution of global shocks to domestic inflation variation, domestic shocks remained the main source of domestic inflation variation. Over the full sample period, domestic shocks accounted for about three-quarters of domestic inflation variation in the median country (about six-sevenths in the median EMDE and two-thirds in the median advanced economy). Domestic supply shocks were the largest domestic source of inflation variation. In EMDEs, for example, domestic supply shocks alone contributed more than half as much to domestic inflation variation as all global shocks combined.

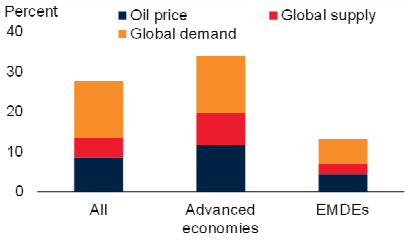
An abundant literature has explored the role of various domestic drivers of inflation in a wide range of country samples and methodologies (Annex 3.1). The methodology used in this chapter quantifies the four most commonly discussed domestic shocks (domestic demand and supply, monetary policy, and exchange rates) in a consistent framework after controlling for global shocks.

[16] The evolution of the volatility of structural shocks can be indirectly measured by the standard deviation of the structural shocks for the subperiods of interest. The standard deviation of oil price shocks halved from 1970-85 (1.45 percent) to 1986-2000 (0.78 percent) and remained low during 2001-17 (0.72 percent). The standard deviation of global demand shocks also decreased from 1970-85 to 1986-2000 (from 1.06 to 0.79 percent) but increased again to 1.1 percent during 2001-17. The standard deviation of global supply shocks evolved in a similar pattern to that of oil price shocks.

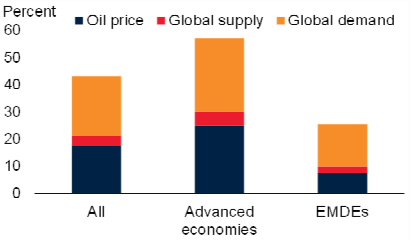
FIGURE 3.11 Contributions of global shocks to domestic inflation

Global shocks accounted for around a quarter of domestic inflation variation, but considerably more in advanced economies (one-third) than in EMDEs (one-seventh). Since 2001, however, this contribution has grown in all country groups—to more than one-half in advanced economies and one-quarter in EMDEs—as a result of considerably larger global demand shocks.

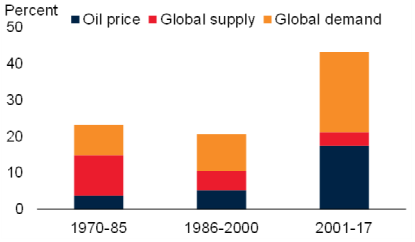
A. Contribution of total global shocks to domestic inflation: 1970-2017



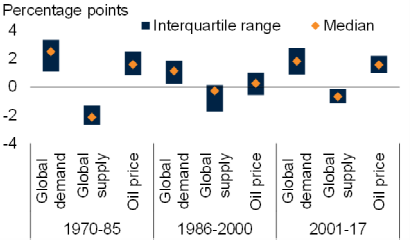
B. Contribution of total global shocks to domestic inflation: 2001-17



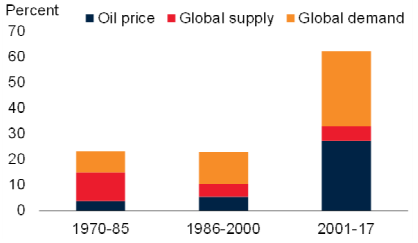
C. Contribution of global shocks to domestic inflation variation over time



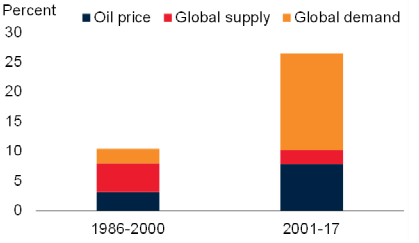
D. Impulse response of domestic inflation to global shocks over time



E. Contribution of global shocks to domestic inflation variation over time: Advanced economies



F. Contribution of global shocks to domestic inflation variation over time: EMDEs



Source: World Bank.

Note: EMDEs = emerging market and developing economies.

A.-C., E., F. Median shares of country-specific inflation variance accounted for by global shocks (global demand, global supply, and oil prices) based on the country-specific factor-augmented vector autoregression models discussed in Annex 3.3, estimated for 29 advanced economies and 26 EMDEs for 1970-2017, unless otherwise noted.

D. Cumulative impulse responses of domestic inflation after two years, following one-standard-deviation shocks. Orange diamonds indicate medians and blue bars indicate the 25th-75th percentile of country-specific impulse responses.

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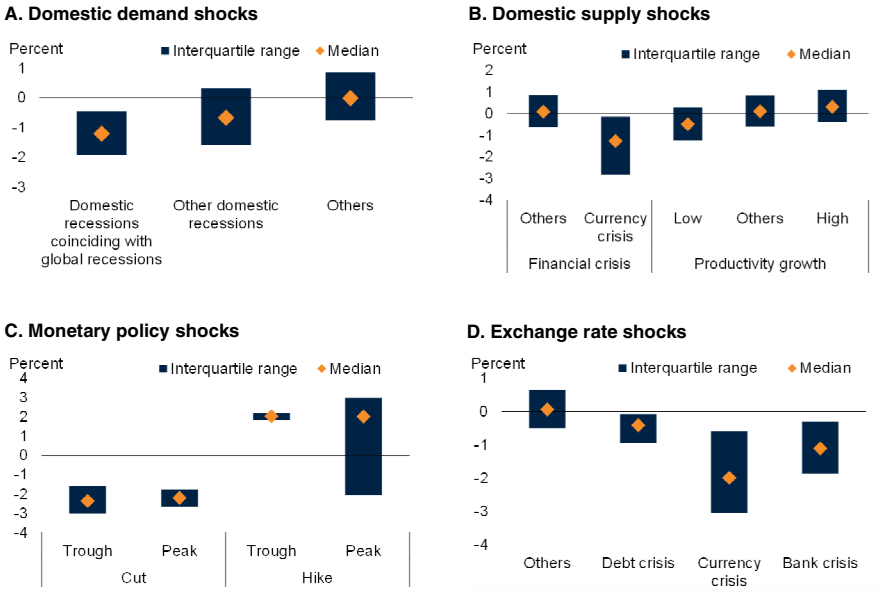
FIGURE 3.12 Correlates of domestic shocks

Negative domestic demand shocks were associated with domestic recessions, especially when they coincided with global recessions. Negative supply shocks were associated with low (or negative) productivity growth and were most pronounced around financial crises. Positive (contractionary) monetary policy shocks were associated with interest rate hikes, especially during economic downturns, and accommodative monetary policy shocks were associated with interest rate cuts. Exchange rate shocks were most pronounced during currency crises but were also sizable during debt and banking crises.



Source: Economic Cycle Research Institute; World Bank.

Note: Orange diamonds indicate median and blue bars indicate the 25th-75th percentile of identified shocks in the full sample period 1970-2017. The results are based on the country-specific factor-augmented vector autoregression estimation discussed in Annex 3.3, estimated for 29 advanced economies and 26 emerging market and developing economies.

A.C. For 21 countries, business cycle turning points are used. For the other countries, the turning points are identified as in Harding and Pagan (2002).

B. Productivity growth defined as total factor productivity (TFP) growth the from Penn World Tables. "High" ("low") indicates the year in which TFP growth is in the highest (lowest) quartile for 1970-2017.

C. Positive (interest rate "hikes") and negative (interest rate "cuts)" monetary policy shocks exceeding one standard deviation.

D. Currency, banking, and debt crises as defined in Laeven and Valencia (2013).

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Correlates of domestic shocks

The model identifies a series of domestic supply, domestic demand, monetary policy, and exchange rate shocks from 1972 onward. These estimated shocks have tended to be associated with the turning points of domestic business cycles, dynamics of productivity growth, monetary policy decisions, and developments during financial crises.

Domestic demand shocks. Negative domestic demand shocks have been closely associated with domestic recessions (Figure 3.12). The demand shocks were more pronounced when domestic recessions overlapped with global recessions. Global recessions may have amplified domestic recessions by generating spillovers through trade and financial links. Ferroni and Mojon (2014) also find that Euro Area disinflation during 2008-09 was largely a reflection of negative demand shocks caused by the global financial crisis.

Domestic supply shocks. Negative supply shocks appear to be associated with low (or negative) productivity growth. They were also particularly pronounced around financial crises. Indeed, Forbes, Hjortsoe, and Nenova (2018) identify strong negative supply shocks in the United Kingdom during the global financial crisis. Currency, debt, and banking crises may have caused severe disruptions to economic activity that were reflected in these negative supply shocks.

Monetary policy shocks. Accommodative monetary policy shocks were associated with policy interest rate cuts. Similarly, contractionary monetary policy shocks were associated with policy rate hikes, especially when they were implemented around business cycle troughs. Many monetary policy rate hikes around business cycle peaks were not identified as contractionary, suggesting that they were largely an endogenous response to inflationary pressures. The model correctly identifies the aggressive U.S. monetary policy tightening in 1979-82 (Annex 1.4 in Chapter 1) as well as the monetary policy loosening in major Euro Area countries in the early to mid-2010s in response to the Euro Area sovereign debt crisis (Conti, Neri, and Nobili 2015).

Exchange rate shocks. As expected, exchange rate shocks were most pronounced during currency crises. They were also significant during debt and banking crises, but they were about one-fifth and one-half, respectively, of the size of exchange rate shocks during currency crises.

Role of domestic shocks in explaining domestic inflation

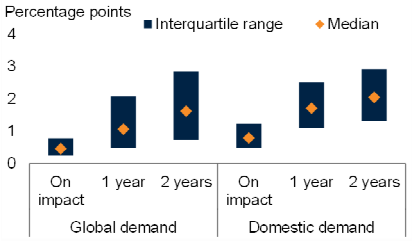
Overall impact of domestic shocks on domestic inflation. The estimated response of domestic inflation to domestic *demand* shocks is slightly stronger than its response to global demand shocks: a one-standard-deviation positive domestic demand shock raised annual domestic inflation by 1.6 percentage points within two years (Figure 3.13).[17] In the median country, domestic *supply*

[17] Many studies document a growing role for domestic demand shocks in explaining domestic inflation variation (Leeper, Sims, and Zha 1996; Domaç and Yücel 2005; Ahmad and Pentecost 2012; Nguyen et al. 2017).

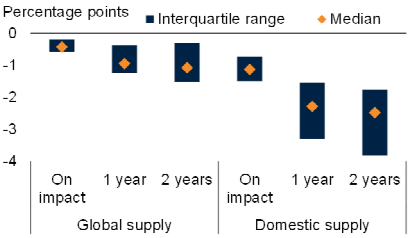
FIGURE 3.13 Impact of domestic shocks on domestic inflation

Domestic inflation responded somewhat more strongly to domestic demand shocks than to global demand shocks. In the median country, domestic supply shocks had about twice the impact of global supply shocks on domestic inflation. The impact of monetary policy shocks was comparable to that of domestic demand shocks.

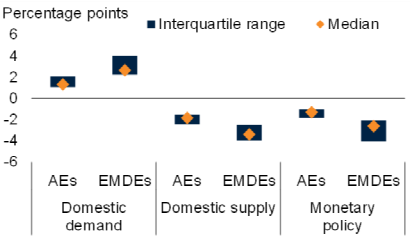
A. Impulse response to global and domestic demand shocks



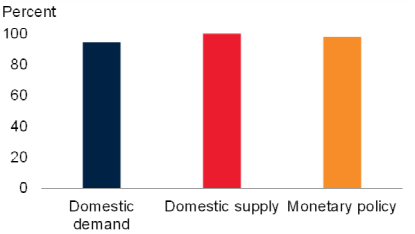
B. Impulse response to global and domestic supply shocks



C. Impulse response to domestic shocks: Advanced economies and EMDEs



D. Share of countries with statistically significant impulse response



Source: World Bank.
Note: AEs = advanced economies; EMDEs = emerging market and developing economies.
A.-C. Cumulative impulse responses of domestic inflation on impact, after one (A, B) or two (A, B, C) years to one-standard-deviation shocks based on the country-specific factor-augmented vector autoregresson models discussed in Annex 3.3, estimated for 29 AEs and 26 EMDEs for 1970-2017. Diamonds show median and blue or red bars indicate 25th-75th percentiles of country-specific results. In the median country, a positive one-standard-deviation domestic demand shock increases domestic output growth by 1.6 percentage points, a positive supply shock decreases domestic inflation by 1.1 percentage points, a positive (contractionary) monetary policy shock increases short-term interest rates (or policy rates) by 0.27 percentage point, and a positive exchange rate shock drives a 15 percentage point increase (appreciation) in nominal effective exchange rates.
D. Share of countries with a statistically significant (at the 16th-84th percentile range) cumulative response of domestic inflation after two years.
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shocks had about twice the impact of global supply shocks on domestic inflation. A one-standard-deviation positive domestic supply shock reduced domestic inflation by about 2.5 percentage points after two years.[18] The impact of monetary policy shocks was comparable to that of domestic demand shocks: a one-standard-deviation increase in short-term interest rates reduced domestic

[18] A role for supply shocks has been found by Globan, Arčabić, and Sorić (2015); Ahmad and Pentecost (2012); and Nguyen et al. (2017).

inflation by 2 percentage points after two years.[19] The impact of exchange rate shocks was smaller (less than 1 percentage point after two years) than that of other domestic shocks.

Broad-based impact of domestic shocks on domestic inflation. The effects of domestic demand, supply, and monetary policy shocks were broad-based: the cumulative impacts after two years were statistically significant in 92 percent of the countries. As explored in Chapter 5, monetary shocks are an important source of exchange rate fluctuations and are often associated with a larger exchange rate pass-through to domestic prices than are other types of shocks. In contrast, few countries display a statistically significant response of domestic inflation to pure exchange rate shocks, in part due to the wide range of sources of exchange rate shocks and the wide range of country characteristics that determine the effects of such shocks on inflation.[20] Possibly reflecting the higher level and volatility of inflation in EMDEs, the response of domestic inflation to domestic shocks was stronger in the median EMDE than in the median advanced economy, although the difference was not statistically significant.

Relative contribution of domestic shocks to domestic inflation. In the median country in the full sample period, domestic shocks contributed more than three times as much as global shocks to domestic inflation variation. Domestic shocks accounted for 67 percent of the variation in domestic inflation in advanced economies, and 85 percent in EMDEs (Figure 3.14). In contrast to *global* supply shocks, which played a limited role in global and domestic inflation variation, *domestic* supply shocks accounted for a greater variance share of domestic inflation (26 percent) than every other type of domestic shock and, in EMDEs, a greater share than all global shocks combined. The predominant role of domestic supply shocks is consistent with previous studies.[21]

Domestic demand shocks and monetary policy shocks each accounted for around 15 percent and exchange rate shocks for about 17 percent of domestic

[19] The transmission of monetary policy has been extensively documented, especially for advanced economies. The recent literature includes Disyatat and Vongsinsirikul (2003); Maćkowiak (2007); Osorio and Unsal (2013); Elbourne and Haan (2009); Globan, Arčabić, and Sorić (2015); Tena and Salazar (2008); Mallick and Sousa (2012); Mishra, Montiel, and Sengupta (2016); Ngalawa and Viegi (2011); and Nguyen et al. (2017).

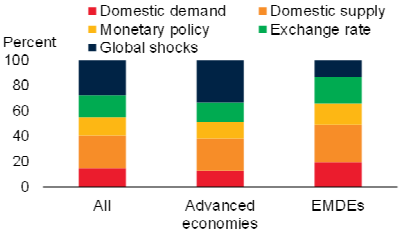
[20] In part, the wide range of impulse responses for exchange rate shocks reflects that, being largely unrestricted, they capture a large variety of shocks.

[21] Supply shocks, which tend to be associated with changes in relative prices, have tended to be more important than shifts in demand. Nguyen et al. (2017) find that the main drivers of inflation dynamics in Sub-Saharan African countries in the previous 25 years were shocks to domestic supply, the exchange rate, and monetary variables. In 33 mostly EMDE countries between 1986 and 2010, Osorio and Unsal (2013) estimate that domestic shocks explain the majority (around 70 percent) of inflation variation. For European Union countries, the evidence is mixed. Vašíček (2011) estimates that global shocks were the main drivers of inflation in the Czech Republic, Hungary, Poland, and the Slovak Republic during 1998-2007.

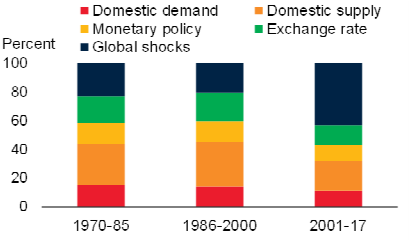
FIGURE 3.14 Evolution of the impact of domestic shocks on inflation

During 1970-2017, domestic supply shocks explained about one-quarter of domestic inflation variation in advanced economies and EMDEs. Other domestic shocks contributed less and in almost equal measure to domestic inflation variation. The contribution of domestic shocks, especially exchange rate and domestic supply shocks, to domestic inflation variation has decreased over time.

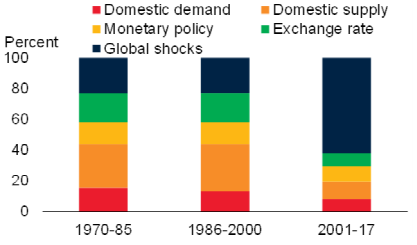
A. Contribution of global and domestic shocks to domestic inflation



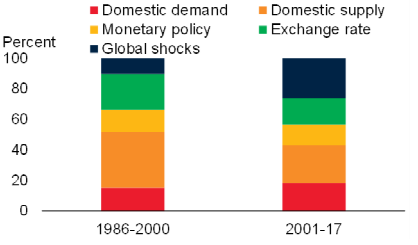
B. Contribution of global and domestic shocks to domestic inflation, over time



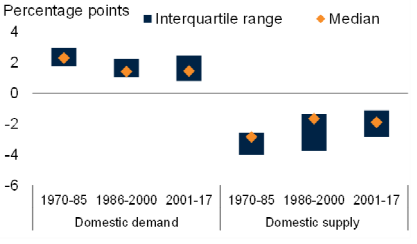
C. Contribution of global and domestic shocks to domestic inflation over time: Advanced economies



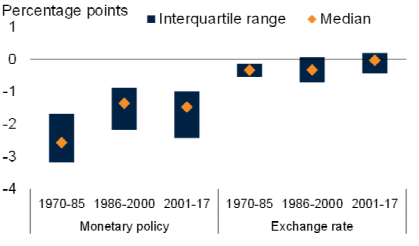
D. Contribution of global and domestic shocks to domestic inflation over time: EMDEs



E. Impulse response of domestic inflation: Domestic demand and supply shocks over time



F. Impulse response of domestic inflation: Monetary policy and exchange rate shocks over time



Source: World Bank.

Note: Median share of country-specific inflation variance accounted for by domestic shocks (domestic demand, supply, exchange rates, and interest rates) based on the country-specific factor-augmented vector autoregression models discussed in Annex 3.3, estimated for 29 advanced economies and 26 EMDEs for 1970-2017. EMDEs = emerging market and developing economies.

E.F. Orange diamonds indicate the median and blue bars indicate the 25th-75th percentile of country-specific impulse responses. Cumulative impulse responses after two years for 1970-85, 1986-2000, and 2001-17.

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inflation variation. The variance share of domestic supply shocks was somewhat more pronounced in EMDEs (30 percent) than in advanced economies (25 percent). In advanced economies and EMDEs, the other three types of domestic shocks contributed in broadly equal measure (but always more in EMDEs than in advanced economies) to domestic inflation variation.

Evolution of the role of domestic shocks in domestic inflation

Evolution of the impact of domestic shocks on domestic inflation. Since the mid-1980s, the sensitivity of domestic inflation to domestic shocks has declined (Figure 3.14). During 2001-17, the responses of domestic inflation to all four types of domestic shocks were half or less of those during 1970-85. These declines largely occurred during the Great Moderation and, in contrast to the response to global shocks, there has not been a rebound in the response to domestic shocks since 2001. The impact of exchange rate shocks, which was modestly negative during 1970-85, all but disappeared during 2001-17. It is possible that a gradual improvement in the anchoring of inflation expectations has contributed to this lower responsiveness of inflation to domestic shocks. The role of inflation expectations is explored in detail in Chapter 4.

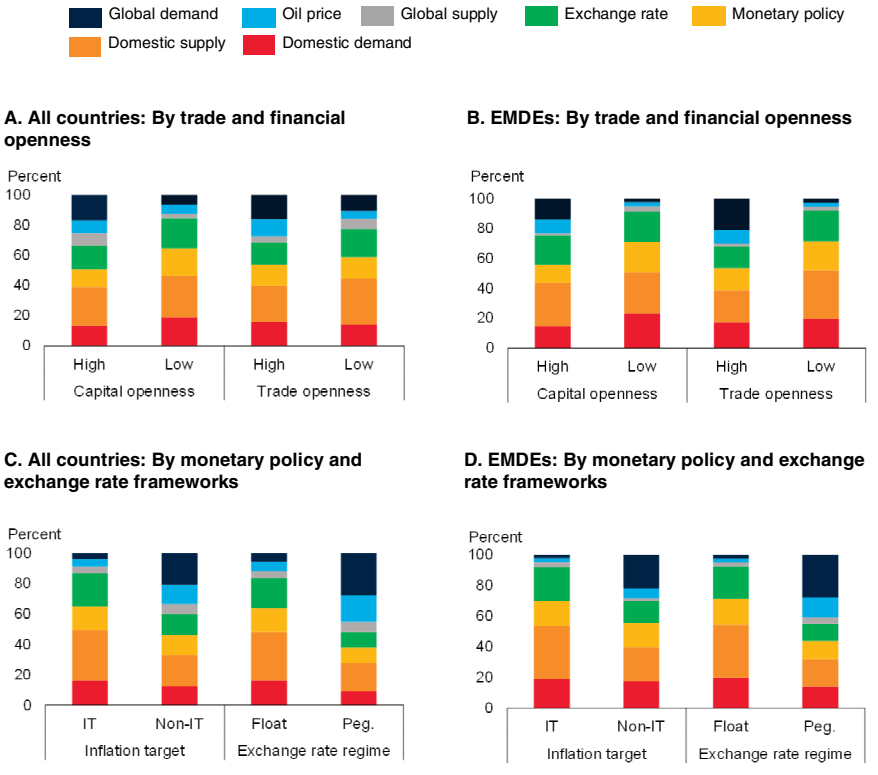
Evolution of the relative contribution of domestic shocks to domestic inflation variation. Since 2001, the contribution of domestic shocks to domestic inflation variation has declined to 53 percent, from 77-80 percent during the preceding decades. This decline has affected all types of domestic shocks broadly similarly. As a result, domestic supply shocks have remained the main source of domestic inflation variation since 2001, accounting for 16 percent of total domestic inflation variation. This broad-based decline in the contribution of all domestic shocks since 2001 is particularly evident in EMDEs. In contrast, in advanced economies, the contribution of supply shocks has shrunk considerably more than that of other shocks, such that, since 2001, domestic supply shocks have contributed less to advanced economy domestic inflation than monetary policy shocks.

Cross-country variation in the role of global and domestic shocks in domestic inflation

Role of global shocks. The role of global factors in explaining domestic inflation has varied widely across countries. The median contribution of global shocks was considerably larger in countries that were open to global trade and finance and were commodity importers (Figure 3.15). Monetary policy and exchange rate regimes also mattered: global shocks were more important inflation drivers

FIGURE 3.15 Contribution to domestic inflation, by country groups

Global shocks have been a more important source of domestic inflation movements in countries with stronger global trade and financial linkages, greater dependence on commodity imports, and fixed exchange rate regimes.



Source: Ilzetzki, Reinhart, and Rogoff 2017; World Bank.

Note: Median share of country-specific inflation variance accounted for by domestic shocks (domestic demand, supply, exchange rates, and interest rates) and global shocks based on country-specific factor-augmented vector autoregression models discussed in Annex 3.3, estimated for 29 advanced economies and 26 EMDEs for 1970-2017. EMDEs = emerging market and developing economies; GDP = gross domestic product; IT = inflation targeting.

A.B. Countries with "high" capital openness are defined as those above the median, as in Chinn and Ito (2017); all others are considered to have "low" capital openness. Countries with "high" trade openness are defined as those with trade-to-GDP ratios above the median; all others are considered to have "low" trade openness.

C.D. IT regimes are defined as in IMF (2016). Flexible exchange rate regimes (Float) are defined as freely floating and managed floating exchange rate regimes, as defined in Ilzetzki, Reinhart, and Rogoff (2017). All other regimes are defined as pegged exchange rate regimes (Peg). See the Appendix for more details on country characteristics.

Click here to download data and charts.

in countries without inflation targeting and fixed exchange rate regimes.[22] In EMDEs, the median contribution of global shocks to domestic inflation variances in countries without inflation targeting and fixed exchange rate

[22] These results do not qualitatively change when the results are based on averages across countries. They are mostly consistent with earlier studies.

regimes, and with greater trade and financial openness was more than twice that in other EMDEs. The variance share of global demand shocks was particularly sizable (20 percent or more) for EMDEs with above-median trade and financial openness, with fixed exchange rate regimes, and without inflation targeting regimes.[23] The variance share of global oil price shocks was particularly sizable in countries, especially EMDEs, that were commodity importers, open to trade and international finance, with fixed exchange rates, and without inflation targeting regimes.[24] The variance share of global supply shocks was particularly large in EMDEs with less independent central banks.

Conclusion

Over the past decade—since the global financial crisis of 2008-09 and the oil price plunge of 2014-16—global inflation has been exceptionally low. The results in this chapter suggest that the recent decline in *global* inflation stemmed in part from the severe global recession and that was prolonged by the oil price plunge. Global demand shocks have accounted for most of the variation in global inflation variation since 2008, and oil price swings have accounted for 60 percent since 2010.

More broadly than the post-crisis period, this chapter has explored systematically, in a unified framework, the roles of domestic and global demand, supply, and commodity price shocks, as well as monetary policy and exchange rate shocks, in explaining movements in global and domestic inflation. The following are the key findings.

First, this chapter highlights the role of global demand shocks and oil price shocks in explaining variations in global inflation since 1970. Oil price shocks and global demand shocks together contributed 80 percent (about 40 percent each) to the variation in global inflation in this period. The roles of global demand shocks and oil price shocks have strengthened considerably over time, while that of global supply shocks has receded.

Second, global shocks have accounted for about one-quarter of domestic inflation variation since the 1970s, but with wide heterogeneity across countries.

[23] Bianchi and Civelli (2015) find that the impulse responses of inflation to global slack are higher in countries that are more open to trade and with higher business cycle integration. Theoretical considerations developed by Martínez-Garcia and Wynne (2010) suggest that inflation is less responsive to domestic slack in countries that are more open to trade. Andrews, Gal, and Witheridge (2018) also find that a high level of global value chain integration can strengthen the transmission of global shocks by accentuating the impact of global economic slack on domestic inflation.

[24] Berganza, Borallo, and del Río (2016) find that the direct effects of falling oil prices have been greater in countries with a larger share of oil in the CPI and higher energy taxation (usually in the form of unit tax rates), as well as currency depreciations after the oil price drop.

The role of global shocks was considerably larger (33 percent) in the median advanced economy—with global demand shocks and oil price shocks about equally important—than in the median EMDE (14 percent) where only global demand shocks played a major role.

Third, it follows that domestic shocks have accounted for about three-quarters of domestic inflation variation and more in EMDEs. In contrast to *global* supply shocks, which played a limited role in global and domestic inflation variation, *domestic* supply shocks accounted for 26 percent of inflation variation and, in EMDEs, for more than any other type of domestic shock. Domestic demand and monetary policy shocks explained about 15 percent, each, of domestic inflation variation.

Fourth, the contribution of global shocks to domestic inflation variation tended to be higher in EMDEs without inflation targeting regimes, with more open capital accounts, with greater trade openness, and with global value chain participation.

Policy makers need to build resilience to global shocks, since their importance as a source of domestic inflation variation has grown over time. This is particularly relevant for policy makers in small, open economies with deep or rapidly growing integration into global trade and financial networks and supply chains. A menu of policy options is available to offset the impact of global shocks in EMDEs. These include active use of countercyclical policies as well as strengthening institutions, including through greater central bank independence. In addition, ample fiscal space and a sound long-term framework for fiscal sustainability can ensure that fiscal policy can support macroeconomic stabilization.

Future research could examine more formally the role of country characteristics. This could be done in a regression framework or by conditioning impulse responses on country characteristics. In addition, changes in the role of global and domestic shocks in domestic and global inflation could be examined in greater detail, for example, by allowing for time-varying coefficients or dynamic factor loadings.

ANNEX 3.1 Literature review: Drivers of domestic inflation

The evidence for a major contribution of global shocks to domestic consumer price inflation is mixed but strongest for global commodity price shocks, particularly in the case of the oil price collapse of 2014-16. The role of global factors, whether global demand and supply shocks or global commodity price shocks, appears to be stronger in countries that are more open to trade, more integrated into global supply chains, and with a greater share of traded goods in the consumer price index basket. The literature on the impact of domestic shocks in emerging market and developing economies (EMDEs) suggests that they explain a substantial portion of the variance of inflation. Domestic supply shocks are at least as important as shocks to demand, but the role of demand shocks has been growing. In EMDEs, the transmission of monetary shocks to inflation is hampered by underdeveloped financial markets as well as by institutional weaknesses.

A large literature has documented the growing role of global factors in domestic inflation. Although strong comovement of inflation among countries is a well-established finding, explanations vary: spillovers from global demand, common supply or commodity price shocks, and trade and financial linkages (Chapter 2). Meanwhile, empirical studies have also typically found an important, albeit diminishing, role of domestic shocks in domestic inflation. Domestic monetary policy is, over the long run, the determining factor for domestic inflation, a principle recognized in the numerical inflation targets set for central banks in many countries. That said, nonmonetary factors, on the demand and supply sides of the economy, and movements in foreign exchange rates can drive short- and medium-term movements in inflation. With increasing globalization, external factors may play a more prominent role (Table A.3.1.1). Against this background, this annex presents a brief survey of the literature to address the following questions:

- How much do global shocks contribute to domestic inflation, and how does the contribution differ by country characteristics?
- How much have oil price shocks contributed to post-crisis inflation?
- What is the relative importance of global and domestic shocks in inflation dynamics?

Role of global shocks in domestic inflation

Empirical studies have documented the role of global shocks in the dynamics of domestic inflation in individual countries using two approaches: a Phillips curve framework and structural vector autoregression (SVAR) or factor-augmented vector autoregression (FAVAR) models. Phillips curve-based evidence on the

role of global factors has been mixed, possibly reflecting measurement error in global output gap estimates. In contrast, vector autoregression (VAR)–based studies have typically found an important contribution of global shocks, especially commodity price shocks, to inflation.[1]

Phillips curve framework. A group of studies has tested the hypothesis that inflation is driven by global slack, in addition to, or instead of, domestic slack. The results have been mixed.

- **Global output gap matters.** Borio and Filardo (2007), in a sample of 15 Organisation for Economic Co-operation and Development (OECD) economies during 1985-2005, find that global inflation and the global output gap add explanatory power to conventional Phillips curve models of domestic inflation.[2] Filardo and Lombardi (2014) also find an important role for global demand shocks, in part transmitted through global commodity price shocks, in inflation in Asian countries. Altansukh et al. (2017) test for structural breaks in the correlation between the components (energy, food, and core) of domestic and trade-weighted foreign inflation in 13 OECD countries during 1970-2013. They find that the short-run sensitivity of headline inflation to foreign energy inflation has increased significantly, but that the synchronization of movements in core inflation has not.

- **Global output gap does not matter.** In contrast, Ihrig et al. (2010) find that in estimates of the Phillips curve for a subset of 11 OECD countries during 1977-2005, the sensitivity of inflation to the global output gap was generally insignificant and often of the wrong sign, and that the sensitivity of inflation to domestic output gaps remained unchanged over time. Similarly, in a broader sample of 24 OECD economies during 1980-2007, Eickmeier and Pijnenburg (2013) find a statistically significant impact on domestic inflation, only for global unit labor cost growth—not global output gaps. Mikolajun and Lodge (2016) estimate Phillips curves augmented by global output gaps, global inflation, and global commodity prices for 19 OECD countries and find little support for a significant role of global economic slack in domestic inflation.[3] Kabukçuoğlu and Martínez-

[1] In a rare study using micro data, Andrade and Zachariadis (2016) find that individual prices adjust to global shocks more slowly than to domestic shocks.

[2] Some studies have examined the role of other external shocks, such as U.S. monetary policy shocks. Using an SVAR framework, Maćkowiak (2007) analyzes the importance of external shocks in the determination of output and inflation in eight Asian countries between 1986 and 2000 and finds that external shocks explained nearly half the variation in inflation.

[3] Moreover, the results suggest that the importance of global inflation in forecasting domestic inflation has its roots solely in its ability to capture slow-moving trends in inflation rates. In the Phillips curve context, the same role is performed by domestic forward-looking inflation expectations.

García (2018) model inflation expectations for 14 OECD countries in a Phillips curve framework that is augmented by the global output gap and global inflation. Again, they find no robustly statistically significant role for global output gaps—which they attribute to measurement error—although they find a significant role for global inflation.

Vector autoregression models. VAR models have more successfully demonstrated a significant role for global developments in driving domestic inflation. Ciccarelli and Mojon (2010) attribute a third of inflation variation to global factors in 22 OECD countries during 1960-2008. Neely and Rapach (2011) attribute more than half of the inflation variation in 64 countries during 1951-2009 to international (global and regional) factors. Mumtaz, Simonelli, and Surico (2011) find a growing share of inflation variation contributed by global factors in 36 mostly advanced economies since 1960. Commodity price shocks are also an important driver of inflation. Using a structural dynamic factor model for Canada, Charnavoki and Dolado (2014) find that global demand, supply, and commodity price shocks played an important role in Canadian inflation during 1975-2010. Furceri, Loungani, and Zdzienicka (2018), in a sample of 34 advanced economies during the 2000s, find that a hypothetical 10 percent increase in global food inflation would have raised domestic inflation by about 0.5 percentage point after a year, but the estimated impact declined over time and became less persistent.

Role of global oil price shocks in post-crisis domestic inflation

Euro Area evidence. Using a Bayesian VAR model, ECB (2017) documents a particularly pronounced contribution of global demand and oil supply shocks to Euro Area inflation in 2008-09 and 2014-16. The authors argue that commodity price movements were the main driver of the global common factor in inflation. However, also in a Bayesian VAR model for the Euro Area, Conti, Neri, and Nobili (2015) find that inflation during 2013-14 was depressed as much by monetary and demand shocks as by oil price movements.

Evidence from the 2014-16 oil price plunge. A recent group of studies focuses on the 70 percent drop in the price of oil from the peak in July 2014 to the trough in January 2016. World Bank (2015, 2018) and Sussman and Zohar (2015) attribute the oil price decline largely to a positive oil supply shock, as the Organization of the Petroleum Exporting Countries decided to protect its global oil market share amid growing U.S. shale oil production. Weak demand played a more prominent role in the subsequent decline in late 2015-16. Berganza, Boralla, and del Río (2016) document that extremely low inflation since the Great Recession has in part reflected the sharp decline in oil prices during 2014-16.

Role of country characteristics

Carney (2015) voices broader concerns among central banks that increased competition from overseas and global financial market integration may have changed the relationship between inflation and domestic economic conditions. Several studies, discussed here, have established empirically that global factors play a greater role in driving domestic inflation in countries with greater trade and global value chain integration, and with a greater share of goods in the consumer price index (CPI) whose prices are highly correlated with global shocks.

Trade integration. Auer, Borio, and Filardo (2017) estimate a Phillips curve model for producer price inflation, augmented by global slack, for 18 OECD countries for 1982-2006. The significantly positive coefficient estimate of the interaction between global slack and global value chain participation indicates that global value chains form an important transmission channel from global slack to domestic inflation. In time-varying-coefficient VAR models, Bianchi and Civelli (2015) find that the impulse responses of inflation to global slack are larger in more trade-open economies and in those with higher business cycle integration. Theoretical considerations developed by Martínez-Garcia and Wynne (2010) suggest that inflation will generally be less responsive to domestic slack the more open the economy is to international trade.

Exposure to food and energy price shocks. Furceri, Loungani, and Zdzienicka (2018) provide evidence that the global food price shocks of the 2000s had a larger impact on domestic inflation in emerging market and developing economies (EMDEs) than in advanced economies. They attribute this to the greater share of food in the consumption baskets of EMDEs and the weaker anchoring of inflation expectations in EMDEs than in advanced economies. Berganza, Boralla, and del Río (2016) find that the post-crisis oil price drop depressed global inflation between 2014 and 2016. The direct effects of falling oil prices were greater in countries with larger shares of oil in the CPI and higher energy taxation (usually in the form of per unit tax rates), as well as in countries where currency depreciations were associated with the oil price drop.

Role of domestic shocks in domestic inflation

In the past two decades, empirical studies have typically found an important, albeit diminishing, role of domestic shocks in domestic inflation. A summary of selected empirical studies on the importance of domestic shocks in inflation dynamics is provided in Table A.3.1.1.

Evidence on advanced economies. Several studies have offered evidence that domestic shocks play a key role in domestic inflation dynamics. Globan, Arčabić, and Sorić (2015) find, for non-Euro Area new European Union

member states, that short-run inflation dynamics could be explained mainly by domestic factors, even if foreign shocks became the major driver of inflation in the medium term. Bobeica and Jarociński (2017), using a medium-scale, reduced-form VAR, document that domestic shocks can explain the "missing disinflation" and "missing inflation" episodes in the United States and the Euro Area in the 2010s. However, Pain, Koske, and Sollie (2006) find, for OECD countries since the mid-1990s, that the sensitivity of inflation to domestic economic conditions has declined.

Evidence on EMDEs. Studies on EMDEs have similarly found that domestic shocks play a predominant role in domestic inflation dynamics, even if the role of global shocks may have grown. For European Union countries, the evidence is mixed, with Vašíček (2011) arguing that global shocks were the main drivers of inflation in the Czech Republic, Hungary, Poland, and the Slovak Republic during 1998-2007 but Halka and Kotlowski (2017) finding that domestic shocks played an important role in inflation dynamics in the Czech Republic, Poland, and Sweden, including by transmitting global demand shocks through the domestic output gap. For Asia, Osorio and Unsal (2013) estimate that domestic shocks explain around 70 percent of total variation in domestic inflation in 33 countries.

Role of monetary policy in domestic inflation

There is an extensive literature on the transmission of monetary policy to the domestic economy. One of the challenges this research has had to address is the simultaneity between monetary policy and economic development: monetary policy responds to the economy, as well as vice versa (Leeper, Sims, and Zha 1996; Gertler and Karadi 2015). Most studies of the transmission of monetary policy to the economy have focused on advanced economies. Using structural model frameworks, many of these studies have shown that monetary policy explains a substantial part of the variation in domestic inflation, with statistical significance.[4] The literature has evolved by developing more advanced empirical frameworks that purport to address the problem of simultaneity. Surveys of this work are provided by Boivin, Kiley, and Mishkin (2010); Benati and Goodhart (2010); and Bhattarai and Neely (2016). Ramey (2016) and Stock and Watson (2017) discuss the evolution of estimation strategies.

[4] For instance, Canova and De Nicolo (2002) show that monetary disturbances explain large portions of output and inflation fluctuations in the G7 economies. The explanatory power of monetary disturbances for output variability in Canada, Germany, Italy, and the United Kingdom is found to exceed 22 percent; for inflation variability in Italy, Japan, the United Kingdom, and the United States, it is found to exceed 54 percent.

Evidence on EMDEs. The evidence on the transmission of monetary policy to macroeconomic conditions is less clear for EMDEs than for advanced economies. A group of earlier studies focused on challenges that EMDEs face in the implementation of monetary policy and specific channels of monetary policy transmission.[5] These challenges include higher default risk, underdeveloped financial markets, and weaker institutions.[6] Although the interest rate and asset price channels of monetary policy transmission are limited, and sometimes insignificant (Mohanty and Turner 2008; Vonnák 2008), some studies have found that the exchange rate channel plays a significant role in EMDEs (Neaime 2008; Bhattacharya, Patnaik, and Shah 2011). In low-income countries, because of undeveloped financial markets, monetary policy transmission relies heavily on the bank lending channel. The evidence on its effectiveness is mixed .[7]

Role of domestic demand and supply shocks in domestic inflation

Several studies have examined nonmonetary macroeconomic shocks as drivers of domestic inflation. Domestic demand shocks include, for example, unanticipated changes in government spending, while domestic supply shocks include unanticipated changes in the availability of goods or services resulting from such factors as severe weather events, labor strikes, and changes in productivity. The effects of such shocks on prices may be transitory or permanent, depending partly on the nature of the shock and partly on the monetary policy regime and anchoring of inflation expectations.

Evidence on advanced economies. Melolinna (2015) uses a FAVAR framework to study inflation dynamics in the Euro Area, the United Kingdom, and the United States. The results suggest that headline inflation in the three economies reacted in a similar fashion to macroeconomic shocks over the previous four decades, with demand shocks having the most persistent effects. Gambetti, Pappa, and Canova (2005) examine the dynamics of U.S. output and inflation using a structural time-varying coefficient VAR. They find that a combination of technology, demand, and monetary shocks explained variations in the persistence and volatility of inflation. These and other studies have found that, along with monetary policy shocks, real macroeconomic shocks, both demand and supply, help to explain inflation dynamics in advanced economies.

Evidence on EMDEs. Several empirical studies have analyzed the effects of supply and demand shocks on inflation in EMDEs. A broad finding is that

[5] Hammond, Kanbur, and Prasad (2009); Mishra, Montiel, and Spilimbergo (2012).

[6] Frankel (2011); Agenor and Aynaoui (2010); Wu, Luca, and Jeon (2011).

[7] Mishra, Montiel, and Sengupta (2016); Mishra and Montiel (2012); Disyatat and Vongsinsirikul (2003); Golenelli and Rovelli (2005); Catao and Pagan (2010); Singh and Kalirajan (2007); Aleem (2010).

supply shocks, which tend to be associated with changes in relative prices, have to be more important than shifts in demand, but that the role of demand shifts has grown. Mohanty and Klau (2001), in a study of 14 EMDEs during the 1980s and 1990s, find significant effects from supply shocks, especially from those affecting food prices. Several studies focus on regional groups of EMDEs:

- ***Asia.*** Osorio and Unsal (2013), using a set of global VAR and SVAR models, study the drivers of inflation in 33 Asian countries during 1986-2010. They find that supply shocks explained around 45 percent of total variation in cyclical inflation, and monetary shocks around 35 percent, but that the role of demand factors had increased since 2000.[8] Dua and Gaur (2009) investigate the determinants of inflation in the framework of an open-economy Phillips curve model for eight Asian countries during 1990-2005. They find that agriculture-related supply shocks were a significant determinant of inflation for EMDEs but not for advanced economies.

- ***Sub-Saharan Africa.*** Nguyen et al. (2017) analyze inflation dynamics in Sub-Saharan African countries, using a global VAR model. They find that in the previous 25 years, the main drivers of inflation were shocks to domestic supply, the exchange rate, and monetary variables, but, in the most recent decade, domestic demand pressures and global shocks played larger roles than previously. Similarly, using the SVAR framework of Blanchard and Quah (1989), Ahmad and Pentecost (2012) study inflation dynamics in 22 African countries. They find that the most important source of inflation was demand shocks, which accounted for between 50 and 90 percent of inflation variation in all countries.

- ***Middle East.*** Hasan and Alogeel (2008) find, for Saudi Arabia and Kuwait between 1964 and 2007, that, in the long run, inflation in trading partners was the main factor affecting inflation, with a smaller contribution from exchange rate pass-through. The estimated impacts of domestic demand and monetary shocks were confined to the short run. Kandil and Morsy (2010) study the determinants of inflation in Gulf Cooperation Council countries during 2003-08, using a model that includes domestic and external factors. They find that binding capacity constraints (supply side) and government spending (demand side) helped to explain short-term movements in inflation.

[8] However, the supply and demand shocks include external factors, for example, commodity price shocks and inflation spillovers from other Asian countries. The contribution to inflation of domestic supply shocks varied from one country to another, between zero and 40 percent.

TABLE A.3.1.1 Literature review: Drivers of inflation—Panel A. Studies on advanced economies

Paper	Sample countries	Sample period	Methodology	Shocks				Main results
				DD	DS	MP	ER	
Amisano and Tristani (2007)	Euro Area	1970:1-2004:4	DSGE		√	√		Inflation targeting and monetary policy shocks explain 76 and 9 percent of inflation variation, respectively. Tax and technology shocks are less important.
Bobeica and Jarociński (2017)	Euro Area and U.S.	1990:1-2014:4	BVAR	√	√	√	√	Domestic shocks are more important in the missing inflation episode, whereas global shocks are more important in the missing disinflation episode.
Canova and De Nicolò (2002)	G7	1973-95	VAR			√		Monetary shocks are the dominant source of output and inflation fluctuations in three of the seven countries.
Conti, Neri, and Nobili (2017)	Euro Area	1995:1-2015:3	BVAR	√		√		Foreign shocks (oil supply and global demand) and aggregate demand are the main drivers of inflation; monetary policy is less important.
Gambetti, Pappa, and Canova (2005)	US	1970-2002	SVAR	√	√	√		Technology, demand, and monetary shocks explain the variation in inflation, with technology contributing 25 percent, demand 17 percent, and monetary policy 14 percent, on average.
Globan, Arčabić, and Sorić (2015)	Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Lithuania, Poland, and Romania	2001-13	SVAR		√	√		Foreign shocks are the major factor in explaining inflation dynamics in the medium run; short-run inflation dynamics are mainly influenced by domestic shocks.
Melolinna (2015)	Euro Area, UK, U.S.	1975M1-2012M12	FAVAR	√	√	√		Demand shocks are more persistent drivers of inflation.
Mumtaz, Zabczyk, and Ellis (2011)	UK	1964:1-2005:1	FAVAR	√	√	√		Supply shocks are the key drivers of inflation, with monetary policy shocks having a small initial impact that slowly increases over time.
Pain, Koske, and Sollie (2006)	OECD countries	1985-2005	VAR		√			The sensitivity of inflation to domestic economic conditions has declined, whereas the sensitivity to foreign economic conditions has risen, working through import prices.

Note: BVAR = Bayesian vector autoregression; DD = domestic demand; DS = domestic supply; DSGE = dynamic stochastic general equilibrium; ER = exchange rate; FAVAR = factor-augmented vector autoregression; G7 = Group of Seven; MP = monetary policy; OECD = Organisation for Economic Co-operation and Development; SVAR = structural vector autoregression; VAR = vector autoregression.

TABLE A.3.1.1 Literature review: Drivers of inflation—Panel B. Studies on EMDEs

Paper	Sample countries	Sample period	Methodology	Shocks				Main results
				DD	DS	MP	ER	
Ahmad and Pentecost (2012)	22 African countries	1980-2015	SVAR	√	√			Demand shocks account for between 50 and 90 percent of inflation variation; domestic supply shocks account for about 10 to 40 percent.
Bhattacharya, Patnaik, and Shah (2009)	India	1997-2009	VAR			√	√	Monetary policy impacts inflation through the exchange rate.
Dua and Gaur (2010)	Japan; Hong Kong SAR, China; Korea, Rep.; Singapore; Philippines; Thailand; China; and India	1990s-2005	Open economy Phillips curve	√	√		√	The output gap is important in explaining inflation in almost all the countries. In developing countries, agricultural supply shocks are important but not so in advanced economies.
Halka and Kotlowski (2017)	Czech Republic, Poland, and Sweden	2000:1-2014:2	SVAR	√	√		√	Domestic shocks are important in inflation dynamics with transmission via the domestic output gap and exchange rate channel.
Hasan and Alogeel (2008)	Saudi Arabia and Kuwait	1966-2007	ECM	√	√			In the long run, inflation in trading partners is the main driving factor of inflation, with significant but lower contribution from exchange rate pass-through. Demand shocks and money supply shocks are important in the short run, but tend to dissipate quickly.
Jongwanich and Park (2008)	China; India; Indonesia; Korea, Rep.; Malaysia; Philippines; Singapore; Thailand; and Vietnam	1996:1-2008:1	SVAR	√			√	Inflation is largely due to excess aggregate demand and inflation expectations rather than external price shocks.
Jongwanich, Wongcharoen, and Park (2016)	China; Hong Kong SAR, China; India; Indonesia; Korea, Rep; Malaysia; Philippines; Singapore; Thailand; and Vietnam	2000:1-2015:2	SVAR			√	√	Cost-push factors such as oil and food prices are more important in explaining PPI than CPI. For CPI, demand-pull factors still explain much of the inflation.

Note: CPI = consumer price index; DD = domestic demand; DS = domestic supply; ECM = error correction model; ER = exchange rate; MP = monetary policy; PPI = producer price index; SVAR = structural vector autoregression; VAR = vector autoregression.

TABLE A.3.1.1 Literature review: Drivers of inflation—Panel B. Studies on EMDEs (*continued*)

Paper	Sample countries	Sample Period	Methodology	Shocks				Main results
				DD	DS	MP	ER	
Kandil and Morsy (2010)	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates	1970-2007	VECM			√	√	Inflation in major trading partners is an important foreign factor. In addition, oil revenues have reinforced inflationary pressures through growth of credit and aggregate spending.
Khan and Hanif (2012)	Pakistan	1992-2011	SVAR	√	√	√		Supply shocks explain 48 percent of variation in inflation, while the share of real demand shocks was around 10 percent and the remaining 42 percent attributed to nominal shocks.
Mohanty and Klau (2001)	14 EMDEs	1981:1-1999:4	Open economy Phillips curve	√	√	√	√	The output gap is a significant determinant of inflation. Supply side factors and import prices (especially food prices, via the exchange rate channel) are also important, but money supply is less relevant.
Neaime (2008)	Egypt, Arab Rep.; Jordan; Turkey; Lebanon; Morocco; and Tunisia	1990s-2000s	VAR			√	√	In Egypt and Turkey, the exchange rate played a dominant role in the transmission mechanism of monetary policy; for Jordan, Lebanon, Morocco, and Tunisia, it was the interest rate.
Nguyen et al. (2017)	33 Sub-Saharan African countries	1988-2013	VAR	√	√	√	√	Main drivers of inflation have been domestic supply shocks and shocks to exchange rate and monetary variables. However, in recent years, domestic demand and global shocks have played a larger role in driving inflation.
Osorio and Unsal (2013)	33 Asian countries	1986-2010	GVAR, SVAR	√	√	√	√	Monetary and supply shocks are the main drivers of inflation, but more recently demand shocks are increasing in importance.
Porter (2010)	China	1996:1-2010:1	BVAR	√		√	√	Global shocks are more important than domestic demand and monetary conditions.
Vašíček (2011)	Czech Republic, Hungary, Poland, and Slovak Republic	1998:1-2007:3	New Keynesian Phillips curve	√	√		√	Inflation seems to be driven by external factors.

Note: BVAR = Bayesian vector autoregression; DD = domestic demand; DS = domestic supply; EMDEs = emerging market and developing economies; ER = exchange rate; GVAR = global vector autoregression; MP = monetary policy; SVAR = structural vector autoregression; VAR = vector autoregression; VECM = vector error correction model.

ANNEX 3.2 Event studies

Global business cycles and oil price swings. The chapter conducts an event study of inflation around peaks of global expansionary periods and troughs of global recessions, and oil price plunges and spikes. It uses quarterly per capita gross domestic product and the algorithm in Harding and Pagan (2002) to identify turning points of global business cycles. The exercise finds four peaks of global expansions (1973:4, 1981:3, 1990:3, and 2008:2) and four troughs of global recessions (1975:1, 1982:4, 1991:1, and 2009:1). In addition to these four global recessions, Kose and Terrones (2015) identify two global slowdowns (1998 and 2000-01) since 1960. World Bank (2015) identifies oil price plunges as episodes of 30 percent or more declines in oil prices over a six-month period, of which there have been six since 1970 (1985-86, 1990-91, 2001, 1997-98, 2007-09, and 2014-16). Oil price spikes are similarly identified and occurred in 1973-74, 1979, 1987-91,1999-2002, and 2004-08.

Disinflation episodes. Country-specific disinflation episodes are defined, using a variation of Ball (1994), as quarters in which the nine-quarter centered moving average of headline consumer price index inflation (quarter-on-quarter, seasonally adjusted) declines by at least 1 percentage point from the peak to the trough. A trough is the quarter in which trend inflation is lower than in the previous four quarters and following four quarters. A peak is defined as the quarter in which trend inflation is above the previous four quarters and following four quarters. This yields 190 disinflation episodes and 179 inflation episodes in 34 advanced economies, and 719 disinflation episodes and 729 inflation episodes in 134 EMDEs during 1970-2017:3.

ANNEX 3.3 Methodology and database

Global block

This chapter employs a factor-augmented vector autoregression (FAVAR) model. In the first step, a global block is estimated in isolation to examine the roles of different types of global shocks in driving global inflation. In the second step, the global block is combined with a country-specific block to compare the roles of global and domestic shocks in driving domestic inflation.

The global block includes three variables: global inflation, global output growth, and oil price growth (for precise variable definitions, see below). All variables are detrended using a 60-quarter centered moving average. Global output growth and global inflation correspond to the global output growth and global inflation factors estimated separately using the following dynamic factor models:[1]

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

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

where π_t^i and y_t are inflation and output growth in country i in quarter t, respectively, while $f_t^{\pi,global}$ and $f_t^{Y,global}$ are the global common factors for inflation and output growth in quarter t, respectively.[2]

In its structural form, the FAVAR model is represented by:

$$B_0 Z_t = \alpha + \sum_{i=1}^{L} B_i Z_{t-1} + \varepsilon_t$$

where ε_t is a vector of orthogonal structural innovations, and Z_t consists of global inflation ($f_t^{\pi,\,global}$), global output growth ($f_t^{y,\,global}$), and oil price growth (Δop). The vector ε_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*").

The chapter follows the methodology in Charnavoki and Dolado (2014) in using sign restrictions to identify global demand, global supply, and oil price

[1] The main assumptions in the estimation of the global factors follow those in Kose, Otrok, and Whiteman (2008) and Kose, Otrok, and Prasad (2012).

[2] The model is specified in terms of growth, not levels, since the variable of interest (inflation) is itself a growth rate.

shocks. Postulating that B_0^{-1} in our model has a recursive structure such that the reduced form errors ($_t$) can be decomposed according to $u_t = B_0^{-1}\varepsilon_t$, the sign restrictions that are imposed over the first four quarters can be written as follows:

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

where a positive *global demand shock* increases global output, global inflation, and oil prices; a positive *oil price shock* increases oil prices and global inflation but reduces global output growth; and a positive *global supply shock* increases global output growth and oil price growth but reduces global inflation.

Structural shocks are assumed to have unit variance, and the magnitude of each shock is defined as a one-standard-deviation increase in the identified structural shocks. Based on the full sample results, it is estimated that a one-standard-deviation shock to global demand represents a 1.2 percentage point increase in global output growth; a one-standard-deviation global supply shock represents a 0.9 percentage point increase in global inflation; and a one-standard-deviation oil price shock a 70 percentage point increase in oil price growth.

The model is estimated by using quarterly data with two lags, as in Charnavoki and Dolado (2014). The lag length is supported by statistical tests (Akaike information criterion [AIC] and Schwartz information criterion [SIC]). Alternative specifications with three or four lags were tested, and the robustness of the VAR estimation results were confirmed. In the Bayesian estimation, the estimation first searches for 1,000 successful draws from at least 2,000 iterations with 1,000 burn-ins; the results reported here are based on the median of these 1,000 successful draws, along with 16-84 percent confidence intervals.

Domestic block

To compare the impact of global and domestic shocks, the model is, in a second step, expanded by a country-specific block. The country-specific block includes four domestic variables: inflation, output growth, nominal effective exchange rates, and nominal short-term interest rates (or policy rates). The model is estimated with two lags (identified as optimal lag length according to the SIC and AIC criteria) on a country-by-country basis, and median results and interquartile ranges are presented. The results are robust to using averages instead of medians.

Similar to Forbes, Hjortsoe, and Nenova (2018, 2017), the global block and the country-specific block are combined as follows:[3]

$$\begin{bmatrix} u_t^{Y,global} \\ u_t^{OilPrice} \\ u_t^{\pi,global} \\ u_t^{Y,domestic} \\ u_t^{\pi,domestic} \\ u_t^{InterestRate} \\ u_t^{ExchangeRate} \end{bmatrix} = \begin{bmatrix} + & - & + & 0 & 0 & 0 & 0 \\ + & + & + & 0 & 0 & 0 & 0 \\ + & + & - & 0 & 0 & 0 & 0 \\ * & * & * & + & + & - & * \\ * & * & * & + & - & - & * \\ * & * & * & * & * & + & * \\ * & * & * & * & * & + & + \end{bmatrix} \begin{bmatrix} \varepsilon_t^{GlobalDemand} \\ \varepsilon_t^{OilPrice} \\ \varepsilon_t^{GlobalSupply} \\ \varepsilon_t^{DomesticDemand} \\ \varepsilon_t^{DomesticSupply} \\ \varepsilon_t^{MonetaryPolicy} \\ \varepsilon_t^{ExchangeRate} \end{bmatrix}$$

where * stands for an unrestricted initial response. While country-specific shocks do not affect global variables contemporaneously, global shocks can affect country-specific variables (without any sign or zero restrictions).

A positive country-specific *supply* or a positive country-specific *demand* shock increases country-specific output growth. Country-specific inflation falls by a positive country-specific supply shock. A positive *interest rate* shock (corresponding to a contractionary monetary policy) initially increases both the domestic interest rate and the exchange rate, and decreases output growth and inflation. Finally, a positive *exchange rate* shock (corresponding to the appreciation of the domestic currency) is assumed to increase the exchange rate, but other effects on domestic variables are left unrestricted.

In the median country, a positive one-standard-deviation domestic demand shock increases domestic output growth by 1.6 percentage points. A one-standard-deviation positive supply shock decreases domestic inflation by 1.1 percentage points. A one-standard-deviation positive (contractionary) monetary

[3] Using a country-specific structural vector autoregression (SVAR) framework with sign restrictions into global and domestic variables in 26 advanced economies for the period of 1992-2015, Forbes, Hjortsoe, and Nenova (2018) identify domestic demand, supply, and monetary policy, and exchange rate shocks along with global permanent and temporary shocks as drivers of domestic inflation and exchange rates. Conti, Neri, and Nobili. (2015) similarly identify global and domestic structural shocks using cross-country data in the Euro Area between 1995 and 2005. In line with those studies, this chapter identifies global and domestic macroeconomic shocks as drivers of inflation. However, this chapter differs from these earlier studies in estimating latent global factors and augmenting country-specific VAR models with these global factors. Instead of estimating the standard single-equation, country-specific Phillips curve, which includes unemployment or output gap as core explanatory variables for inflation, the FAVAR model in this chapter includes domestic and foreign drivers of inflation and allows feedback loops over time among variables. The model is thus expected to enhance the explanatory power for domestic inflation and reduce concerns about omitted variables in single-equation, country-specific Phillips curves.

policy shock increases short-term interest rates (or policy rates) by 0.27 percentage point. A positive one-standard-deviation exchange rate shock represents a 15 percentage point increase (appreciation) in nominal effective exchange rate appreciation.

The results for the roles of global and domestic shocks in explaining the variation in domestic inflation are presented as median point estimates across countries.[4] Interquartile ranges indicate the range from the 25th to the 75th quartile of country-specific estimates (for example, Forbes, Hjortsoe, and Nenova 2017).

Bayesian estimation

The system is estimated on a country-by-country basis. The Bayesian estimation searches for 1,000 successful draws of at least 2,000 iterations with 1,000 burn-ins. The results shown in the chapter are based on the median of these 1,000 successful draws and 68 percent confidence intervals at the country level, although alternative presentation methodologies (for example, the median target, as in Fry and Pagan [2011]) are considered as a robustness check. In the Bayesian estimation, the Minnesota priors proposed by Litterman (1986) are used; since the Minnesota prior assumes that the variance-covariance matrix of residuals is known, the entire variance-covariance matrix of the variance autoregression is estimated by ordinary least squares. For the estimation, the identification strategy through the algorithm introduced by Arias, Rubio-Ramirez, and Waggoner (2014) is used, where the standard Cholesky decomposition is employed with an additional orthogonalization step that is necessary to produce a posterior draw from the correct distribution for structural vector autoregression coefficients.

Database

The sample includes 29 advanced economies and 26 emerging market and developing economies (EMDEs) with at least 10 years (40 quarters) of continuous data for the variables in the domestic block, but the sample period differs across countries (Table A.3.3.1). Long-term components of quarterly growth rates are proxied by 15-year moving averages, benchmarking Stock and Watson (2012).[5] The following variables are used as inputs in the FAVAR estimation:

[4] Focusing on cross-country medians mitigates concerns that, for the United States and China, the domestic block might affect the global block contemporaneously.

[5] Unit-root tests of 55 quarterly inflation rates indicate that most of the country-specific inflation rates are stationary or trend-stationary at the 5 percent significance level. Based on these results, long-term trends in inflation rates are eliminated. As in Chapter 2, the results are qualitatively robust to different detrending methods (for example, the Hodrick-Prescott or Butterworth filters).

- Global output growth is the global common factor of quarter-on-quarter, seasonally adjusted real gross domestic product (GDP) growth in a sample of 29 advanced economies and EMDEs for 1970:1-2017:4.
- Global inflation is defined as the global common factor of quarter-on-quarter headline consumer price index (CPI) inflation (seasonally adjusted) in a sample of 47 advanced economies and EMDEs. For robustness, the estimation is repeated using core inflation and producer price index inflation, similarly defined.
- Oil price growth is the quarter-on-quarter growth rate of nominal oil prices (average of Dubai, West Texas Intermediate, and Brent).
- Domestic inflation is quarter-on-quarter, seasonally adjusted headline CPI inflation.
- Domestic output growth is quarter-on-quarter, seasonally adjusted real GDP growth.
- Domestic interest rates are quarter-on-quarter differences in three-month Treasury bill rates or monetary policy rates.
- Nominal effective appreciation is quarter-on-quarter appreciation in trade-weighted nominal exchange rates against 52 currencies, as provided by the Bank for International Settlements.

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 results presented in this chapter are robust to the following changes:

- Alternative measures of global inflation and global output in the estimation of the global block: (i) global inflation and output factors estimated with an identical group of 25 countries and (ii) median GDP growth and inflation rates among countries.
- Alternative measures of oil prices in the global block: real oil prices and nominal energy prices.
- Use of averages, instead of medians, in reporting all country-specific results on the contribution of global and domestic shocks to domestic inflation (Table A.3.3.2).
- An alternative number of periods (that is, two-quarters periods) in imposing sign restrictions in identifying country-specific structural shocks.

- Alternative sign restrictions: positive domestic demand shocks lead to contemporaneous increases in country-specific, short-term interest rates (or policy rates).
- Alternative presentations of 1,000 successful draws following Fry and Pagan (2011): instead of presenting the median across 1,000 successful draws, use of the draw that is closest to the median across 1,000 successful draws (that is, the median target). The same strategy has been applied to calculate the corresponding 68 percent confidence sets, again by following Fry and Pagan (2011).
- Country-specific FAVAR estimation results for 2001-17 instead of full-sample results.

TABLE A.3.3.1 List of countries and sample periods

Country sample periods			
Country	Sample period	Country	Sample period
Australia	1970:2 - 2017:4	India	1993:3 - 2017:4
Austria	1990:1 - 2017:4	Israel	1985:3 - 2017:4
Azerbaijan	2005:3 - 2017:4	Italy	1979:2 - 2017:4
Belgium	1970:2 - 2017:4	Jordan	1999:3 - 2017:4
Bulgaria	1994:4 - 2017:4	Japan	1989:3 - 2017:4
Brazil	1998:3 - 2017:4	Korea, Rep.	1991:3 - 2017:4
Botswana	1994:4 - 2017:4	Luxembourg	1999:3 - 2017:4
Canada	1970:2 - 2017:4	Mexico	1989:1 - 2017:4
Switzerland	1970:3 - 2017:4	Macedonia, FYR	2008:1 - 2017:4
Chile	1986:3 - 2017:4	Malta	1999:3 - 2017:4
China	1984:4 - 2017:4	Malaysia	2004:4 - 2017:4
Colombia	1994:4 - 2017:4	Morocco	1995:4 - 2017:4
Costa Rica	1997:3 - 2017:4	Netherlands	1982:3 - 2017:4
Czech Republic	1992:4 - 2017:4	Norway	1979:2 - 2017:4
Germany	1970:2 - 2017:4	New Zealand	1974:3 - 2017:4
Denmark	1970:2 - 2017:4	Philippines	1987:3 - 2007:3
Dominican Republic	2004:3 - 2017:3	Poland	1992:1 - 2017:4
Egypt, Arab Rep.	2002:4 - 2017:2	Portugal	1986:2 - 2017:4
Spain	1977:3 - 2017:4	Russian Federation	2000:1 - 2017:4
Finland	1987:3 - 2017:4	Slovak Republic	1996:1 - 2017:4
France	1970:2 - 2017:4	Slovenia	2002:3 - 2017:4
United Kingdom	1970:2 - 2017:4	South Africa	1981:3 - 2017:4
Greece	1994:4 - 2017:4	Sweden	1983:3 - 2017:4
Honduras	2005:4 - 2017:4	Thailand	2000:4 - 2017:4
Hungary	1995:4 - 2017:4	Tunisia	2000:4 - 2017:4
Indonesia	1990:3 - 2017:4	Turkey	2007:1 - 2017:4
Ireland	1984:3 - 2017:4	United States	1970:2 - 2017:4
Iceland	1988:3 - 2017:4		

Note: Countries with at least 40 quarters of data have been included.

TABLE A.3.3.2 Contribution of domestic shocks to domestic inflation

Panel A. Income groups

	All countries		AEs		EMDEs	
	Median	Mean	Median	Mean	Median	Mean
Total global shocks	27.7	32.5	33.3	37.0	13.6	19.7
Total domestic shocks	72.3	67.5	66.7	63.0	86.4	80.3
Domestic demand shock	14.5	13.8	12.9	12.2	19.5	19.5
Domestic supply shock	26.0	24.4	25.2	23.8	29.7	25.3
Monetary policy shock	14.4	14.2	13.2	12.5	16.9	16.6
Exchange rate shock	17.3	15.1	15.4	14.5	20.3	18.8

Panel B. Subperiods

	1970-85		1986-2000		2001-17	
	Median	Mean	Median	Mean	Median	Mean
Total global shocks	23.2	30.3	20.6	26.1	43.2	44.3
Total domestic shocks	76.8	69.7	79.4	73.9	56.8	55.8
Domestic demand shock	15.5	13.5	13.9	13.7	11.3	12.0
Domestic supply shock	28.3	26.2	31.1	27.9	20.8	19.3
Monetary policy shock	14.4	14.0	14.4	14.3	10.6	11.8
Exchange rate shock	18.7	16.1	19.9	18.1	14.2	12.6

Note: The table shows median across countries' shares of country-specific inflation variance accounted for by domestic shocks (domestic demand, supply, exchange rates, and interest rates) and global shocks based on country-specific factor-augmented vector autoregression models estimated for 29 advanced economies and 26 EMDEs for 1970-2017 (panel A) and three subsamples (panel B). AEs = advanced economies; EMDEs = emerging market and developing economies.

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