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One-stop source: A global database of inflation

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ABSTRACT

This paper introduces a global database that contains inflation series: (i) for a wide range of inflation measures (headline, food, energy, and core consumer price inflation; producer price inflation; and gross domestic product deflator changes); (ii) at multiple frequencies (monthly, quarterly and annual) for an extended period (1970–2023); and (iii) for a large number (up to 209) of countries. As it doubles the number of observations over the next-largest publicly available sources, the database constitutes a comprehensive, single source for inflation series. It also illustrates the potential use of the database with three applications. First, it studies the evolution of inflation since 1970 and documents the broad-based disinflation around the world over the past half-century, with global consumer price inflation down from a peak of 16.9 percent in 1974 to 2.5 percent in 2020, before rising to 7.8 percent in 2022. Second, the paper analyzes the role of common factors in explaining movements in different measures of inflation. While, across all inflation measures, inflation synchronization has risen since the early 2000s, it has been much higher for inflation measures that involve a larger share of tradable goods. In addition, the paper examines the behavior of inflation during global recessions. Global inflation fell sharply (on average by 0.9 percentage points) in the year to the trough of global recessions and continued to decline even as recoveries got underway.

1. Introduction

Low and stable inflation has generally been associated with faster growth and more stable output and employment whereas both very low and very high inflation have been associated with macroeconomic challenges.[2] Economies with high inflation typically experienced significantly weaker growth and extended periods of high inflation frequently ended in financial crises. Conversely, persistently below-target inflation has accompanied weak growth in advanced economies since the 2007–09

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[2] For linkages between inflation and activity, see Kremer et al. (2013); Easterly (2019); and Ha et al. (2019).

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global financial crisis. The outbreak of the COVID-19 pandemic in 2020 forced many governments and central banks to employ accommodative policies to support demand. This, combined with a release of pent-up demand and persistent supply-side bottlenecks, triggered a resurgence of inflation in many countries over the past two years.

A thorough understanding of the long-term evolution of global inflation requires a comprehensive database that covers a truly global set of countries for an extended period. Several well-known databases with selected indicators of inflation are available; however, no database systematically brings together many inflation measures for a large number of countries over a long time span. This paper introduces a new database of inflation that fills this gap by compiling inflation data from multiple sources, including various international institutions as well as a large number of country-specific sources.

Our database has the following advantages over others in the literature. First, it is a *comprehensive* database for a virtually global sample of countries over half a century: up to 38 advanced economies and 171 emerging market and developing economies (EMDEs) for 1970–2023 (Table 1). The data coverage expands on other data sources in all inflation measures, especially for high-frequency (monthly and quarterly) inflation data. Although the country coverage of some other cross-country data sources is comparable to our database, those databases focus on only a few inflation measures, lower data frequencies, or shorter time periods. These cross-country sources are complemented by more than 100 country-specific sources to obtain headline consumer price index (CPI) inflation, its subcomponents, and producer price indices (PPI, Table A1). When we introduce our database, we document similarities and differences between the new database here and other data sources.[3]

Second, our database provides a *balanced* sample of a wide range of inflation measures (headline, core, energy and food CPI; PPI; and GDP deflator) for 25 countries from 1970 and 67 countries from 2000. To our knowledge, no other database provides such a large, balanced dataset for multiple measures of inflation over such a long sample period. This type of comprehensive and balanced sample is a prerequisite for any detailed cross-country analysis of inflation.

Third, the database improves the coverage (length) of time series compared with other sources. Other cross-country data sources differ in the length of available country-specific inflation data depending on inflation measures and data frequencies. In our database, we maximize the time coverage for each country and inflation measure by collecting directly data from cross-country and/or country-specific sources with the longest time series. For core inflation, where publicly available data is patchy, we estimate missing observations by deriving core inflation as the difference between headline inflation and the contributions of energy and food inflation. This expands the core inflation dataset by another 70 countries to 171 countries between 1970 and 2023.

As a result of our data compilation across many sources, our database constitutes a one-stop source for inflation data. It has a significantly larger coverage than other databases across the six inflation measures (headline, core, food, and energy CPI; PPI; and GDP deflator). Our monthly, quarterly, and annual databases approximately double the number of observations compared with the next-largest databases. The most extensive additions in our database are in the components of CPI inflation: for annual energy inflation, we double the number of observations over the next-largest database; for core inflation, we increase the number of observations by one-half. A further contribution of our database is the extension of the historical data. Our database offers the full time series of annual data from 1970 for 155 countries whereas other standard cross-country databases have such data for about 105 countries.

Fourth, beyond official price statistics available in cross-country and country-specific data sources, our database includes analytical measures of inflation that are important inputs into monetary policy decisions. For instance, we decompose individual headline CPI inflation rates for 82 countries into trend and cyclical inflation components.

We illustrate the use of our database in the context of three aspects of global inflation. First, we document the broad-based disinflation observed over the past five decades prior to the pandemic. Trend disinflation over that period manifested in all measures of inflation. Earlier studies have documented broad-based global disinflation, but with data sets that covered a narrower set of countries or a shorter period. These studies have been mostly restricted to advanced economies and have excluded the past decade of unusually low inflation, the drop in the price of oil in 2014–16, and recent developments associated with the pandemic and its aftermath.

Second, we use a dynamic factor model to analyze the extent of inflation synchronization across the largest number of inflation measures. This application expands on earlier studies that relied on fewer inflation measures for mostly advanced-economy data. Specifically, we consider multiple measures of inflation, including sectoral inflation series, for a large number of countries. We also analyze the global and group-specific drivers of inflation. We study potential structural breaks in inflation series by examining multiple sub-periods over the past half century. In addition, we employ a battery of sensitivity exercises to assess the robustness our findings.

In addition, we study the evolution of inflation around global recessions since 1970 and compare the evolution of inflation during the 2020 recession induced by the COVID-19 pandemic with inflation developments during the previous global recessions. We report our findings on the behavior of inflation during global recessions in the Online Appendix.

The rest of the paper is structured as follows. In Section 2, we briefly explain different measures of inflation and introduce our database.[4] In Section 3, as the first application of the database, we document the evolution of inflation over time. In Section 4, we systematically explore the extent of inflation synchronization among a wide range of inflation measures. Section 5 concludes.

[3] The database is available at: https://www.worldbank.org/inflation-data. It is updated twice a year.

[4] In Appendix 1, we present several basic conceptual issues, including the interpretation of different measures of inflation.

Table 1
Number of countries in different sources of inflation data.

	Since 1970				Since 2000				
	New Database	OECD	IFS	ILO	New Database	OECD	IFS	WEO	ILO
Headline inflation									
Annual	**155**	30	94	27	**188**	45	169	185	55
Quarterly	**92**	30	91	■	**163**	45	163	■	■
Monthly	**83**	28	81	25	**157**	43	156	■	51
Food inflation									
Annual	**130**	23	■	20	**157**	41	■	■	50
Quarterly	**24**	23	■	■	**78**	41	■	■	■
Monthly	**23**	21	■	18	**63**	39	■	■	45
Energy inflation							■	■	■
Annual	**83**	17	■	■	**126**	38	■	■	32
Quarterly	**19**	17	■	■	**60**	38	■	■	41
Monthly	**19**	16	■	■	**60**	36	■	■	37
PPI inflation									
Annual	**30**	8	25	■	**67**	38	66	■	■
Quarterly	**25**	8	22	■	**66**	33	63	■	■
Monthly	**24**	8	17	■	**63**	32	58	■	■
Core inflation									
Annual	**25**	18	■	■	**57**	38	■	■	■
Quarterly	**18**	18	■	■	**49**	38	■	■	■
Monthly	**17**	17	■	■	**47**	34	■	■	■
GDP deflator									
Annual	**130**	■	84	■	**183**	■	159	182	■
Quarterly	**13**	■	4	■	**67**	■	52	■	■

Notes: Coverage of inflation data of based on the observations in 2021. Balanced sample of annual headline CPI inflation from WEO starts from 1980. "■" indicates data are not available. OECD refers to the main macro database of the Organization for Economic Cooperation and Development (OECD.Stat). IFS is the International Monetary Fund's International Financial Statistics, and WEO is the International Monetary Fund's World Economic Outlook (WEO) database. ILO refers to the International Labor Organization's ILOSTAT database. See Section 2 for details on data sources.

2. Database: Measures and country coverage

Measures of inflation. The database includes six measures of inflation: headline, food, energy, and core CPI inflation; PPI inflation; and GDP deflator changes at monthly, quarterly and annual frequencies (Table 1 and Tables A1-A3). Data sources include ILO's *ILOSTAT*, IMF's *International Financial Statistics*, *Consumer Price Index*, and *World Economic Outlook* databases, World Bank's *World Development Indicators* (WDI), *OECD.Stat*, *Eurostat*, Federal Reserve Economic Data (*FRED*), *UNdata*, as well as a large number of country-specific sources, including central banks and statistical offices.[5] Especially for the components of the CPI, these country-specific sources are critical: they expand the number of observations by 48 countries for energy inflation, 32 countries for food inflation, and 16 countries for core inflation as well as 27 countries for headline CPI inflation.

As a result of our data compilation across many sources, our database has a significantly larger coverage than other cross-country sources across the six inflation measures for up to 209 countries for 1970–2023. Our monthly, quarterly, and annual databases approximately double the number of observations compared with the next-largest databases (IMF *IFS* or *WEO*, depending on the frequency). For example, our database has roughly 37,000 annual observations compared with the IMF's *IFS* and *WEO* of about 17,000 and 14,500 observations, respectively.[6] The most important additions are in the components of CPI inflation: for annual energy inflation, we double the number of observations (to 6,500) over the next-largest database (the IMF's *Consumer Price Index* database with 2,800 observations) and for core inflation, we increase the number of observations by one-half (to 2,700 observations, compared with 1,700 observations in the *OECD.Stat*). A further contribution of our database is its coverage of much longer inflation series. Our database offers annual data from 1970 for 155 countries, whereas other major cross-country databases (*OECD.Stat*, *WEO*, *IFS*, and *ILOSTAT*) offer such data only for 105 countries. We utilize differences across multiple data sources to assemble the new database.

The major data sources from international institutions—including *OECDstat*, *IFS*, and *ILOSTAT*—usually follow the reference classification by the United Nations and provide some cross-country comparable price indices, including energy price index and consumer price index excluding energy and food products (core CPI). That said, some data series collected from various

[5] The *WEO database* includes headline CPI inflation only for 191 countries at annual frequency for the period of 1980–2021. The *IFS database* includes headline CPI, GDP deflator, and producer price inflation at monthly, quarterly, and annual frequencies, but does not include other inflation measures. The *Consumer Price Index* database includes headline CPI and its subcomponents at monthly, quarterly, and annual frequencies. The *OECD.Stat* database provides headline, core, energy, and food consumer price inflation, and producer price inflation, but for at most 45 countries for 2000–22 (before 2000, for only 30 countries). The *ILOSTAT* database provides headline and food price inflation for 56 countries during 2001–2022 but does not include other inflation measures.

[6] Our database has roughly 91,000 quarterly observations (based on the sample period of 1970–2022) compared with the IMF's IFS of about 48,000 observations. Our monthly database has roughly 217,000 observations, compared with about 115,000 in the IMF's IFS.

sources, particularly country-specific sources, exhibit discrepancies in price indexes. These differences can be due to structural breaks in the compilation of price indices over time—due to different base years, changes in consumption baskets or due to methodological variations, such as different definitions and coverage of inflation measures, as well as differences in data quality and data revisions.[7]

We minimize these types of differences in the new database. For example, in the case of higher-frequency (monthly and quarterly) data, we construct a price index (instead of inflation rates) based on the data source that provides the longest time series and report the data based on a specific (fixed) reference year.[8] The (selected) data source, the reference (base) date, definitions of the inflation measures, and the information on the extrapolation, if applicable, are documented for each country in the database. In the case of annual inflation, we combine the price series from multiple sources to maximize the coverage in both cross-sectional and time-series dimensions only if there are no significant discrepancies among series from different sources. We test for structural breaks in the resulting data series.

Country coverage. Headline inflation data are available for 209 countries, including 38 advanced countries and 171 EMDEs, including 27 low income countries (LICs, based on the World Bank country classification 2022). A complete (balanced) dataset of annual data for all six inflation measures is available for 25 countries between 1970 and 2022, including 20 advanced economies and 5 EMDEs. Quarterly data for headline CPI inflation is available for up to 38 advanced economies and 157 EMDEs, for 1970:1 until 2023:1 or the latest. A balanced sample with quarterly data for CPI inflation available for the same period includes 28 advanced economies and 64 EMDEs.

Headline inflation. Data are drawn from multiple databases: *OECD.Stat*, the IMF *World Economic Outlook* database and *International Financial Statistics, ILOSTAT, UNdata and* country-specific sources including central banks and statistical offices. The IMF *Consumer Price Index* database is available for long time periods, but with gaps. Country-specific sources in 24 countries provide additional data for headline CPI inflation. The combination of data from multiple sources enables us to expand the total number of observations by more than 20 percent. While additional countries are included in the sample thanks to country-specific sources, this expansion also pertains to the historical data that is typically needed for time series analysis. For example, while the next-most comprehensive cross-country database for annual inflation (the *World Economic Outlook*) offers quite an extensive country coverage (187 countries), it does not offer inflation data before 1980. In contrast, our database offers such historical data since 1970 for 155 countries out of the 203 countries with recent inflation data.

Food inflation. As a measure of food inflation, our database mainly employs inflation in the food sector following the classification by the OECD and IMF. Data for food prices are drawn from four cross-country datasets as well as country-specific sources. The *ILOSTAT* database on CPI components has a comprehensive coverage of food prices. *OECD.Stat* covers food prices for OECD members and a few non-members starting in 1970. Data from the IMF *Consumer Price Index* database are used to fill data gaps, in particular from the 2010 s. In around one-half of the countries, the time series for food price inflation in the new database is longer than the data provided by other sources. Country-specific sources provide the data for at least 74 countries. When we employ such country-specific sources, we explain any differences in the definitions of food price inflation in footnotes to the corresponding country in our database. Our resulting database more than doubles the observations over the next-largest database (*ILOSTAT*) for annual data, and raises them by around 40 percent for quarterly data.

Energy inflation. We follow the OECD definition of energy CPI inflation that is a weighted average of prices of various energy sources. Energy inflation data are drawn from multiple sources—*OECD.Stat*, *UNdata*, *Consumer Price Index*, *Eurostat, and FRED*. Country-specific sources provide additional data for up to 52 countries. If country-specific sources define energy inflation differently, we document these differences in the database. When there is no separate energy price series in a country, we estimate the energy inflation using the inflation rates in the relevant sectors (such as energy and fuel) and their corresponding weights in the consumption baskets.[9]

Core inflation. Since headline price inflation can be highly volatile, alternative inflation measures are employed to better distinguish transitory from persistent movements, and ultimately, to better anticipate future developments in inflation (Luciani and Trezzi, 2019; Laflèche and Armour, 2006). The literature has used the generic term "core" inflation to refer to these alternative measures. Official core inflation data are available for up to 101 countries (50 countries since 2000) and drawn from *OECD.Stat*, *Eurostat, and FRED*. Country-specific sources provide additional data for up to 84 countries. The OECD and other multilateral data sources usually employ CPI inflation that excludes food and energy prices as a main

[7] For example, the reference years for the data vary across different sources, such as the IMF's IFS database (base year=2010), OECDstat (base year=2015), and national sources (which have various base years). However, some national sources offer vintage data based on additional base years, which enables the extrapolation of certain data series. In addition, the data sources often focus on somewhat different coverages for consumer price index (food, core, energy), and produce price index. These variations are further illustrated through country-specific examples, which are discussed in more detail below.

[8] In such exceptional cases where we extrapolate the price index using different data sources and/or reference years, we provide technical details on our treatment of the data series in the database. The list of inflation measures extrapolated using multiple sources are summarized in Table A4. In most of the cases, they are extrapolated using some vintage data based on national sources. That said, in the case of the energy price index, due to the different coverages (definitions) of the price index across data sources, the data are separately reported rather than being extrapolated.

[9] Examples of alternative coverage of energy prices include: electricity and fuel (Iran), electricity and gas (Puerto Rico, Singapore), and water, electricity, gas and other fuels (Lebanon). About 20 countries have several price series involving different sources of energy. In some other countries where the data for only one of the sectors are available or where only inflation rates based on a broader classification (e.g., housing, water, gas, electricity, and other fuels) are available, we proxy energy inflation with the inflation rates for the sector with the closest coverage to our basic definition of energy prices. We provide explanations about these types of differences in definitions in the database.

(and harmonized) measure of core price inflation. In addition, we employ other measures of core inflation wherever it is defined differently in country-specific contexts.[10]

We introduce two additional estimates of core inflation in our database: residual-based core inflation and trend inflation (Appendix 2). First, for a larger set of countries and for longer periods, core inflation series are estimated using CPI weights and inflation in CPI components obtained from multiple sources. The combination of data from multiple sources more than doubles the annual observations for energy CPI inflation and it increases the number of annual inflation series. For most EMDEs, and especially LICs, monthly energy inflation series are not available. These calculations expand the sample for core inflation by 70 countries to 171 countries for at least one year between 1970 and 2022.

Second, cyclical and trend inflation series are estimated using the univariate unobserved components-stochastic volatility model of trend inflation in Stock and Watson (2016). In their model, the rate of inflation is expressed as the sum of a permanent and a transitory (or cyclical) component. Trend inflation is defined as the part of inflation that follows a permanent stochastic trend which is used as a proxy for core inflation. These series are available on a quarterly basis for up to 82 countries from 1971.

Producer price (PPI) inflation. We use the producer price index that covers all industries (both domestic and imported products) following the IMF's IFS and draw PPI data from *OECD.Stat*, *IFS*, *Eurostat, FRED*. Country-specific sources provide additional data for up to 24 countries. Data from multiple sources are combined only if there are no large discrepancies between the databases. Since the coverage of PPI index varies across different data sources for some countries, we explain the relevant definitions in footnotes wherever necessary in the database.[11]

GDP deflator. For 1970–2022, data are drawn from the *WEO* and *IFS, WDI,* and *FRED*. This allows us to extend the dataset backwards to the 1970 s for 130 countries out of the 196 countries with recent data available in the *World Economic Outlook*. Quarterly data are available for up to 96 countries, mostly derived from the *IFS* and *FRED* databases. Overall, our database expands the observations of the other data sources by up to 46 percent.

Global inflation. Global inflation is the cross-country median inflation in a balanced set of 155 countries, of which 126 are EMDEs. The median is chosen to control for several episodes of hyperinflation, especially in the 1980 s and 1990 s. That said, trends in median inflation were broadly consistent with trends in unweighted or GDP-weighted average inflation (weighting by average real GDP for 2010–19). While global inflation is defined as the median for the purposes of this paper, the database also includes these unweighted and weighted average inflation rates for completeness.

Group-specific inflation. The database also includes inflation for several country groups, always based on group medians and spanning those countries with data available from 1970. The country groups include 37 advanced economies and 156 EMDEs—including 26 LICs as well as 97 EMDE commodity exporters and 59 EMDE commodity importers (as the World Bank country classification). Aggregates are also included for six regions (following the World Bank definition): 24 EMDEs in East Asia and the Pacific (EAP); 23 EMDEs in Europe and Central Asia (ECA); 36 EMDEs in Latin America and the Caribbean (LAC); 19 EMDEs in the Middle East and North Africa (MNA); 8 EMDEs in South Asia (SAR); and 47 EMDEs in Sub-Saharan Africa (SSA). While the remainder of this paper refers to medians for group inflation, for completeness, unweighted and GDP-weighted average inflation rates (using average real GDP for 2010–19 for weights) for all groups are also included in the database.

Global commodity price indexes. Global commodity prices and indexes are available from 1960 from the World Bank's *Pink Sheet* of commodity price data. The following global price indexes are available at monthly, quarterly, and annual frequencies: agricultural commodity index; energy commodity index; non-energy commodity index; and food commodity index. All indexes are in nominal U.S. dollars, scaled to 2010 = 100.

3. Evolution of global inflation

Global annual inflation fell sharply from its 1974 peak of nearly 17 percent, to 2.5 percent in 2020. This decline began in advanced economies in the mid-1980s and in EMDEs in the mid-1990s. By 2000, global inflation had stabilized at historically low levels. Lower inflation was accompanied by lower inflation volatility, especially among advanced economies. In 2021–22, however, global inflation rose sharply due to accommodative policies, supply disruptions, pent-up demand, and soaring commodity prices, especially after Russia's invasion of Ukraine. This section discusses the evolution of inflation and the roles played by these developments.[12]

From the mid-1970s to 2020, global inflation declined sharply. It fell from a peak of 16.9 percent in 1974 to a trough of 1.9 percent in 2015 before returning to 2.5 percent in 2020 (Fig. 1). In EMDEs, inflation declined from a peak of 17.5 percent in 1974 to 3.0 percent in 2020; in LICs, it fell from a peak of 24.4 percent in 1994 to 5.9 percent in 2020. The trend decline

[10] These core inflation measures include: CPI inflation excluding regulated items and fuel for vehicles and home (Brazil), CPI inflation excluding fruits, vegetables, and regulated items (Egypt), and CPI inflation excluding food, beverage, tobacco, energy, and administrative products (Mauritius). We explain these differences in the database.

[11] For instance, while the *IFS* reports the PPI that is aggregated for all commodities—along with disaggregated index for consumer finished goods, imported raw materials, and industrial commodities—*OECD.STAT* compiles the producer price index for the manufacturing sector for either the total or domestic market. In addition, other country-specific sources often report the wholesale price index instead of the producer price index.

[12] In Appendix 3, the evolution of global inflation and its drivers around the past global recessions—including the recent pandemic-induced recession of 2020—are explored in more detail. In addition, in Appendix 4, long-term structural factors driving global inflation are discussed.

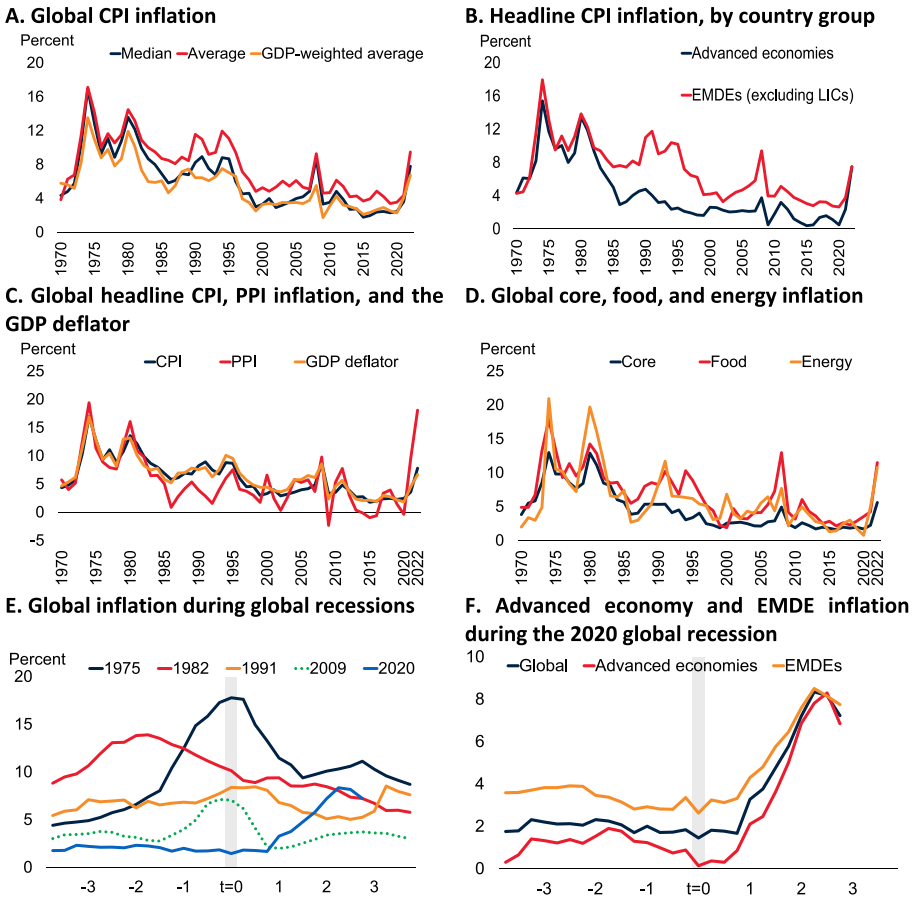


Fig. 1. Inflation trends Sources: Haver Analytics; Kose et al. (2019); World Bank. Notes: CPI = consumer price index; EMDEs = emerging market and developing economies; LICs = low income countries; PPI = producer price index. A.-D. Inflation rates refer to annual average inflation. A.B. Median headline CPI inflation across country groups based on a balanced sample of 155 countries, including 29 advanced economies and 126 EMDEs. Average and GDP-weighted average global inflation rates are based on 193 countries. Annual inflation over 50 percent are excluded from the sample. C.D. Medians based on data for inflation in up to 196 countries. E.F. Horizontal axes indicate years before and after the troughs of global recessions (shaded area, t = 0). Global inflation is defined as median inflation (4-quarter rolling average of quarterly annualized inflation) across 76 countries, consisting of 25 advanced economies and 51 EMDEs. Troughs of global recessions are identified using global per capita GDP are consistent with the results in Kose et al. (2019). Trough of global recession in 2020 is assumed to be at the second quarter of 2020.

started earlier (in the mid-1980s) in advanced economies than in EMDEs and LICs (in the mid-1990s). The downward trend has manifested in all inflation measures, including headline CPI, core CPI, PPI, and GDP deflator inflation. By the early 2000s, the disinflation was largely completed, although it resumed after the global financial crisis at a milder pace.

The "near-universal" character of disinflation since the mid-1970s was already recognized by Rogoff (2003), but most other studies have focused on advanced economies. The widely shared disinflation in advanced economies has been attributed partly to common terms-of-trade shocks, such as oil price swings, a shift in monetary policy regimes towards price stability. Other factors may have included sounder fiscal policies, deregulation, globalization, and, in the 1990s, accelerating productivity growth in parts of the world.[13]

1970s. In the wake of two major oil crises—the quadrupling of oil prices in 1973 and the doubling of oil prices in 1979–80—global median inflation tripled from 4.4 percent in 1970 to 13.6 percent in 1980. Some advanced-economy central banks, freed in 1971 from the constraints of the Bretton Woods system of fixed exchange rates, aimed to support economic activity with monetary expansion. Against the backdrop of pent-up depreciation pressures, the elimination of the nominal anchor of fixed exchange rates set off an inflationary wage-price spiral with weak economic growth (often termed "stagflation").

[13] A comprehensive discussion of these factors is presented in Ha et al. (2019). Several recent studies focus on the growing role of global developments in driving inflation and in dampening the responsiveness of inflation to domestic developments (Forbes, 2019). Goodhart and Pradhan (2020) discuss in greater detail the role of demographics; and Gilchrist and Zakrajsek (2015) the role of access to finance. Studies of disinflation in EMDEs have focused on specific policy experiments in individual countries, such as the introduction of inflation targeting, greater exchange rate flexibility, or macroeconomic stabilization programs (see Cecchetti et al. 2007, Mishkin, 2000, Bernanke et al., 2001, and Aizenman et al., 2008).

1980s. In advanced economies, monetary policy tightening in the late 1970s and early 1980s helped rein in inflation, which declined to a median of 3 percent by 1986 from its peak of 15 percent in 1974, and helped establish central bank credibility, although often at the cost of deep recessions. In EMDEs, disinflation was delayed by persistent large fiscal and current account deficits, often exacerbated by fixed exchange rate regimes, deteriorating terms of trade for commodity exporters, and political disruptions (Dornbusch 1986; Edwards 1989). For example, for several decades, Argentina, Brazil, Chile, Israel, Mexico, Peru, and Uruguay had chronically high inflation of more than 20 percent for five or more consecutive years (Figure A1).

1990s. In the second half of the 1980s and during the 1990s, many EMDEs implemented macroeconomic stabilization programs and structural reforms to improve economic efficiency. These initiatives often included the removal or easing of foreign exchange market controls, trade liberalization, tighter fiscal policy, and stronger fiscal and monetary policy frameworks. In EMDEs across Europe, Central Asia, and South Asia, inflation soared, as previously centrally planned economies collapsed, and the accompanying price and exchange rate liberalization released pent-up demand pressures. Subsequent stabilization efforts were associated with deep output losses. As transition economies exited high inflation and even hyperinflation during 1989–94, output declined sharply often amid civil wars and trade embargoes (Fischer et al., 1996). Within two years, on average, these economies started growing again. In Latin America and the Caribbean, renewed stabilization programs that centered around sound fiscal discipline and greater central bank independence gained traction and inflation declined (Figure A2).

2000–2019. The disinflation of the 1980s and 1990s paused in the early 2000s in the run-up to the global financial crisis, partly as a result of rapidly rising energy and food prices. After the global financial crisis, deflation or low inflation became pervasive across advanced economies: in 2015, inflation was negative in more than half of the advanced economies and, in 2016, inflation was in the low single digits in three-quarters of advanced economies. This raised concerns about low inflation, or possibly even deflation, becoming entrenched in inflation expectations (Figure A3). To reduce the risk of falling into a deflationary environment, advanced economy central banks implemented exceptionally accommodative monetary policy after the global financial crisis, including through unconventional measures. In EMDEs, inflation fell within or below target ranges in 60 percent of inflation-targeting economies (from less than 50 percent in 2007), making room for monetary policy rate cuts to support economic activity (Figure A4).

2020s. Since the beginning of the COVID-19 pandemic, global inflation has been on a rollercoaster ride. In the early stages of the pandemic, during the first half of 2020, global inflation declined by around one percentage point amid widespread mobility restrictions and associated disruptions in economic activity. The rebound in global demand and activity since the second half of 2020, together with soaring food and energy prices and continued supply bottlenecks in some manufacturing sectors, pushed headline inflation to decade highs across many countries in 2021–22. Median global headline inflation exceeded 9 percent in the second half of 2022, its highest level since 1995 (Figure A5). Inflation reached almost 10 percent in EMDEs, its highest level since 2008, and in advanced economies just over 9 percent, the highest since 1982. From the second half of 2022, inflation appears to have started declining in both advanced economies and EMDEs, but to levels that are still well-above pre-pandemic levels.

Soaring inflation in 2021–22 reflected a combination of demand and supply factors that are elaborated in greater detail in Appendix 3 (Ha, Kose, and Ohnsorge, 2021, 2022; Shapiro, 2022). On the demand side, the acceleration of growth during the initial economic rebound from the 2020 global recession, as well as the lagged effects of earlier macroeconomic support, added to persistent price pressures. On the supply side, shortages of key commodities, exacerbated by Russia's invasion of Ukraine, contributed substantially to higher energy and food prices. In some countries, tight conditions and mismatches in labor markets raised wages. Finally, many countries experienced large currency depreciations that passed through into higher import, producer, and consumer prices. As a result of the increase in inflation, short-term (one-year-ahead) inflation expectations have risen in most economies. In contrast, long-term (five-year-ahead) inflation expectations have been broadly stable (Figure A3). This stability may reflect the perception of credible commitments of major central banks to meeting their inflation targets, reinforced by their recent policy tightening.

In Appendix 3, we document the evolution of inflation around global recessions. Our findings indicate that some of the sharpest inflation movements over the past half-century occurred around global recessions. Global inflation declined sharply during global recessions, and continued to decline even as recoveries took hold.

4. Explaining global inflation

The previous section established the broad-based disinflation until the early 2000s and subsequent low inflation before the pandemic as well as a broad-based rise in inflation over the past three years. The highly synchronized nature of these trends suggests that common global factors were at work. This section estimates the role of these common factors in explaining movements in different measures of inflation.

4.1. Methodology

In theory, a wide range of factors could be responsible for the global synchronization of inflation, such as common shocks, similar policy responses, and structural features of economies, including openness to international trade and

financial flows.[14] Partly reflecting these diverse sources of inflation synchronization, as documented in previous sections, while national inflation rates have exhibited some common trends, the inflation cycle has differed between advanced economies and EMDEs—in particular in the 1980s and 1990s.

A dynamic factor model is designed to decompose inflation in each country into (i) a global inflation factor that is shared across all countries, (ii) an advanced-economy or EMDE factor that is shared within the respective groups (that is, two group-specific inflation factors, one for advanced economies and one for EMDEs), and (iii) an idiosyncratic inflation factor that is unique to each individual country.[15] The degree of global inflation synchronization is measured by the share of the variance of national inflation attributable to the global factor. In a similar fashion, the extent of inflation synchronization within each country group is measured by the fraction of variance that is explained by the group-specific factor. Thus, the inflation equation for each country takes the following form:

$$\pi_{i,t} = \beta^{i}_{Global} f^{Global}_{t} + \beta^{i}_{Group} f^{Group}_{t} + \varepsilon_{i,t}$$

where π_i denotes inflation in country i; the global and country-group factors are represented by f^{Global}_{t} and f^{Group}_{t} respectively; and the coefficients before them (β), typically referred to as factor loadings, capture the sensitivity of inflation to these factors. In order to identify such factors, we follow Kose, Otrok, and Whiteman (2003) and impose zero restrictions on some of the βparameters.[16] The error terms ($\varepsilon_{i,t}$) are assumed to be uncorrelated across countries at all leads and lags. Following the earlier studies on the estimation of dynamic factor models the error terms and factors follow an independent AR(q) process. The importance of each factor in explaining inflation is measured by the fraction of total variance of inflation due to the respective factor. This is computed by applying the variance operator to each equation in the system. Specifically, for inflation in country i:

$$Var(\pi_i) = \left(\beta^{i}_{Global}\right)^2 Var\left(f^{Global}\right) + \left(\beta^{i}_{Group}\right)^2 Var\left(f^{Group}\right) + Var(\varepsilon^{\pi,i})$$

Since there are no cross-product terms between the factors, the variance of inflation attributable to the global factor is:

$$\frac{(\beta^{i}_{global})^2 Var(f^{Global})}{Var(\pi_i)}$$

The variance shares due to the group factors and idiosyncratic terms are calculated using a similar approach.

To document the differences across different inflation measures, a dynamic factor model is estimated using five aggregate measures of inflation with varying tradables content (headline CPI, core CPI, PPI, GDP deflator, and import prices).[17] We assume that the indices of headline CPI, PPI, and import prices have a larger tradables content than the GDP deflator and the core CPI include.[18] Global and group-specific factors for each inflation measure are estimated for a balanced set of annual data for the 38 countries (25 advanced economies and 13 EMDEs) with available data for all five measures over 1971–2022 for the full sample. We later estimate additional dynamic factor models to examine the drivers of global inflation using disaggregated inflation measures that capture movements in sectoral inflation.

There are two specific econometric issues we consider in our exercise. First, in many dynamic factor models, the estimated factors are assumed to be stationary (Jackson et al. 2016). Since there is mixed evidence on the stationarity of inflation in the literature, we conduct a set of country-specific and panel unit root tests (Culver and Papell 1997; Charemza, Hristova and Burridge 2005). Based on the panel unit root tests, the null hypothesis that a unit root is present in inflation series is rejected (Tables A5-A6). The tests with the country-specific inflation series lead to mixed results. In nearly two-thirds of countries, the presence of unit roots in headline CPI inflation is rejected at the 5 percent significance level.

[14] Early studies often highlighted the contributions of synchronized or coordinated monetary policies as a major source of inflation comovement, especially among advanced economies (Clarida et al., 2002; Rogoff, 2003). More recent work has emphasized the roles of international spillovers of technology and increased trade integration through global value chains (Henriksen et al., 2013; Auer et al., 2017; Andrews et al., 2018; Auer et al., 2019).

[15] The model is estimated using Bayesian techniques as described in Kose et al. (2003). The assumptions for global and group-specific inflation factors follow the previous studies. For instance, by estimating a dynamic factor model that decomposes macroeconomic fluctuations in output, consumption, and investment into a global, group, and country-specific factors, Kose et al. (2012) document some evidence of business cycle convergence within groups of countries but divergence (or decoupling) between them. On inflation cycles, some studies provide evidence on the role of regional, sectoral, or group-specific factors in driving national inflation (Parker, 2018; Neely and Rapach, 2011; Förster and Tillmann, 2014; and Karagedikli et al., 2010).

[16] The innovations to the factors, not the factors themselves, are orthogonal by construction. Of course, the factors could comove for brief periods but, with a sufficiently long sample, they will be orthogonal as implied by construction. In small samples, it is possible that the global and group-specific factors appear correlated due to a spurious correlation. That is, two independent but serially correlated processes often have a non-zero measured cross-correlation in small samples. In our estimates, the correlations between the global factor and group-specific factors are between 0 and 0.2 (at most).

[17] Although the definitions and coverage of tradable and nontradable goods and services differ across studies, the literature suggests that there are substantial differences between tradable and nontradable goods in inflation synchronization. Tradable goods, in contrast to non-tradable ones, sold in another country, should follow theoretically the law of one price (Johnson 2017). They are thus more likely to be subject to common shocks--e.g., international commodity prices, which lead to stronger inflation synchronization across countries (Parker 2018). That said, inflation synchronization also occurs among non-tradable goods--due to, for instance, sectoral inflation spillovers through input–output linkages (Auer, Levchenko, and Sauré 2019).

[18] In price indices for the United States, for example, the share of tradable goods and services is greatest for the PPI (54 percent), followed by the headline CPI (53 percent), GDP deflator (26 percent), and core CPI (15 percent) (U.S. Bureau of Labor Statistics). Our classification of sectors into tradables and non-tradables follows the earlier literature; agriculture, hunting, forestry and fishing, mining and quarrying and manufacturing are classified as tradable sectors and the rest as non-tradable (Knight and Johnson 1997).

Second, there might be structural breaks in inflation series. Structural break tests (following Bai and Perron 1998) in the mean of the country-specific inflation rates that are the input into the dynamic factor estimation suggest that country-specific inflation series have, on average, one structural break over 1970–2022 although the timing of the break differs across countries (Figure A6). The results of structural break tests are broadly consistent with the evolution of global inflation documented in Section 3. In advanced economies, estimated structural breaks in inflation tend to be clustered in the early- to mid-1980 s. In EMDEs, they are concentrated in the mid-1980 s and the late-1990 s. Hence, the structural breaks identified mainly reflected periods when inflation began to decline as the long-term disinflation process started.

In light of our findings for unit roots, we remove low-frequency movements from the inflation series. To capture the low-frequency trend components, we employ the Local Mean method as suggested by Stock and Watson (2012) who proxy trend components of macroeconomic data with 15-year moving averages. Our de-trended inflation series are stationary. We also consider alternative de-trending methods, such as the Hodrick-Prescott (HP) filter. Following Lopes and West (2004) and others, we employ different types of factor models—principal components analysis, Bayesian static factor models, and factor models using the maximum-likelihood algorithm—that do not require the global inflation factor and underlying series to be stationary.[19]

Instead of explicitly testing for structural breaks in the estimation of the factor model, we explore plausible structural breaks by implementing a variety of sub-samples analyses.[20] First, we start by estimating the model for three sub-periods with roughly equal length: 1971–1986, 1987–2002, and 2003–2022. These sub-periods coincide with the results of structural breaks in the country-specific inflation data described above. We then experiment with alternative sub-periods involving 10-year windows or a few sub-samples that exclude the structural breaks described above: 1986–2022 (excluding the pre-1985 period), 1971–1995 (excluding the post-1995 period), 1996–2022 (excluding the pre-1995 period), and 1971–2019 (excluding the post-pandemic period). We discuss the results of these exercises in Section 4.4. The results from these additional exercises are in line with those for the three sub-periods we estimated as our baseline.

4.2. Behavior of global inflation factors

Global factors were typically more volatile for inflation measures with greater tradables content. Global factors for *PPI* and for *import price* inflation tended to move together over the past five decades, but with considerably greater variability in the global factor for import price inflation—as may be expected for goods prices that are heavily exposed to, if not determined in, global markets (Fig. 2). During global recessions and episodes of large oil price swings, the global PPI and import price factors exhibited sharper movements than the global headline CPI factor. With a larger share of services and non-tradable goods in the *GDP deflator*, the global factor for the GDP deflator was considerably less volatile than those for headline CPI, PPI and import price inflation.

Since the mid-1980 s, the global factor for *core CPI* inflation—which includes the largest share of non-tradable goods and services among the inflation measures examined here—has been less volatile than those for the other inflation measures. This may reflect the exclusion of energy prices (which tend to comove globally) as well as strengthened monetary policy frameworks and better-anchored inflation expectations as a growing number of central banks succeeded in lowering inflation from high levels and began to employ inflation targeting frameworks. The de-coupling of core inflation from other inflation measures was also reflected in declining correlations between the global factors for core CPI and other measures of inflation. Since the beginning of the pandemic, reflecting a string of global shocks, however, the correlations among the inflation measures have significantly increased.

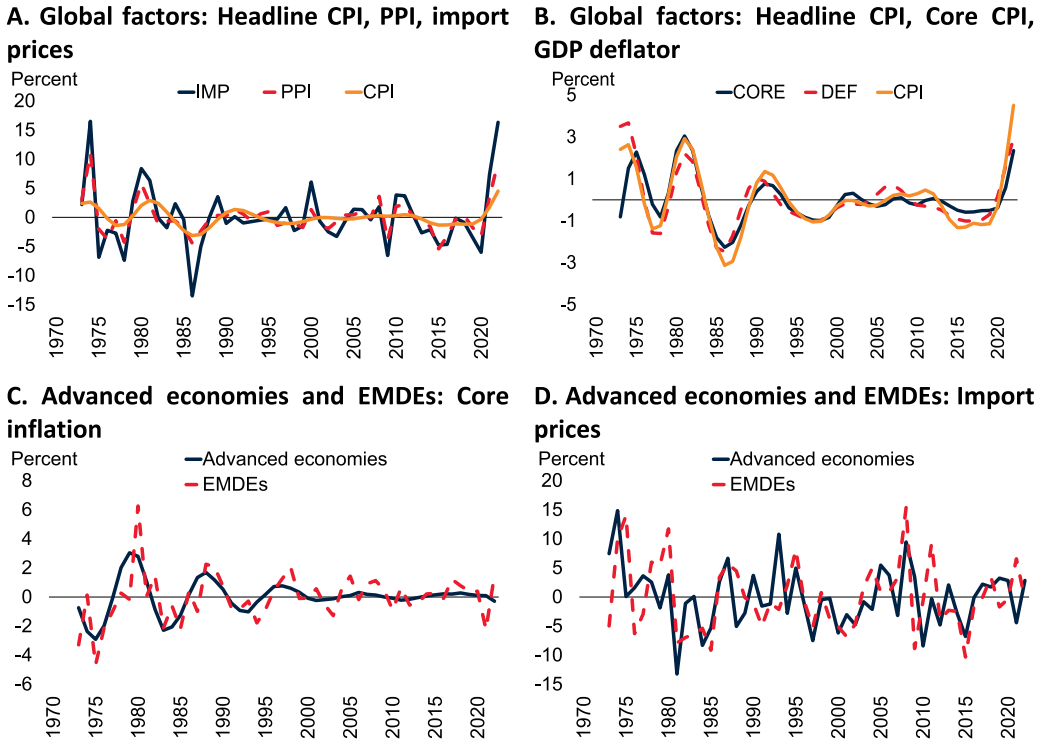
4.3. Inflation synchronization across inflation measures

We first examine the drivers of aggregate measures of global inflation in this section. We then consider the drivers of the sectoral measures of global inflation as summarized in Appendix 5, followed by a series of robustness checks in Appendix 6.

The estimated global factor's share in inflation variance was higher the greater the tradable goods and services content of the basket (Table 2; Fig. 3). For example, the global factor's largest share of inflation variation was found for import prices (57 percent in the median country) and its smallest share for core CPI inflation (11 percent). The variance share of the global factor for PPI inflation was 52 percent and that for consumer price inflation was 30 percent. The variance share for GDP deflator growth (20 percent) was between that for headline CPI inflation and core CPI inflation.

[19] Factor models with non-stationary data series are also employed by Bai (2004), Bai and Ng (2004), Pena and Poncela (2004), and Barigozzi et al. (2016a; 2016b).

[20] This dispersion of structural breaks in the country-specific inflation series of our highly heterogeneous sample of countries has implications for testing for structural breaks in the dynamic factor estimation itself. Previous studies have often identified structural breaks in factor models by imposing a single break point across multiple factors (Breitung and Eickmeier, 2011, Bates et al., 2013, Cheng et al., 2016, and Corradi and Swanson, 2014). Given the evidence of at least two clusters of structural breaks in our heterogeneous sample of advanced economies and EMDEs, this assumption would not be appropriate. For instance, Stock and Watson (2009) argue that mild factor loading instability, particularly if sufficiently independent across the different constituent variables, does not affect the estimation of the number of factors, nor subsequent estimation of the factors themselves. In addition, the relatively short time dimension of our annual sample (52 years) and the presumed position of structural breaks early in the sample would likely yield statistically insignificant test results. In fact, some studies argue that it can sometimes—in the case of small samples, for instance—be better to ignore parameter instability when estimating a factor model and use pre-break data for macroeconomic forecasting (Pesaran and Timmermann, 2005; 2007, Stock and Watson, 2009).



Sources: World Bank.

Notes: The global inflation factors are estimated with a baseline dynamic factor model (two-factor model) for annual inflation in 38 countries (25 advanced economies and 13 EMDEs) for the period of 1971-2020. "IMP", "PPI", "CPI", "CORE", and "DEF" indicate inflation in import prices, producer prices, headline CPI, core CPI, and GDP deflator, respectively. Long-term trends are eliminated using 15-year moving average. EMDEs: emerging market and developing economies.

Fig. 2. Global factors for different measures of inflation.

In contrast to the results for the global factor, the group-specific inflation factor accounted for a similar variance share (3–7 percent) across inflation measures. For core CPI, the median variance shares of group-specific factor (3 percent) were about a quarter of the share of the global factor. For import prices and PPIs, the variance shares of group-specific factors (3–6 percent) were minor compared to those of the global factor. Variance shares of the global and group-specific factors were larger for advanced economies than EMDEs, especially for PPI, headline CPI and GDP deflator inflation.

4.4. Inflation synchronization over time

Trends in inflation synchronization over time were broadly similar across the five aggregate inflation measures (Table 2; Fig. 3). This is based on the estimation of the model for three approximately equal sub-periods: 1971–86, 1987–2002, and 2003–22. The first sub-period, 1971–86, overlaps with the Great Inflation of 1965–84; the second, 1987–2002, was a period of widespread disinflation; and the third, 2003–22, was a period of low but typically stable inflation until the recent years after the pandemic (Bryan 2018). During 1971–86, the role of the global inflation factor was sizable for all five inflation measures except core CPI inflation; the median variance share of the global inflation factor was 65 percent for inflation in import prices, followed by PPIs (54 percent) and core CPIs (5 percent). Global inflation synchronization weakened during 1987–2002 as countries disinflated at different speeds but then, after 2003, synchronization strengthened again beyond the degree of synchronization in 1971–86 across all types of inflation measures. The degree of synchronization remained much greater for import prices, PPI, and headline CPI inflation than for the other inflation measures.

The generally lower variance share of global factors for core CPI inflation than for other inflation measures may reflect the smaller tradables content in consumption baskets than in other inflation aggregates. The median share of global factors in core inflation variation is much larger in advanced economies (28 percent) than in EMDEs (3 percent), possibly reflecting

Table 2
Variance decompositions of inflation A. Full sample B. Sub samples.

Factors	Import prices	PPI	Headline CPI	GDP deflator	Core CPI
Global	57.3 [55.2 59.2]	52.0 [46.1 56.9]	29.7 [25.9 33.0]	20.2 [15.8 24.2]	11.2 [8.6 16.0]
Group	3.3 [1.7 6.3]	5.5 [3.3 9.6]	6.9 [4.9 9.1]	3.3 [1.1 6.6]	2.8 [0.6 7.2]

Periods	Factors	Import prices	PPI	Headline CPI	GDP deflator	Core CPI
1971–1986	**Global**	65.4 [54.7 73.1]	54.2 [49.1 59.5]	14.8 [9.6 19.6]	14.5 [8.4 22.5]	4.8 [3.4 6.8]
	Group	9.0 [2.9 22.8]	6.6 [1.4 17.4]	15.2 [9.7 22.2]	17.4 [6.4 36.0]	23.8 [18.6 29.6]
1987–2002	**Global**	11.0 [2.7 29.0]	10.4 [3.4 18.1]	3.1 [0.9 8.2]	7.8 [3.9 13.8]	2.0 [0.3 5.0]
	Group	21.5 [3.6 41.2]	21.3 [12.3 32.0]	4.6 [0.7 11.2]	7.9 [3.2 14.0]	7.1 [1.9 16.5]
2003–2022	**Global**	67.2 [62.6 71.5]	63.2 [60.1 66.0]	55.4 [46.6 63.7]	39.4 [30.4 47.2]	32.1 [24.5 39.2]
	Group	6.1 [2.2 11.2]	6.7 [4.1 9.7]	4.2 [0.4 9.5]	2.9 [0.5 8.0]	5.4 [1.4 12.1]

Notes: The contributions of global and group-specific inflation factors to inflation variance (in percent) are estimated with a dynamic factor model for each of the five different inflation measures: Import prices, PPI, headline CPI, GDP deflator, and core CPI. The sample includes 38 countries (25 advanced economies and 13 EMDEs), except for import prices, which are only available for 21 countries (17 advanced economies and 4 EMDEs). The numbers in parentheses indicate the 16–84 percent confidence intervals. CPI: consumer price index; GDP: gross domestic product; PPI: producer price index; EMDEs: emerging market and developing economies.

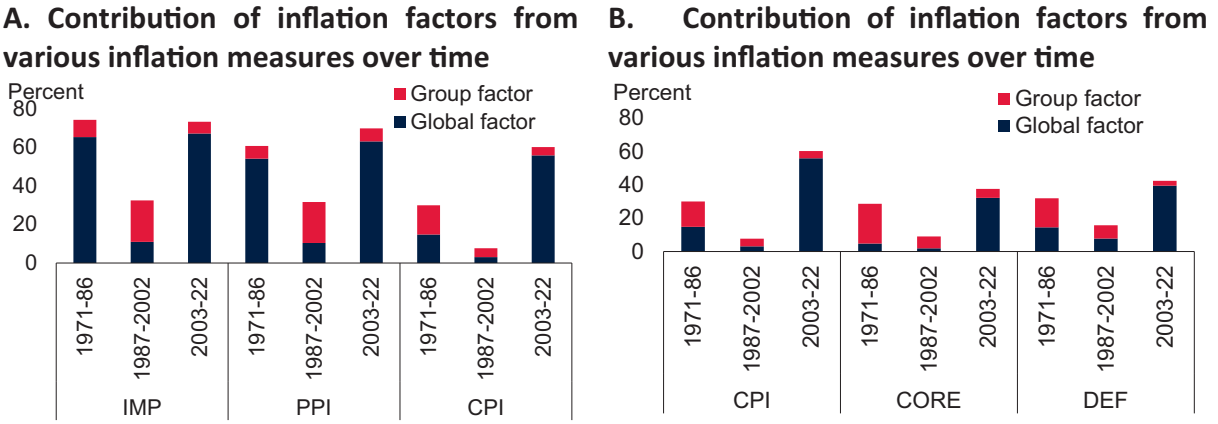


Fig. 3. Inflation synchronization: different measures of inflation Sources: World Bank. Notes: The global inflation factors are estimated with a baseline dynamic factor model (two-factor model) for annual inflation in 38 countries (25 advanced economies and 13 EMDEs) for the period of 1971–2022. "IMP", "PPI", "CPI", "CORE", "DEF" indicate inflation in import prices, producer price index, headline CPI, core CPI, and GDP deflator, respectively. Long-term trend is eliminated using 15-year moving average. All numbers refer to sample medians.

greater synchronization of business cycles and monetary policies in advanced economies. The share of global factors in import price inflation variation is sizable in both advanced economies (61 percent) and EMDEs (41 percent).

During 1971–86, the variance share of the global factor was greater than, or as sizable as, that of the group-specific factor for all inflation measures except core CPI inflation. During 1987–2002, however, the variance share of the global inflation factor fell to, or below, 10 percent for all five measures while the share of the group-specific factor rose to match or even exceed that of the global factor for all inflation measures. Again, this may capture the fact that disinflation in EMDEs lagged that in advanced economies by about a decade. Since 2003, the variance share of the global inflation factor has risen for all inflation measures, in particular in headline and core CPI inflation and GDP deflator. This may have reflected the inflation declines during the two global recessions (2009 and 2020) during this period as well as the large commodity price surges in the economic rebound from the pandemic and the wake of the war in Ukraine. It is consistent with the large role of commodity prices in global inflation factors that was also identified by Kamber and Wong (2020) and Parker (2018).

We also experiment with some alternative sub-periods to test the dynamic factor models, including shorter periods with 10-year rolling windows and longer sub-periods that exclude certain structural breaks in inflation: 1986–2022, 1970–1995, 1996–2022, and 1971–2019 (see Table A7). The results from these additional exercises are broadly consistent with those from the three sub-periods we studied above.

5. Conclusion

A thorough understanding of the long-term evolution of global inflation requires a comprehensive database that covers a truly worldwide sample of countries. We introduce a single, one-stop source for inflation data in this paper. Although several cross-country databases are available that include selected indicators of inflation, no database systematically brings together multiple measures (including headline, food, energy, and core consumer price inflation; producer price inflation; and GDP deflator changes) for such a large number of countries over such a long period.

As a result of our extensive data compilation effort across many sources, our database has twice the number of observations than the next largest inflation database for our six inflation measures (headline, core, energy, and food CPI, PPI, GDP deflator) for up to 209 countries for 1970–2023. Our addition of national sources expands, especially, the country coverage for energy, food price, and core inflation. Our database also extends the historical data that is typically needed for time series analysis.

We apply the inflation database to analyze three issues: the evolution of inflation over the past five decades, the synchronization of inflation over time and across country groups, and the behavior of inflation during global recessions. First, we document the broad-based disinflation over the past five decades. Second, we use a dynamic factor model, to show global inflation synchronization across a wide range of countries and inflation measures. Our results suggest that global inflation synchronization has broadened over the past half-century—across both types of goods and types of countries. In addition, we document that global inflation declined sharply during global recessions, and continued to decline even as recoveries took hold.

Our database can be used to analyze various additional questions. For example, it is possible to examine the contributions of long-term structural changes to global disinflation over recent decades by combining our comprehensive database of inflation with other economic variables that reflect country characteristics. Another avenue for future work could be to assess the degree of comovement in long-term inflation trends using a more refined measure of trend inflation, such as trends of different frequencies based on a frequency domain analysis. An empirical model could also be developed in future research to capture the structural breaks in inflation and their effects on inflation synchronization in a subset of countries with a long time series of monthly data.

Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jimonfin.2023.102896.

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