



The Great Tightening: Insights From the Recent Inflation Episode

CHAPTER 2, OCTOBER 2024 WORLD ECONOMIC OUTLOOK

OUTREACH PRESENTATION

JORGE ALVAREZ (CO-LEAD), EMINE BOZ (CO-LEAD), THOMAS KROEN, ALBERTO MUSSO, GALIP KEMAL OZHAN, NICHOLAS SANDER, SEBASTIAN WENDE, AND SIHWAN YANG, UNDER THE GUIDANCE OF JEAN-MARC NATAL.

RESEARCH ASSISTANCE PROVIDED BY CANRAN ZHENG AND WEILI LIN.

Key Questions

1. What happened?

- What explains the last four years' inflation dynamics in advanced and emerging market economies?
- What was the contribution of shocks and policy settings in accounting for inflationary trends?

2. What was the monetary policy reaction and transmission?

- Is there evidence that monetary policy response and transmission were significantly different this time around?

3. What lessons can we draw for monetary policy in a world with more frequent sectoral shocks?

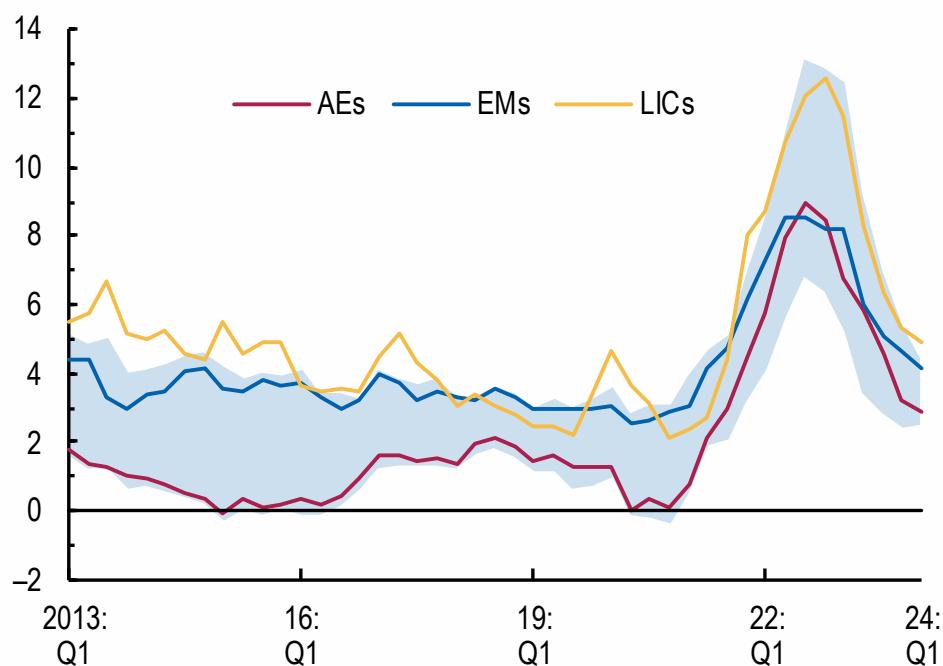
- Which structural characteristics of the impacted sectors matter for the policy response?
- Is there a case for modifying monetary policy frameworks?
 - ▶ Timely question as major central banks are about to review their monetary policy frameworks.

1. What happened?

The inflation surge was global and unexpected

Global Inflation

(Percent, year-over-year, SAAR)

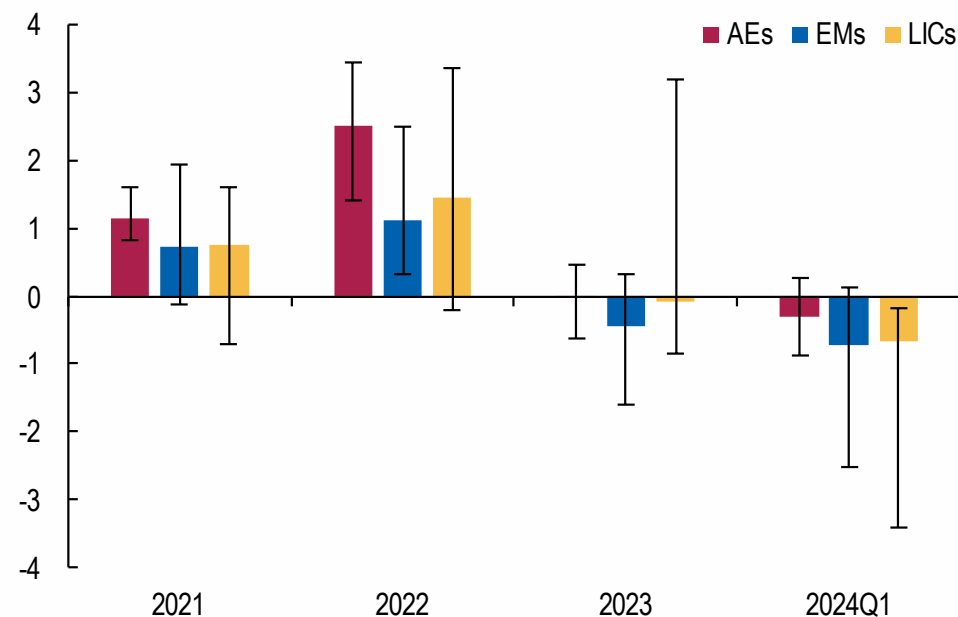


Sources: WEO; and IMF Staff calculations.

Note: Lines are the median of consumer price index (CPI) inflation within each analytical group. The band depicts the 25th to 75th percentiles of data across economies. AEs = advanced economies; EMs = emerging market economies; LICs = low-income countries; SAAR = seasonally adjusted annual rates.

Inflation Forecast Errors

(Median, year-over-year percent change)

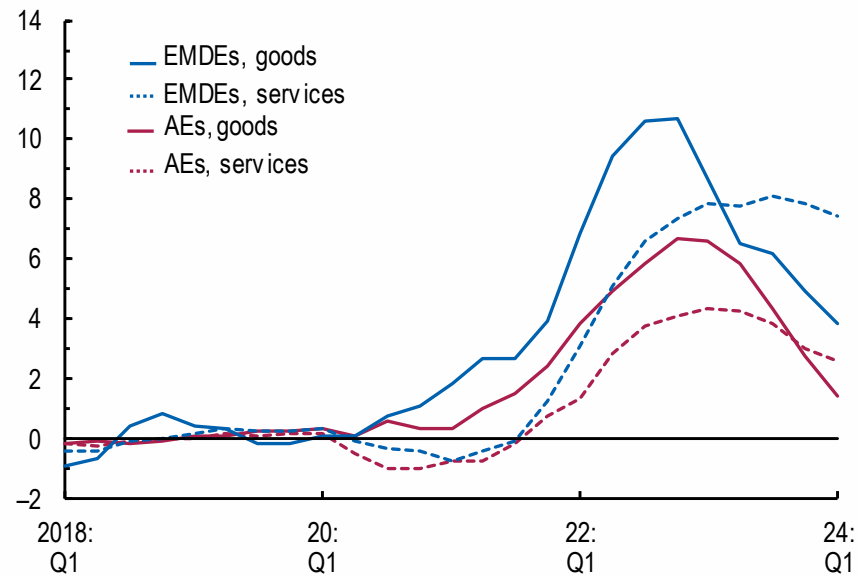


Sources: WEO; and IMF staff calculations.

Note: Forecast errors are derived by comparing one-year ahead CPI inflation forecasts to actual figures in each year's April WEO. The actual values for a given year t are taken from the April WEO in the following year ($t + 1$). The bars represent median inflation rates, and the whiskers extend from the 25th to the 75th percentiles of data across economies. The data for 2024:Q1 are annualized year-over-year percent changes, with a limited country sample due to quarterly data availability. AEs = advanced economies; EMs = emerging market economies; LICs = low-income countries..

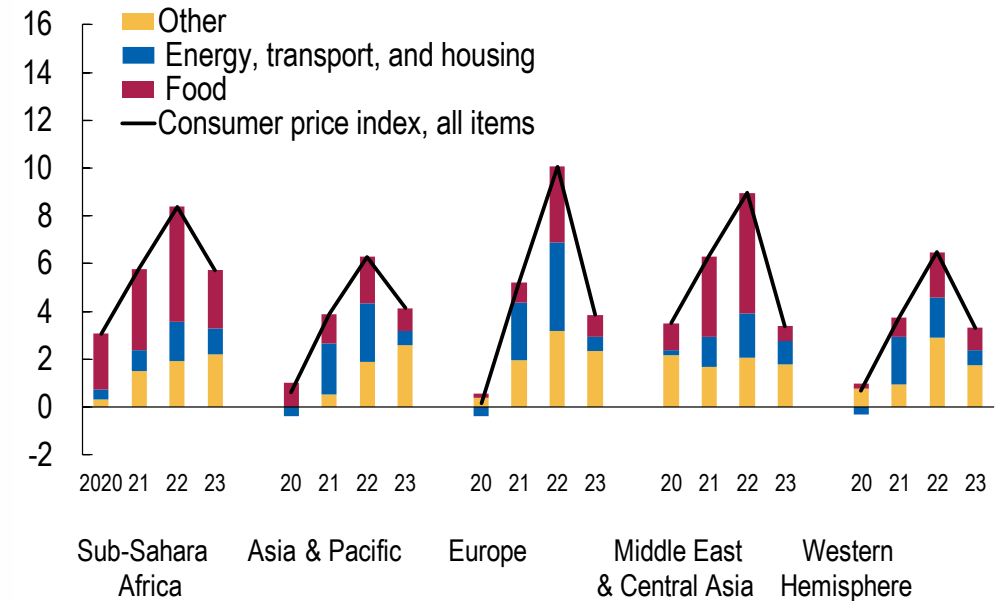
Inflation had a strong sectoral component due to sectoral shifts, energy and food price shocks

Movements in Sectoral Prices – Average Sectoral Inflation
(Percent; annualized)



Sources: OECD; Haver Analytics; and IMF staff calculations.
 Note: Figure displays the average inflation rates for goods (excluding food and energy) and services across a sample of 30 AEs and 13 EMs over time. Data are reported as deviations from 2018–19 average. AEs = advanced economies, EMs = emerging markets.

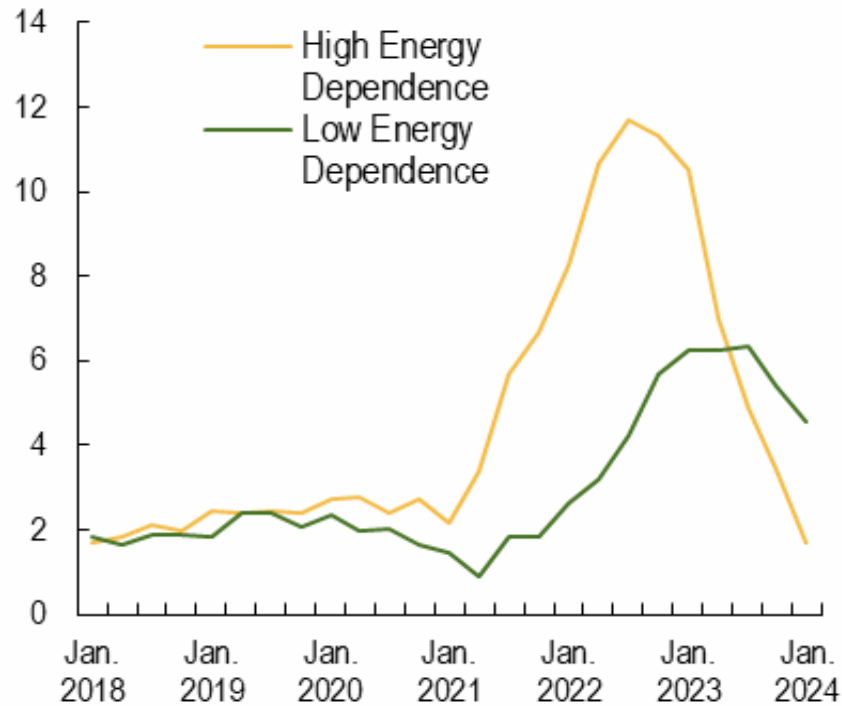
Inflation Driven by Energy and Food
(Percent; annualized)



Sources: IMF, CPI database; and IMF staff calculations.
 Note: Chart shows inflation contributions from broad categories. Contributions are computed first by country, annualized over available months where data are partial (e.g. for 2023). The chart shows the median contributions and aggregate inflation rate for each region.

Inflation surge driven by energy-dependent and flexible price sectors

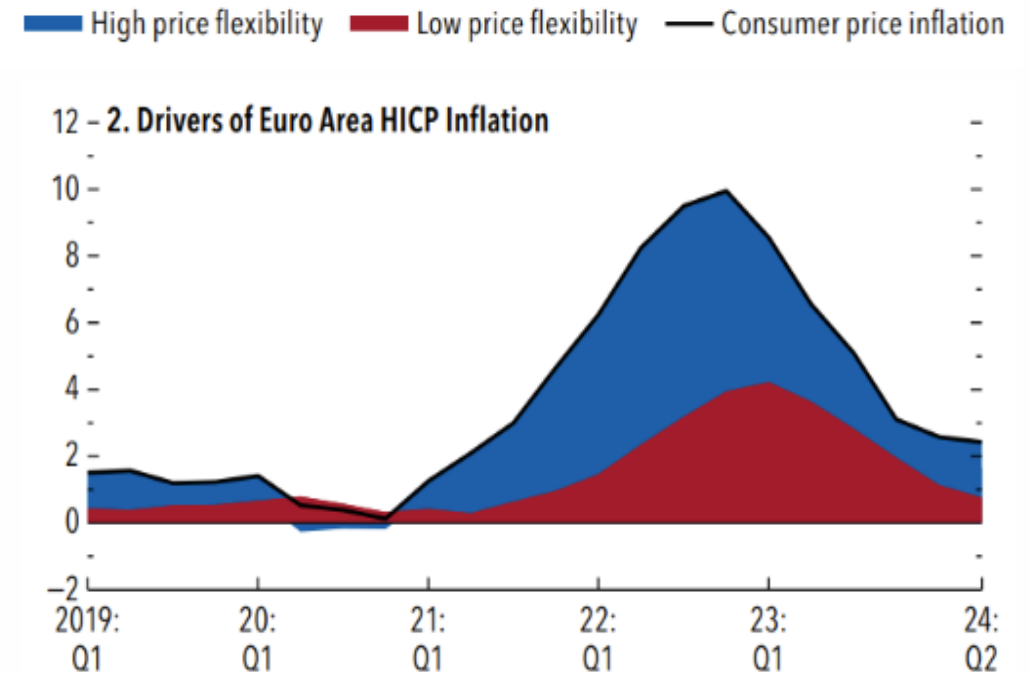
Sectoral Inflation and Energy Dependence
(Percent, annualized rate)



Sources: BEA; Haver Analytics; OECD; WEO; and IMF staff calculations

Note: Energy dependence is computed using sectoral input-output matrices and defined as direct and indirect share of oil, gas, and utilities in sectoral inputs. Sectors are defined as energy-dependent if their energy dependence is above the median. Remaining sectors have low energy dependence. Sectoral inflation rates are represented by their respective median across high and low energy dependent sectors.

Sectoral Inflation and Price Flexibility in Europe
(Percent, annualized rate)

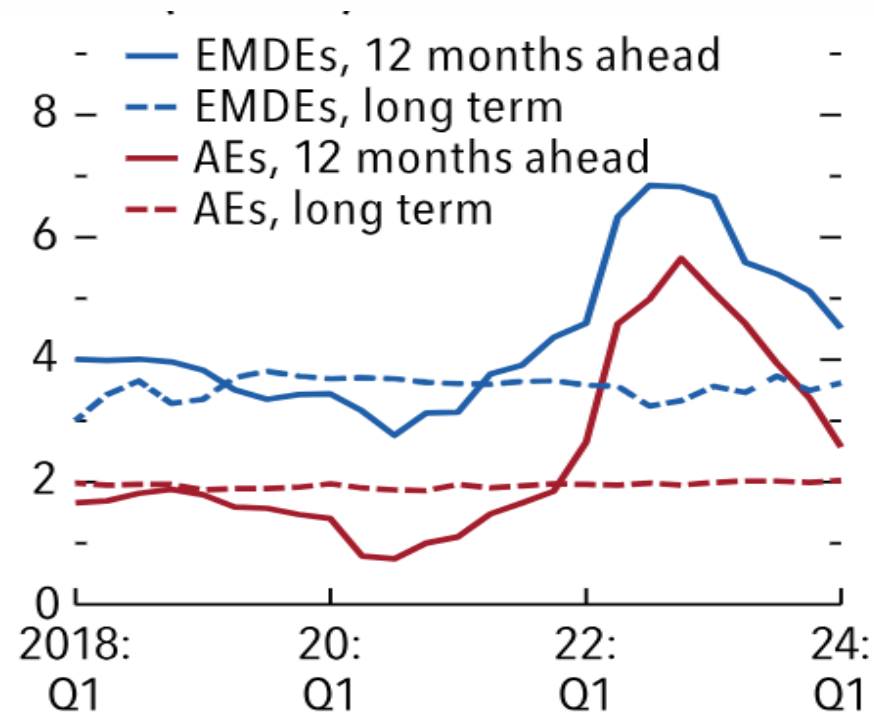


Sources: OECD; WEO; and IMF staff calculations.

Note: Inflation is measured as HICP inflation across Euro area sectors. Sectoral price flexibility is computed using data from Rubbo (2023). Sectoral data features 12 HICP sectors. Sectors are split along median of price flexibility and then inflation is aggregated across countries using PPP-country weights and within-country HICP weights.

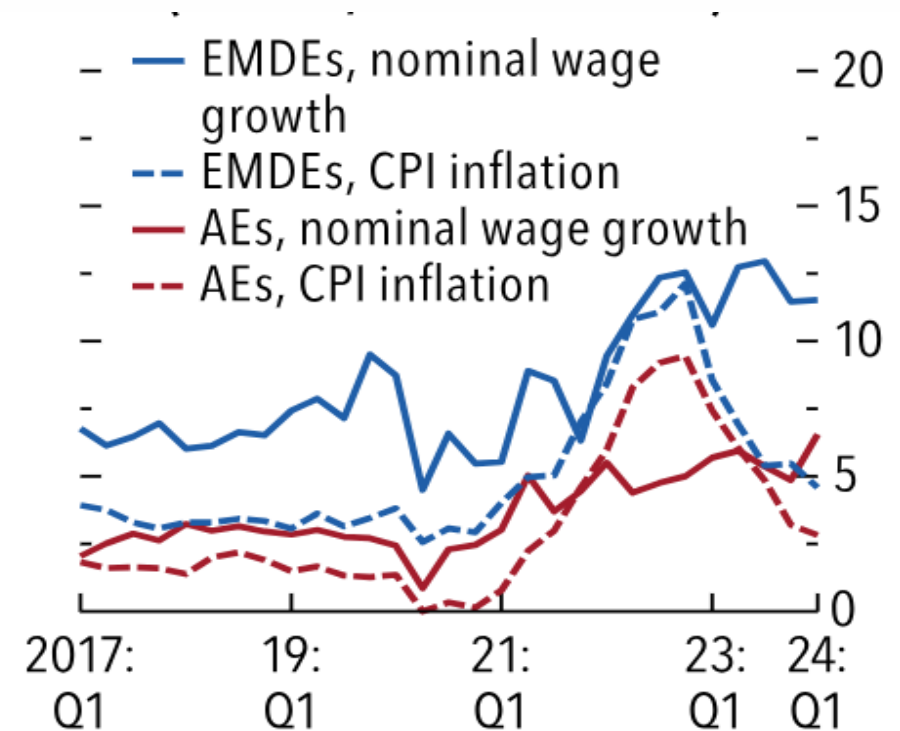
Muted long-term inflation expectations and real wage movements

Stable Long-Term Inflation Expectations (Percent)



Sources: Consensus Economics; and IMF staff calculations.
 Note: Figure reports 12-month ahead (solid lines) and long-term 10-year ahead (dashed lines) inflation expectations across advanced economies and emerging markets and developing economies. Each line represents in-group median. AE = advanced economies; EMDE = emerging market and developing economies.

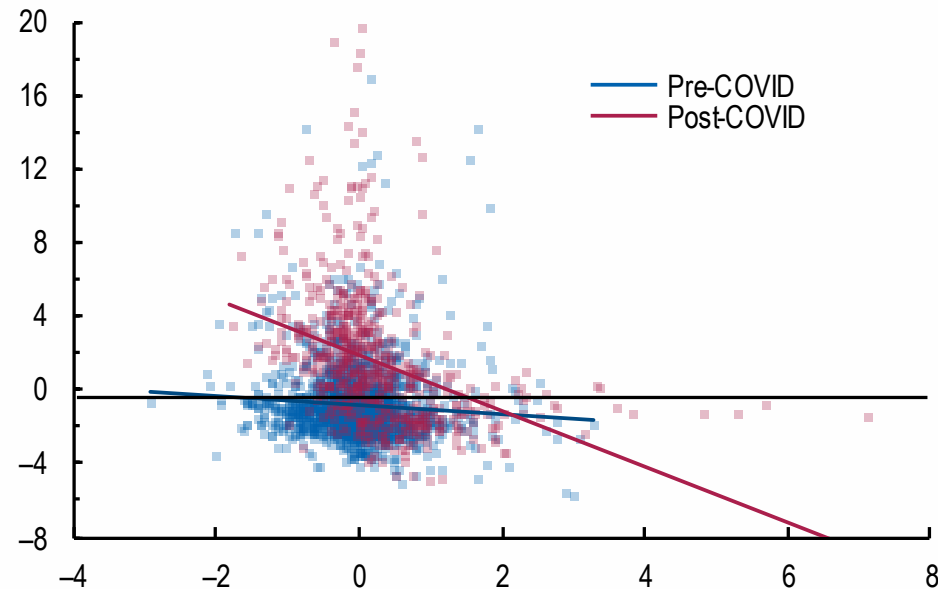
Moderate Real Wage Growth (Percent, annualized rate)



Sources: ILO; OECD; and IMF staff calculations.
 Note: Figure reports real wages computed as nominal wages (defined on a per-worker basis) divided by the CPI and then indexed to 100 in each country in 2017Q1. Each line reports group median. AE = advanced economies; EMDE = emerging market and developing economies.

Across the globe, the Phillips curve steepened and shifted up

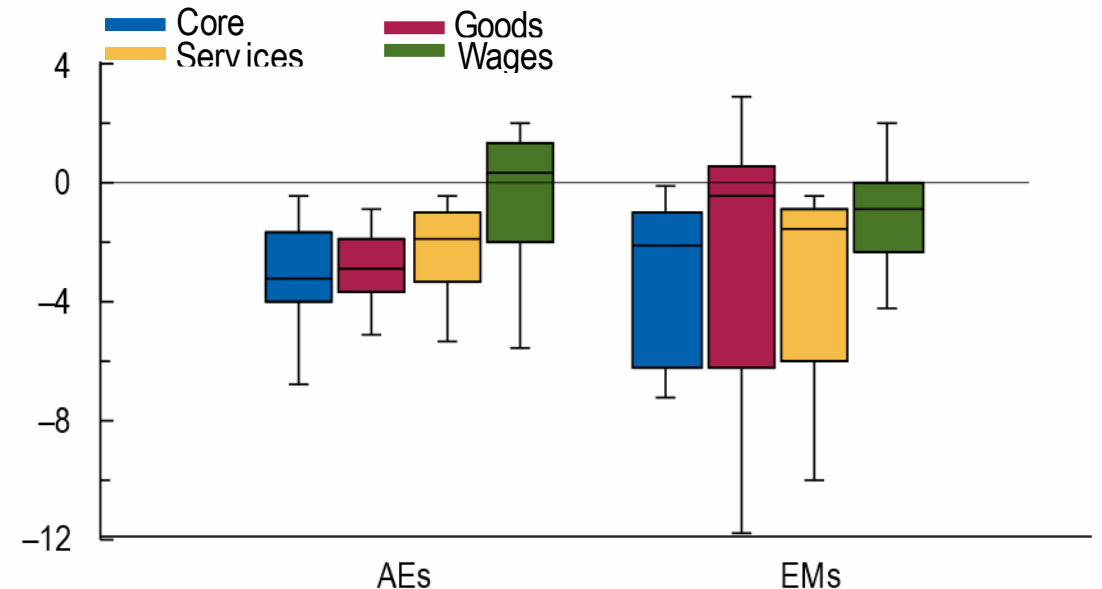
Core Inflation Deviations vs. Unemployment Gap (Percent)



Sources: Haver Analytics; and IMF staff calculations.

Note: The first two quarters of 2020 are excluded. X-axis shows unemployment gap and y-axis denotes core inflation deviation. Inflation measures are residualized on a country fixed effect within each country. Blue and red lines are linear fits with a sample of 29 advanced economies and 15 emerging markets during the period from the first quarter of 2010:Q1 to the first quarter of 2024. "Post-COVID" is defined as 2020:Q1 onward. The unemployment gap is estimated using a univariate Hodrick-Prescott filter. Outliers with deviations of inflation from country average by more than 20 percentage points are excluded.

Steepening of empirical Phillips Curves (Percent for 1ppt change in slack)

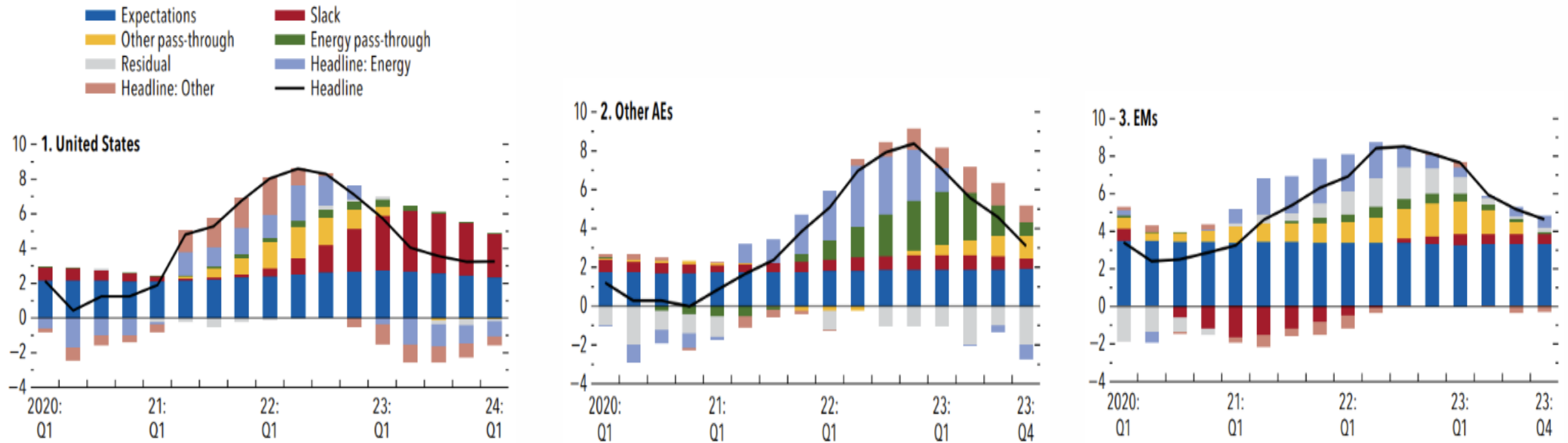


Sources: Haver Analytics; WEO; and IMF staff calculations.

Note: Figure reports distribution of Phillips curve slope changes across countries from country-level estimations of pre-2020 and post-2020 Phillips curves. The sample starts in 2010 and the first two quarters of 2020 are excluded. Outside values (more than 1.5 interquartile ranges below first quartile or above third quartile) are excluded from boxplots. AEs = advanced economies, EMs = emerging markets.

Headline shocks and subsequent passthrough were key. Labor markets less so.

Inflation Drivers in the US, other AEs, and EMs (Percent, annualized rate)



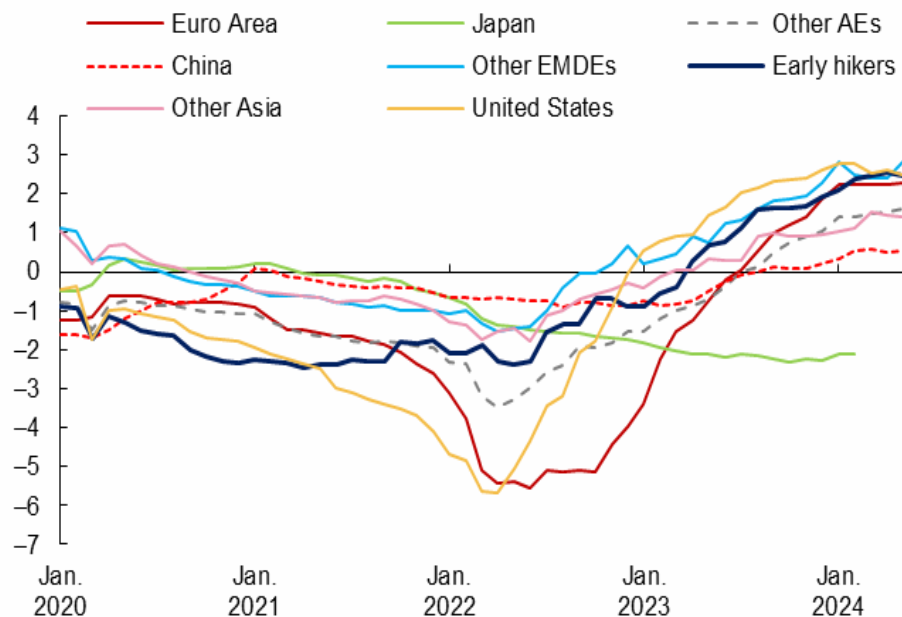
Sources: Consensus Economics; Haver Analytics; and IMF staff calculations.

Note: US inflation drivers are estimated on monthly data (following Dao and others 2024) and then converted to quarterly; for other countries, estimation is conducted on quarterly data. “Slack” is measured using the vacancy-to-unemployment ratio for AEs and using the unemployment gap (estimated using a univariate Hodrick-Prescott filter) for EMs. Country-level contributions for AEs and EMs are aggregated across country groups using purchasing-power-parity GDP weights. Fitted values for inflation gap are converted into 12-month rates. AEs = advanced economies; EMs = emerging markets.

2. Monetary policy reaction and transmission: a comparison with pre-2020 episodes

There was a synchronous monetary policy response, with some EMs hiking earlier

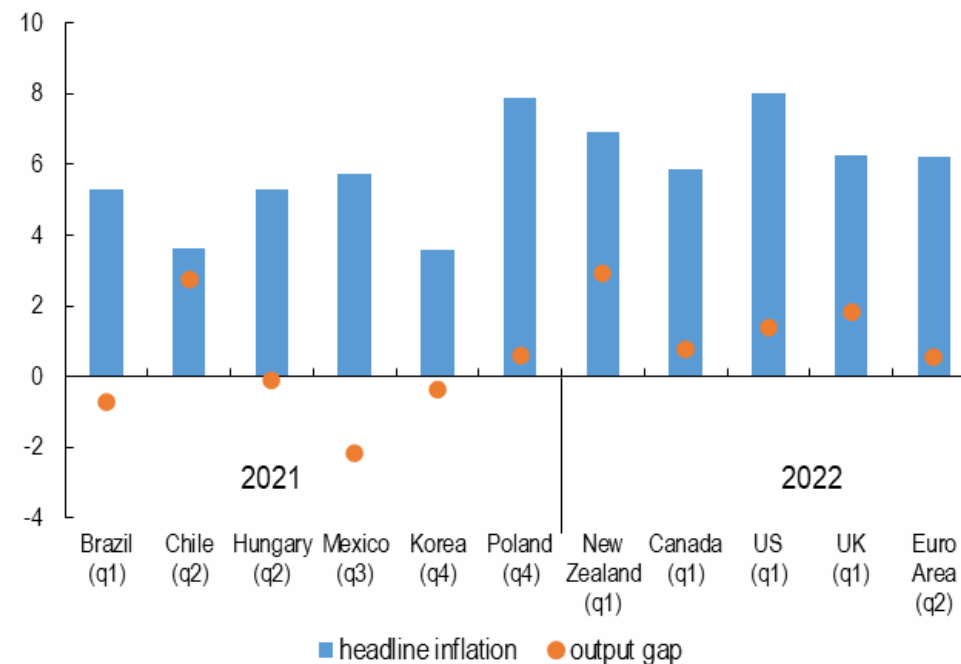
Monetary Tightening – Real Policy Rate
(Percent, annualized rate)



Sources: Bank for International Settlements; Consensus Economics; Haver Analytics; and IMF staff calculations.

Note: Real policy rates are computed as nominal policy rates minus 1-year ahead inflation expectations. Sample includes 16 AEs and 65 EMDEs. “Other” aggregates are medians. AEs = advanced economies; EMDEs = emerging market and developing economies. Early hikers=Brazil, Chile, Hungary, New Zealand, Norway, Peru, Poland and South Korea.

Economic Conditions at lift-off
(Percent)

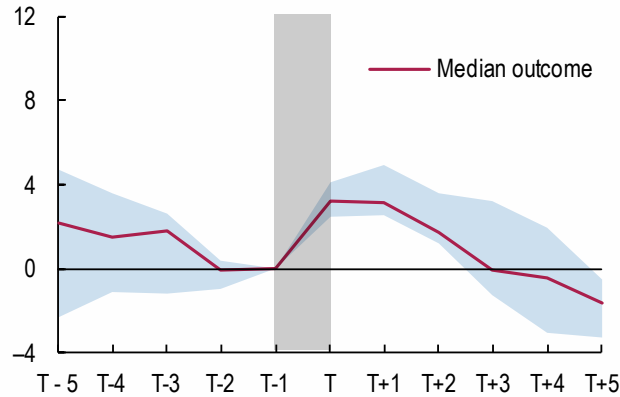


Sources: Bank for International Settlements; Haver Analytics; and IMF staff calculations.

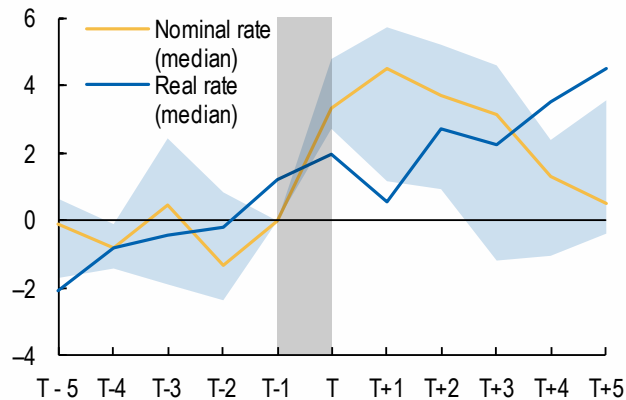
Note: Figure reports economic conditions at first interest rate hike during current tightening cycle for early hikers (Brazil, Chile, Hungary, New Zealand, Norway, Poland and South Korea), Canada, Euro Area, UK, and US. Countries are sorted by the timing of their first interest rate hike. Headline inflation, output gap, and change in nominal effective exchange rate are all reported in percent.

Post-2020 episodes were associated with looser policy stance than resolved episodes of 1970s

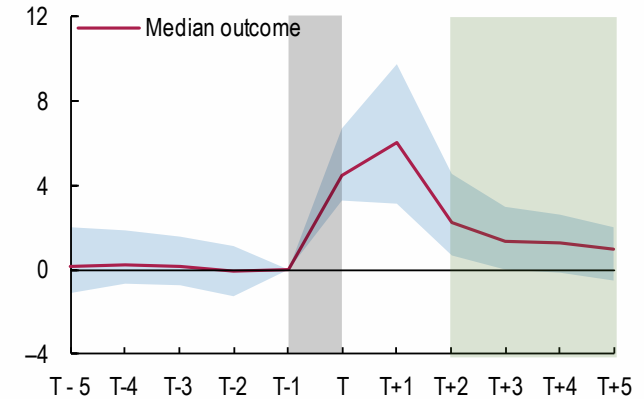
Resolved episodes in 1970s, inflation
(Percent)



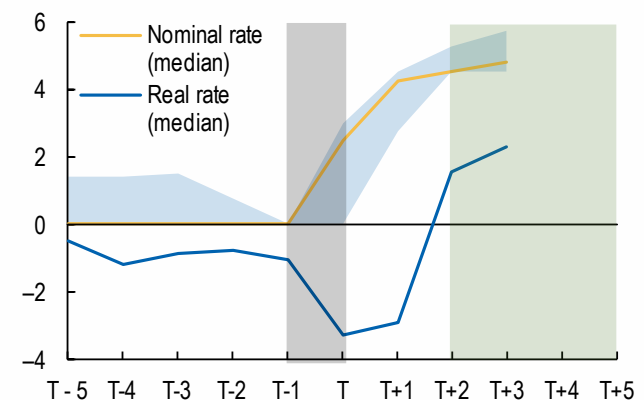
Resolved episodes in 1970s, interest rate
(Percent)



Post-2020 inflation
(Percent)



Post-2020 short-term interest rate
(Percent)

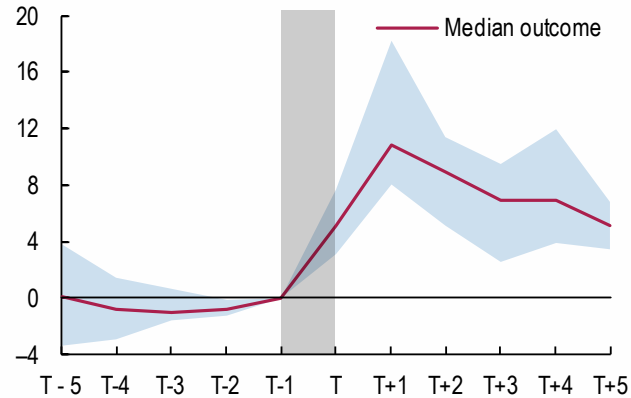


Sources: WEO; Haver Analytics; Ari et alii (2023); and IMF staff calculations.

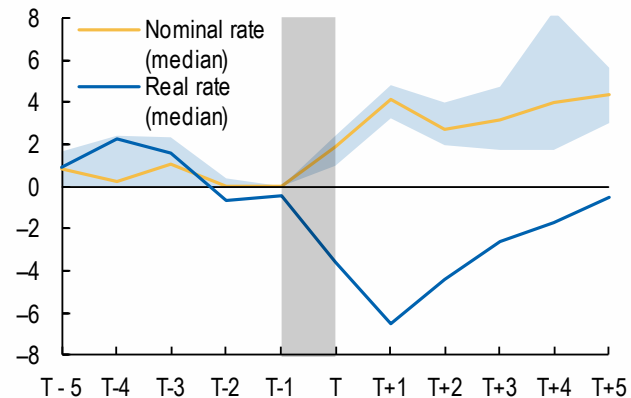
Note: An inflation episode is categorized as “resolved” if inflation falls to within 1 pp of its pre-shock rate by the end of 5-year window. 1970s resolved includes 13 inflation shock episodes (1973-1979). Post-2020 encompasses 125 inflation episodes centered around 2021 and 2022. Median refers to median outcome across inflation episodes. Dashed lines indicate the 25th and 75th percentiles of data across inflation episodes. Inflation and short-term nominal interest rate are normalized at T-1. Real rate is in levels. Gray shaded area indicates the inflation shock identified as in the appendix. Green shaded area indicates projections.

Post-2020 episodes were associated with tighter policy stance than unresolved episodes of 1970s

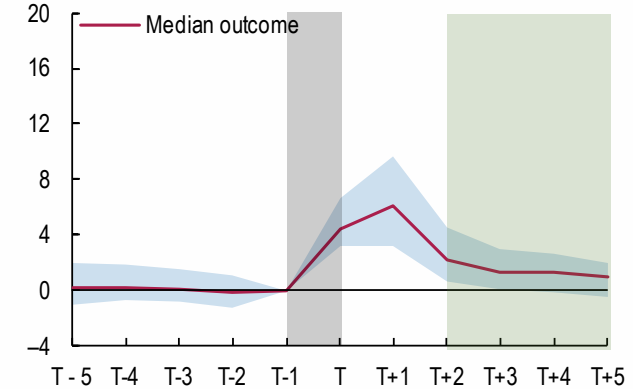
Unresolved episodes in 1970s, inflation
(Percent)



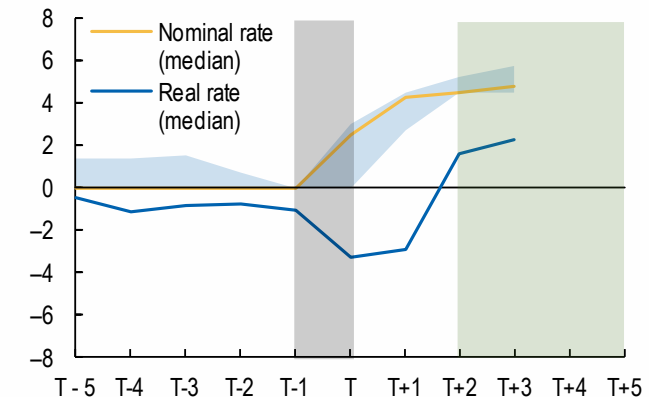
Unresolved episodes in 1970s, interest rate
(Percent)



Post-2020 inflation
(Percent)



Post-2020 short-term interest rate
(Percent)

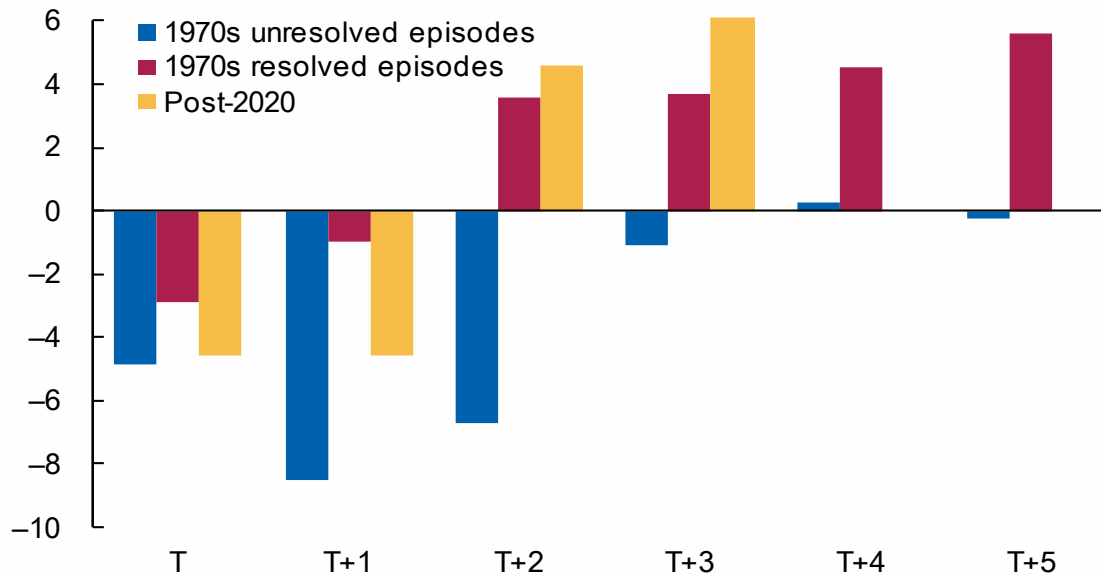


Sources: WEO; Haver Analytics; Ari et alii (2023); and IMF staff calculations.

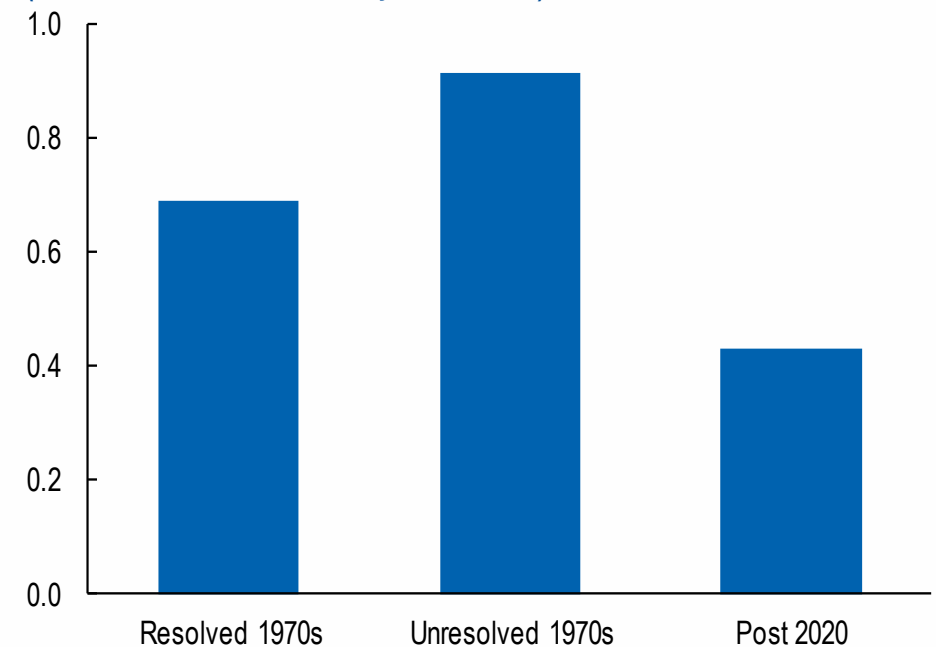
Note: An inflation episode is categorized as "resolved" if inflation falls to within 1 pp of its pre-shock rate by the end of 5-year window., otherwise "unresolved." 1970s unresolved includes 12 inflation shock episodes (1973-1979). Post-2020 encompasses 125 inflation episodes centered around 2021 and 2022.. Median refers to median outcome across inflation episodes. Dashed lines indicate the 25th and 75th percentiles of data across inflation episodes. Inflation and short-term nominal rate are normalized at T-1. Real rate is in levels.

Post-2020 tightening with respect to Taylor-rule-implied tightening is in between resolved and unresolved inflation episodes of 1970s

Deviation from Taylor-Rule-Implied Tightening
(Percent)



Pre-shock inflation volatility
(Variance normalized by its mean)

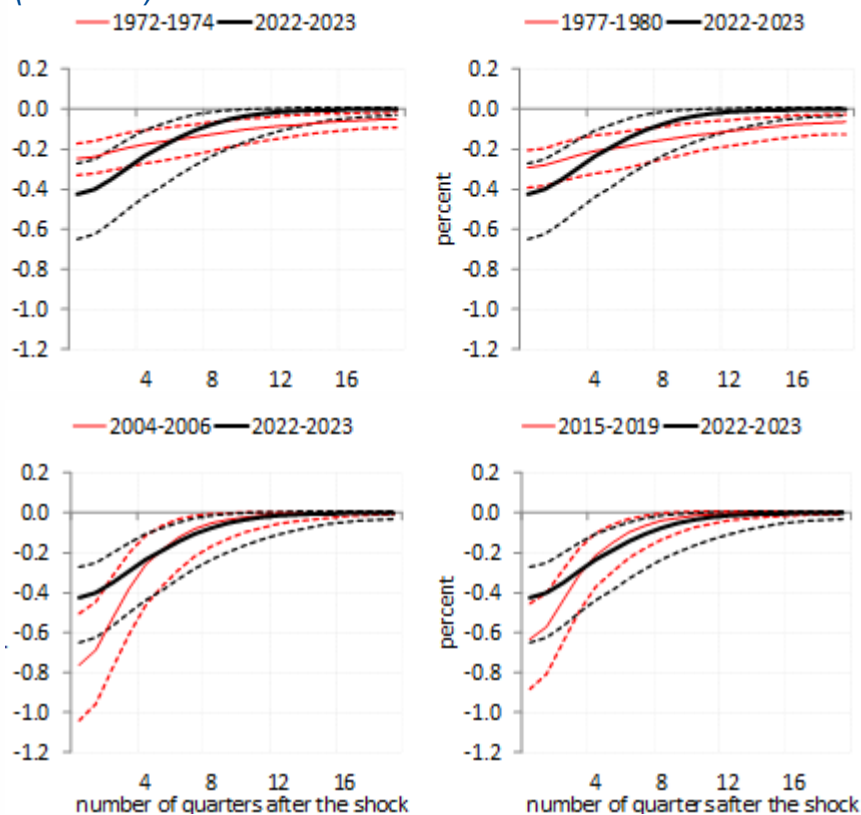


Sources: WEO; Haver Analytics; Ari et alii (2023); and IMF staff calculations.

Note: 1970s unresolved includes 12 inflation shock episodes and 1970s resolved episodes include 13 inflation shock episodes (1973-1979). Post-2020 encompasses 125 inflation episodes centered around 2021 and 2022. Bars refer to averaged pre-shock inflation volatility across inflation episodes, defined as the variance of inflation between $T - 5$ and $T - 1$ normalized by its mean over the same period.

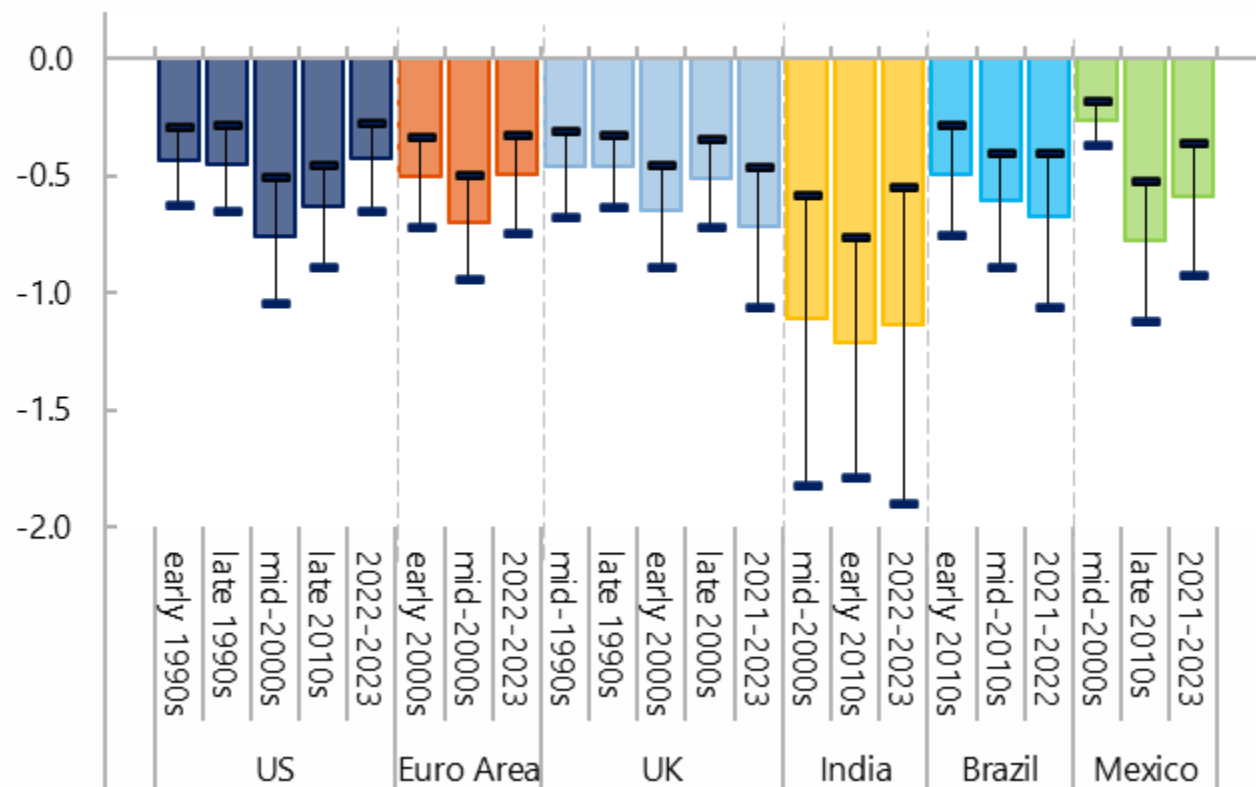
The transmission of monetary policy tightening to consumer prices did not change significantly in 2021 – 2023

PCE responses to selected tightening episodes in the US
(Percent)



Note: Percent response of the US personal consumption expenditures price index (PCE) to a 100 bps monetary policy shock (median and 68% HPD set) as a function of the average coefficients estimated during selected tightening episodes.

Peak effects on consumer prices of recent tightening episodes in AEs and EMs
(Percent)



Note: Bars and whiskers: average peak impact of consumer prices to a 100 bps monetary policy shock (median and 68% HPD set) as a function of the average coefficients estimated during selected tightening episodes.

3. What lessons can we draw for monetary policy in a world with more frequent sectoral shocks?

A non-linear multi-country and multi-sector new-Keynesian model with sectoral constraints for analyzing the Great Tightening

- **Model Environment**

- Dynamic New Keynesian framework
- Two-country model (USA and ROW)
- Multi-sector production with input-output linkages (11 sectors)
- Occasionally binding labor usage constraints by sector

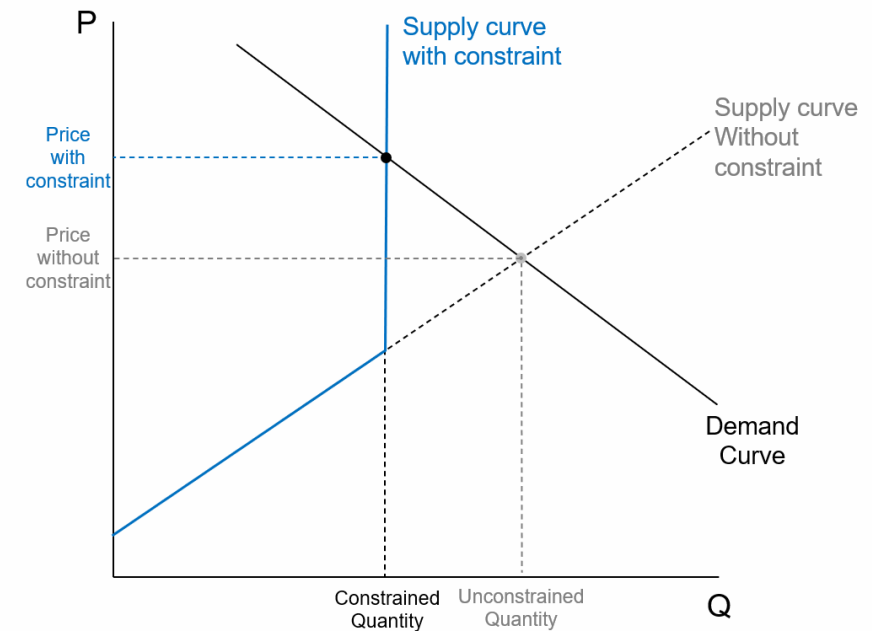
- **Shocks (Scenarios)**

- Aggregate: Monetary policy, Fiscal policy, Aggregate demand, Labor supply
- Sectoral: Productivity, Preference, Labor constraint

- **Two Model Experiments**

- Phillips Curve steepens due to arbitrary supply constraints
- Alternative monetary policy experiments, both for 2020-2023 and for specific shocks.

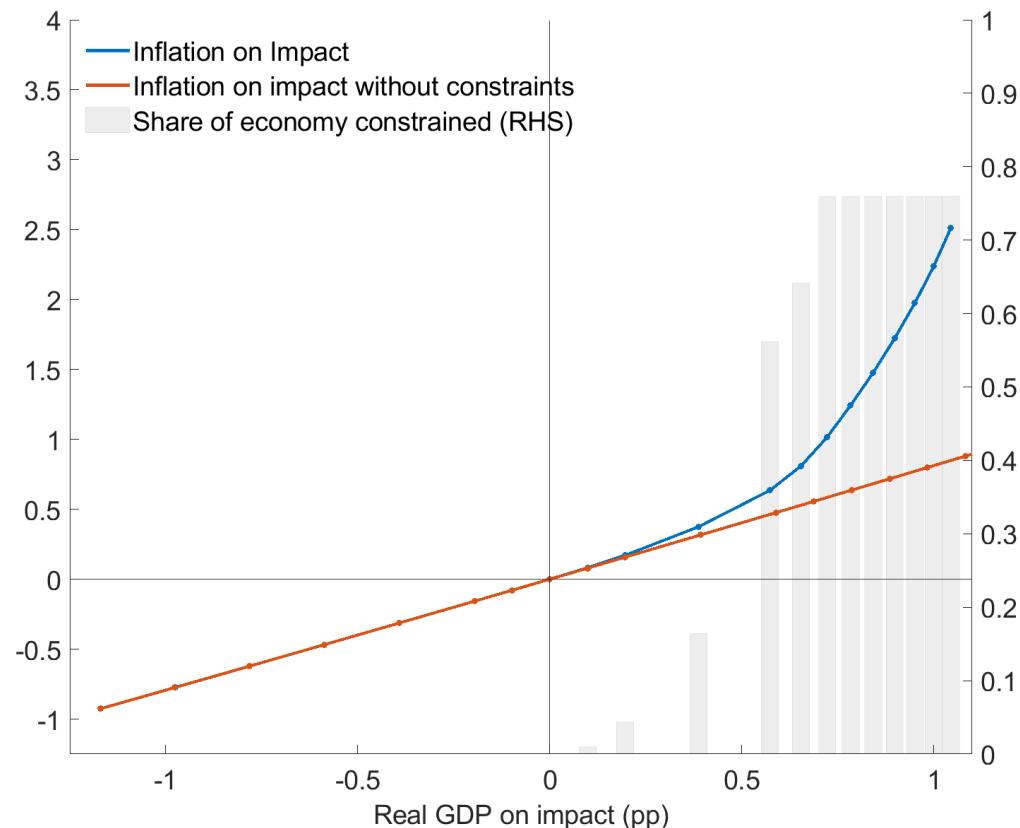
Example of Supply Constraint



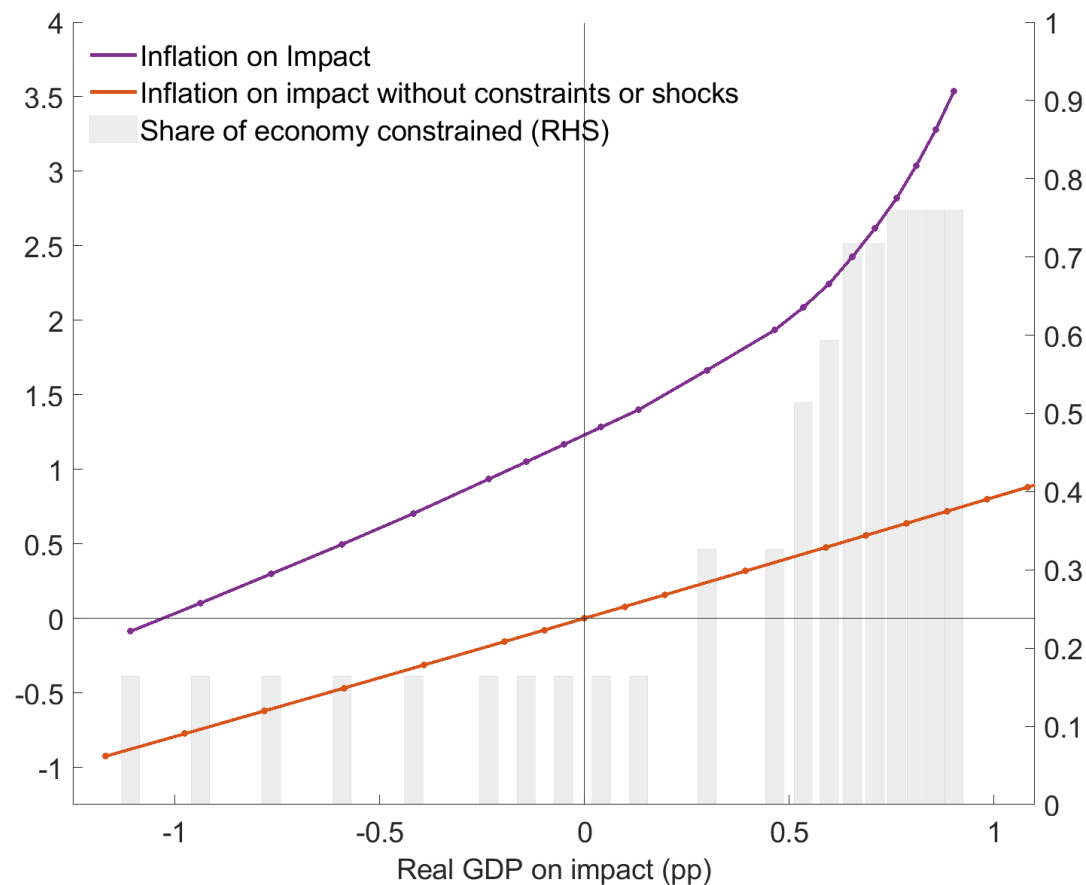
Note: Figure shows an example of a constraint in our model. This shows the output price against the value added of that sector. In the model value added is comprised of labor (which can be constrained) and a fixed factor. A labor constraint thus limits value added and raises the output price of the firm

Supply constraints steepen and sectoral demand changes shift the Phillips Curve

Phillips curve with occasionally binding constraints
(Percent)



Phillips Curve with constraints plus sectoral demand shocks
(Percent)



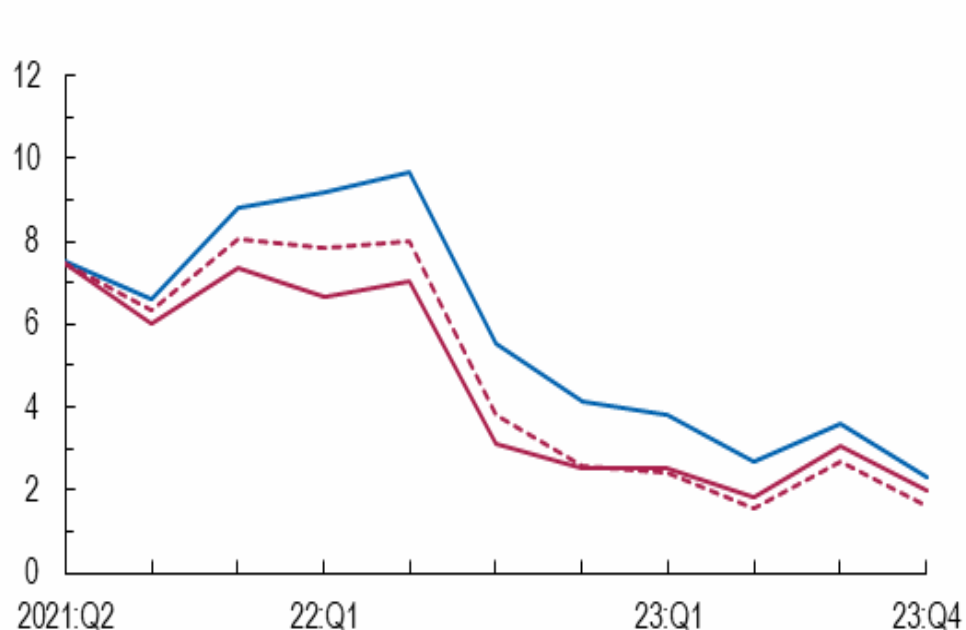
Sources: IMF staff calculations

Note: The blue line shows the combination of the impact effect of real GDP (x-axis) and inflation (left-scale) on monetary policy shocks of various sizes with panel 2 also including a relative demand shock. The grey bars (right scale) show the share of the economy constrained. The red line shows the same combination without any supply bottlenecks imposed. The Phillips curve shape will depend on the choice of constraints.

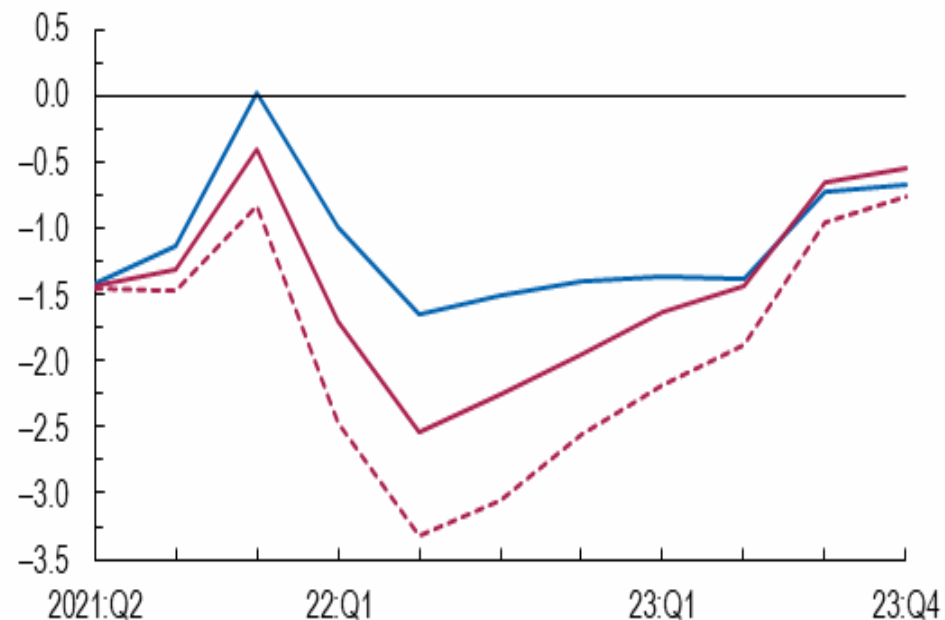
Policy tightening costs less output loss when supply bottlenecks are prevalent

CPI Inflation:
(QoQ annualised)

- Observed
- Tighten early
- - - Tighten early + no bottlenecks



Real GDP:
(Deviation from steady state in %)



Sources: Federal Reserve Economic Data; Organisation for Economic Co-operation and Development; and IMF staff calculations.

Note: "Tighten early" scenario assumes rates rise three quarters earlier. Standard monetary policy counterfactuals assume identified labor constraints remain. "No bottlenecks" assumes the wedge between the marginal product of labor and wages (shadow price of constraint) is kept consistent with the data, but the constraint does not bind.

Coordinated tightening expedites disinflation process

- **Scenario (green line)**

ROW tightens policy later than US

US remains as observed

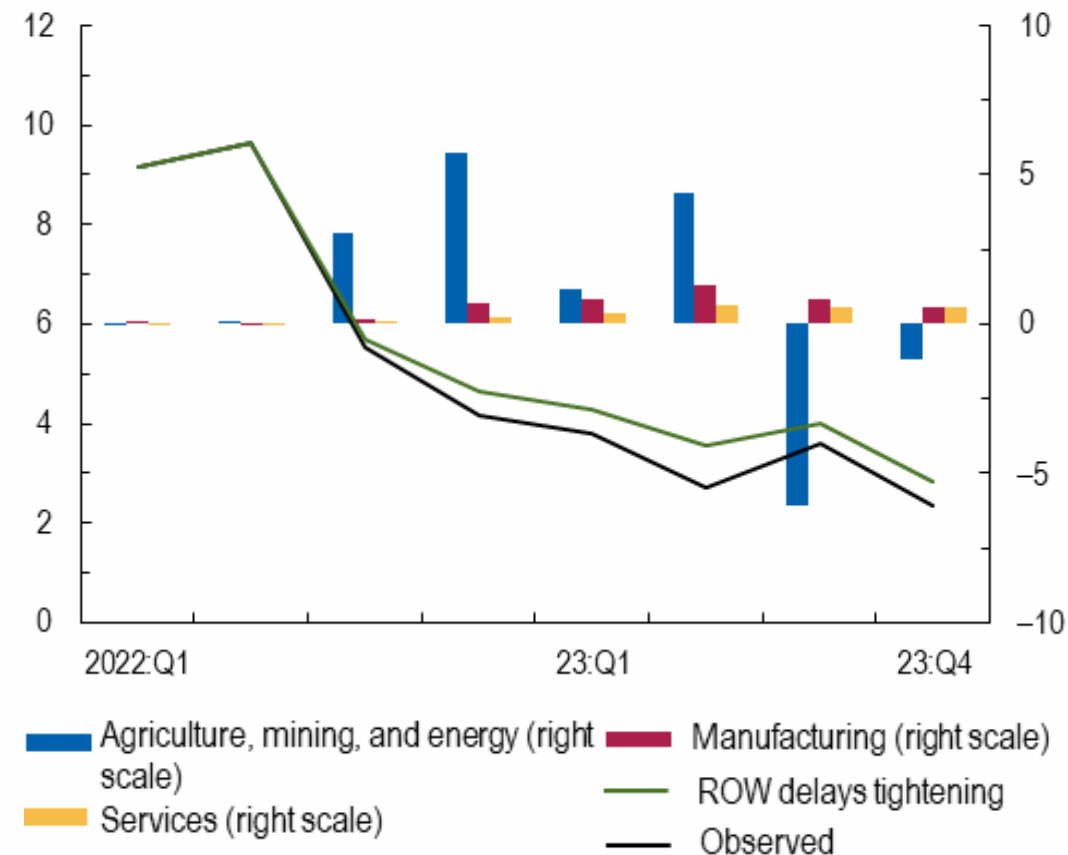
- **Bar graphs**

Sectoral decomposition of difference between red and black lines

- **Implications**

- Flexible price sectors (blue) act immediately
- Other sectors react through input-output linkages interacting with price stickiness

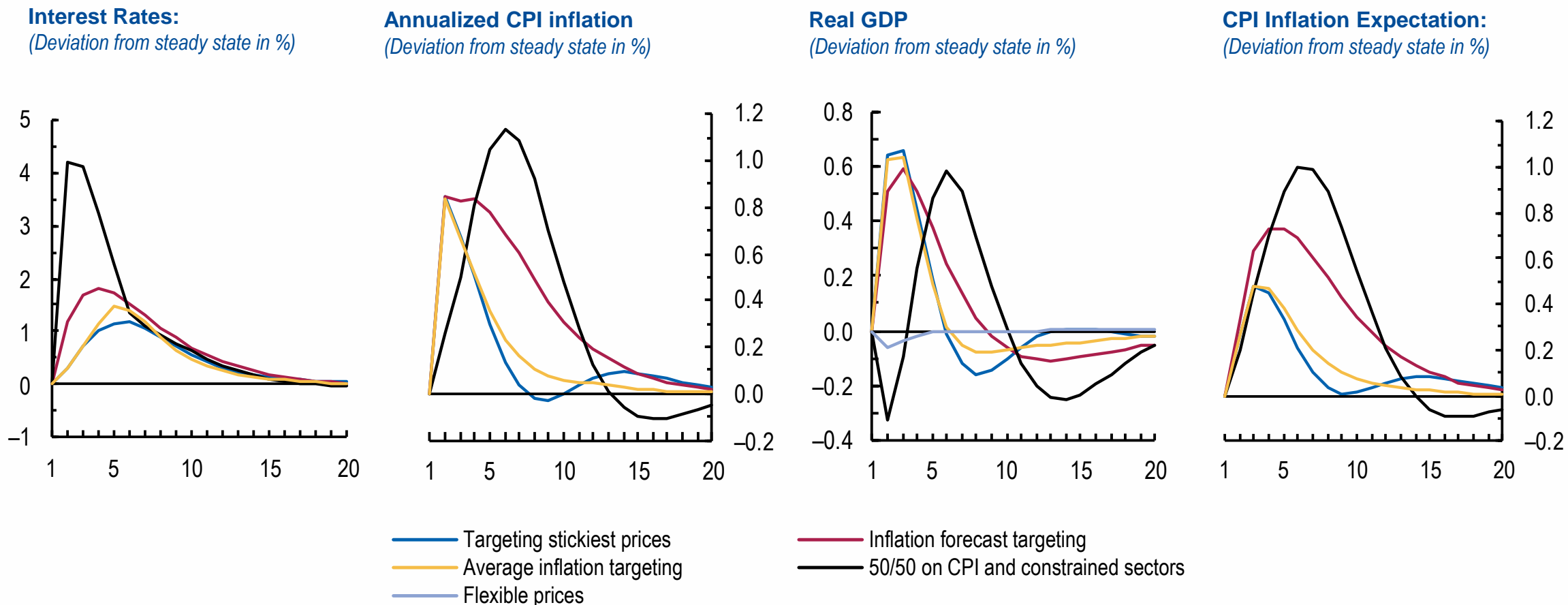
US inflation (QoQ annualized)



Sources: Federal Reserve Economic Data; Organisation for Economic Co-operation and Development; and IMF staff calculations.

Note: "The rest of the world (ROW) delays tightening" scenario assumes ROW hiking is delayed three quarters and US rates remain as observed. Identified labor constraints are assumed to remain. The right-hand y-axis shows percentage point difference in sectoral inflation between the observed data and "ROW delays tightening" scenario.

Targeting inflation in the stickiest-price sectors remains appropriate when supply bottlenecks are sparse



Source: IMF staff calculations.

Note: The Taylor rules are identical except for the inflation measure targeted. "Targeting stickiest prices" targets the five sectors with the steepest Phillips curves. "Inflation forecast targeting" targets the four-quarter moving average of future CPI inflation. "Average inflation targeting" represents average inflation targeting in which the central bank targets the average of the previous four quarters of inflation. "50/50 CPI and constrained sectors" targets CPI inflation and sectoral inflation in agriculture, mining, and energy. "Flexible prices" shows relative prices in a scenario without nominal rigidities in any sector market. In each case the Taylor parameter is 3, the persistence parameter is 0.5, and neither GDP nor the output gap is targeted. CPI = consumer price index.

Conclusions

Taking stock

- **Sectoral shifts amid policy stimulus and capacity constraints** characterized recent inflation episode
 - Energy shocks and other shocks to headline inflation played an outsized role
 - Empirical price Phillips curves steepened
- **Novel model** can account for transmission of sectoral shocks to economy-wide inflation
 - Key feature: sectoral dynamics
 - Inflation surges as many sectors hit capacity constraints amid demand shocks
 - As a result, Phillips curve steepens

Lessons

- 1. Policy tightening is effective when a combination of supply bottlenecks plus strong demand can steepen Phillips curve**
 - Favorable sacrifice ratio, e.g., low output cost
 - Well-defined escape clauses should be considered to tackle inflationary pressures when aggregate Phillips curves steepen + forward guidance should internalize those escape clauses
- 2. When supply bottlenecks are confined to specific sectors, standard policy rules remain appropriate.**
- 3. Need a better understanding of sectoral dynamics**
 - Models with sectoral linkages and heterogeneity
 - More granular sectoral data + high-frequency indicators of supply constraints



World Economic Outlook October 2024

THANK YOU!