Managing Expectations: Inflation and Monetary Policy

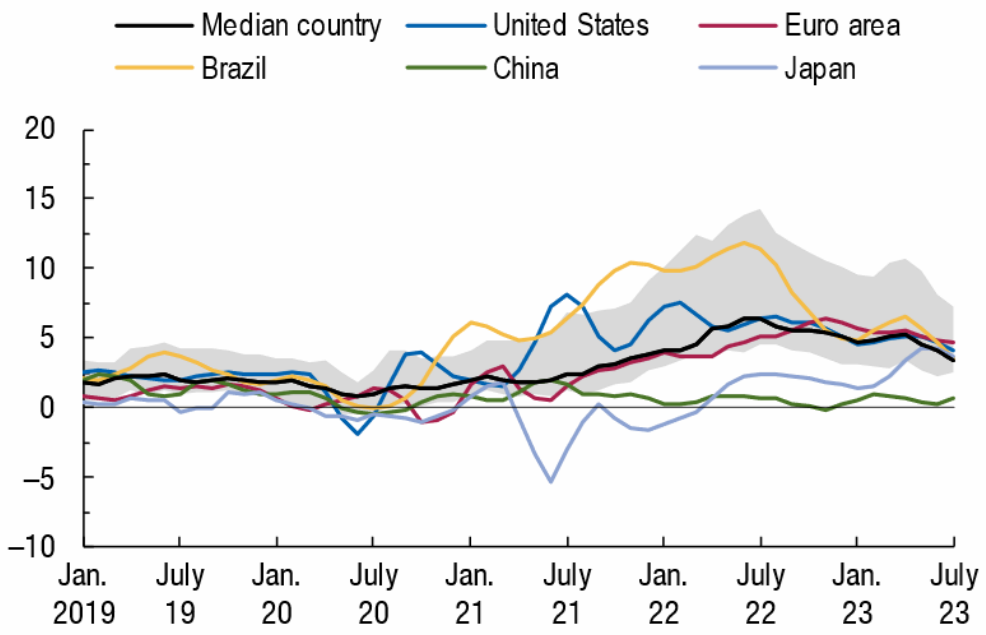
OCTOBER 2023 **OUTREACH**

Silvia Albrizio, John Bluedorn, Allan Dizioli, Christoffer Koch, and Philippe Wingender with support from Yaniv Cohen, Pedro Simon and Isaac Warren. Arash Sheikholeslam and Mona Wang provided technical and computational assistance.

Persistent inflationary environment

Recent Core Inflation Dynamics

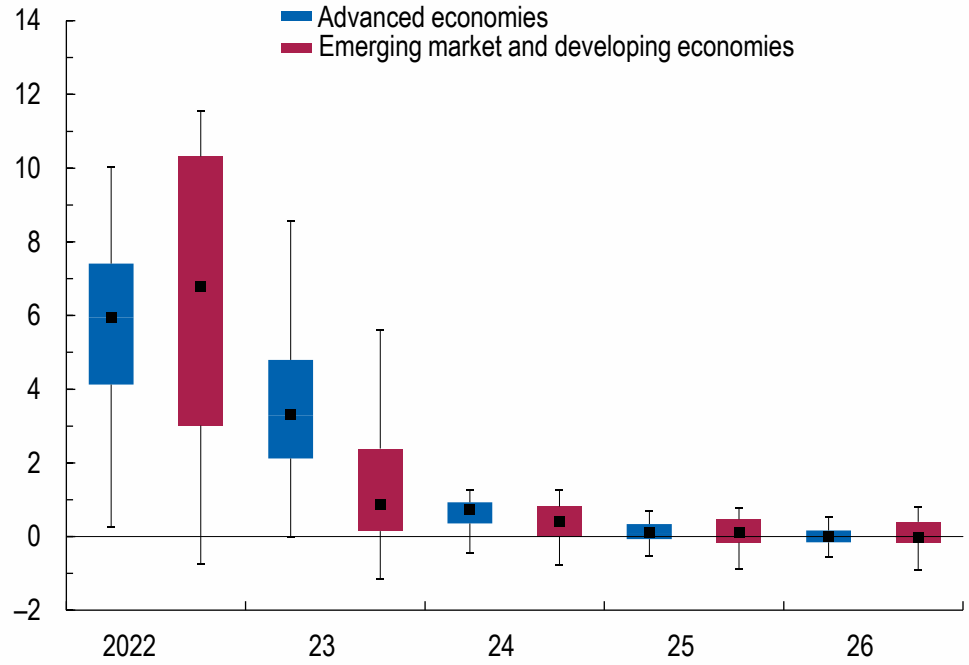
(Percent change, 3-month annualized, seasonal adjusted)



Sources: Haver Analytics; and IMF staff calculations.
Note: The figure shows the development in core inflation across 17 emerging markets and developing economies and 18 advanced economies. Core inflation is the change in prices for goods and services excluding those for food and energy (or the closest available measure). For the euro area (and other European countries for which the data are available), energy, food, alcohol, and tobacco are excluded. The grey band depicts the 25th to 75th percentile of inflation across countries. 35 sample countries account for approximately 81 percent of 2022 world output.

Cross-Economy Deviations of Inflation Expectations from Targets

(Percentage points)



Sources: Consensus Economics; and IMF staff calculations.
Note: Inflation expectations in the figure are from professional forecasters, in order to maximize economy coverage. For each economy group, the boxes denote the upper quartile, median, and lower quartile of the distribution, while the whiskers show the maximum and minimum within the boundary of 1.5 times the interquartile range.

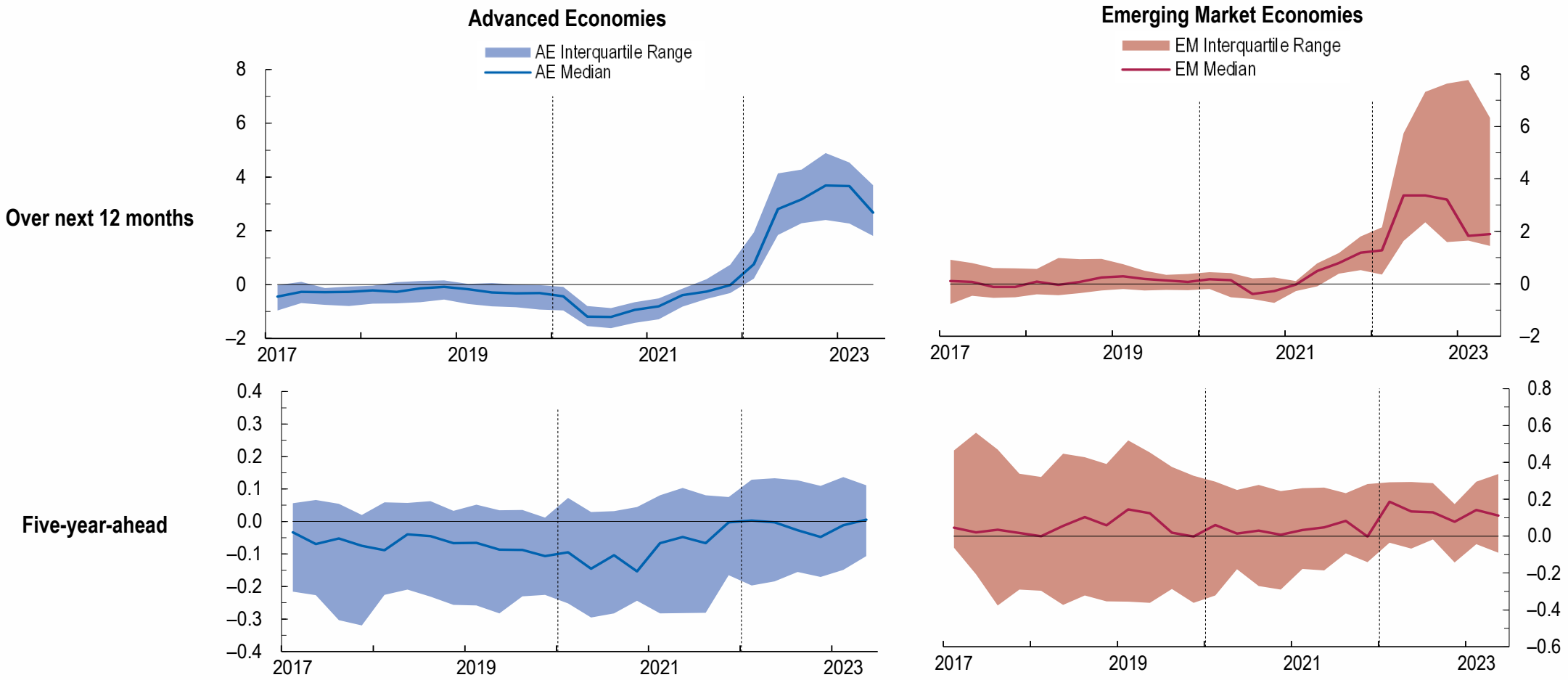
The role of inflation expectations

- How have inflation expectations behaved recently?
- How important are expectations in explaining inflation dynamics?
- How do expectations affect monetary policy effectiveness, and can policy affect expectations?

Near-term expectations rose, while long-term are broadly stable.

Cross-Economy Distribution of Mean Inflation Expectations Over Time

(Percentage points deviation from target)



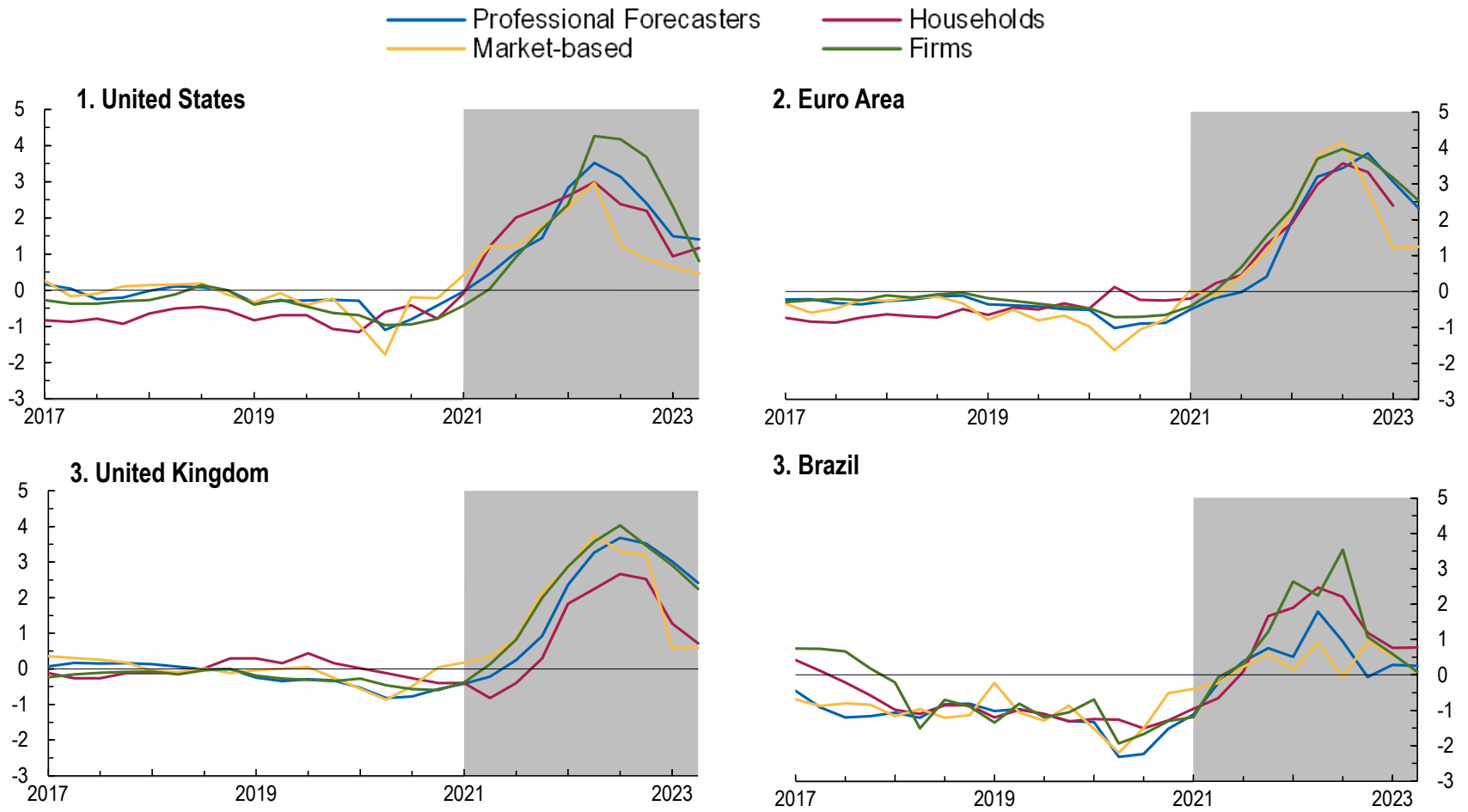
Sources: Consensus Economics, central bank websites, Haver Analytics, and IMF staff calculations.

Note: Economies are included based on Consensus Forecast data and inflation target availability. 22 AEs: AUS, CAN, CHE, CZE, DEU, ESP, EST, FRA, GBR, ITA, JPN, KOR, LTU, LVA, NLD, NOR, NZL, SVK, SVN, SWE, TWN, and USA. 14 EMDEs: BRA, CHL, CHN, COL, HUN, IDN, MEX, PER, PHL, POL, ROU, RUS, THA, and TUR. AE = Advanced Economies; EM = Emerging Market Economies.

Agents' inflation expectations agree on broad dynamics.

12-Months Ahead Inflation Expectations by Different Agents

(Z-score: standard deviation from the mean)



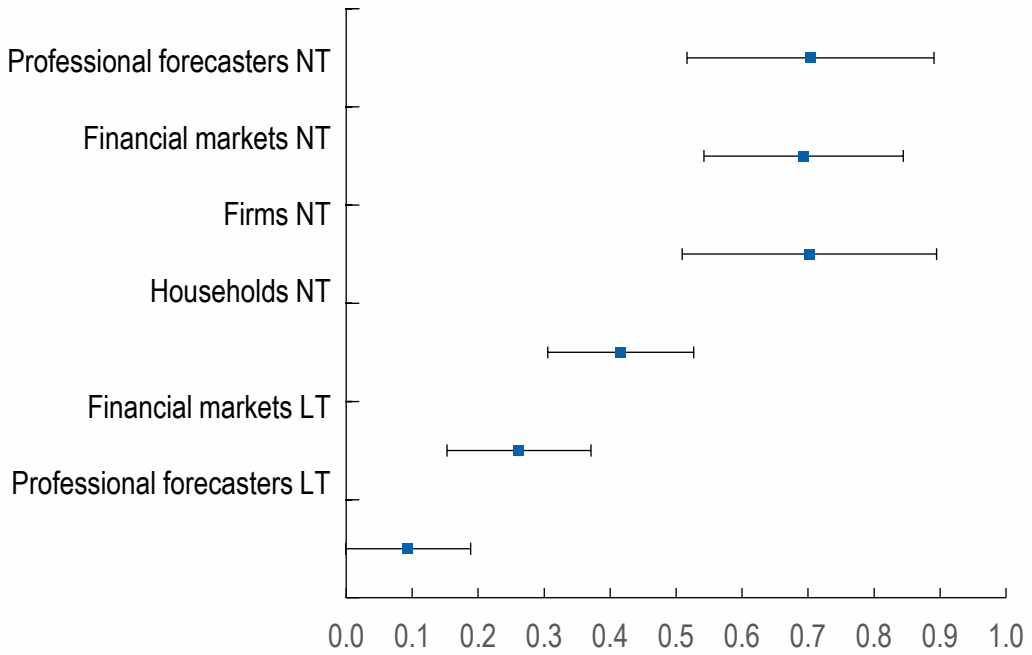
Sources: Consensus Economics, University of Michigan, Bank of England/IPSOS Inflation Attitudes Survey, Fundaçâo Getúlio Vargas, European Commission, S&P Capital IQ, NL Analytic and IMF staff calculations.

Note: Standard deviation from the mean of 2004 Q1 to 2023 Q2 of professional forecasters, household and market expectations, and textual analysis of firms' earnings calls. 2021 Q1 and subsequent period highlighted in gray to illustrate state dependency.

Near-term inflation expectations help explain current inflation.

Estimated Effects of Alternative Inflation Expectations Measures on Current Inflation

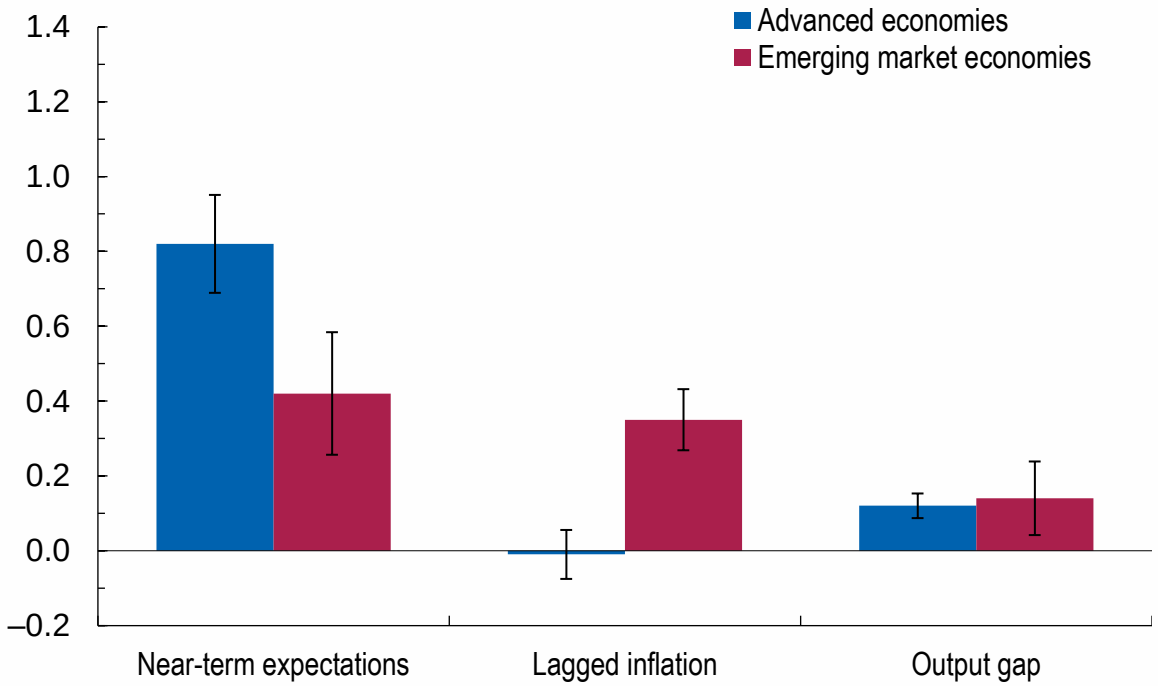
(Standardized regression coefficients)



Source: IMF staff calculations.
Note: The figure shows standardized coefficients from linear regressions estimated by pooled times series for the euro area, United Kingdom, and United States using quarterly data from 1991:Q2 through 2023:Q1. The dependent variable is quarterly headline inflation, seasonally adjusted at an annualized rate. Horizontal lines show 90 percent confidence intervals with heteroskedasticity-robust standard errors. LT = long-term (five-year-ahead; for financial markets is next-5-years) inflation expectations; NT = near-term (next-12-months) inflation expectations.

Key Instrumental Variables Coefficients of the Hybrid Phillips Curve

(Regression coefficients)

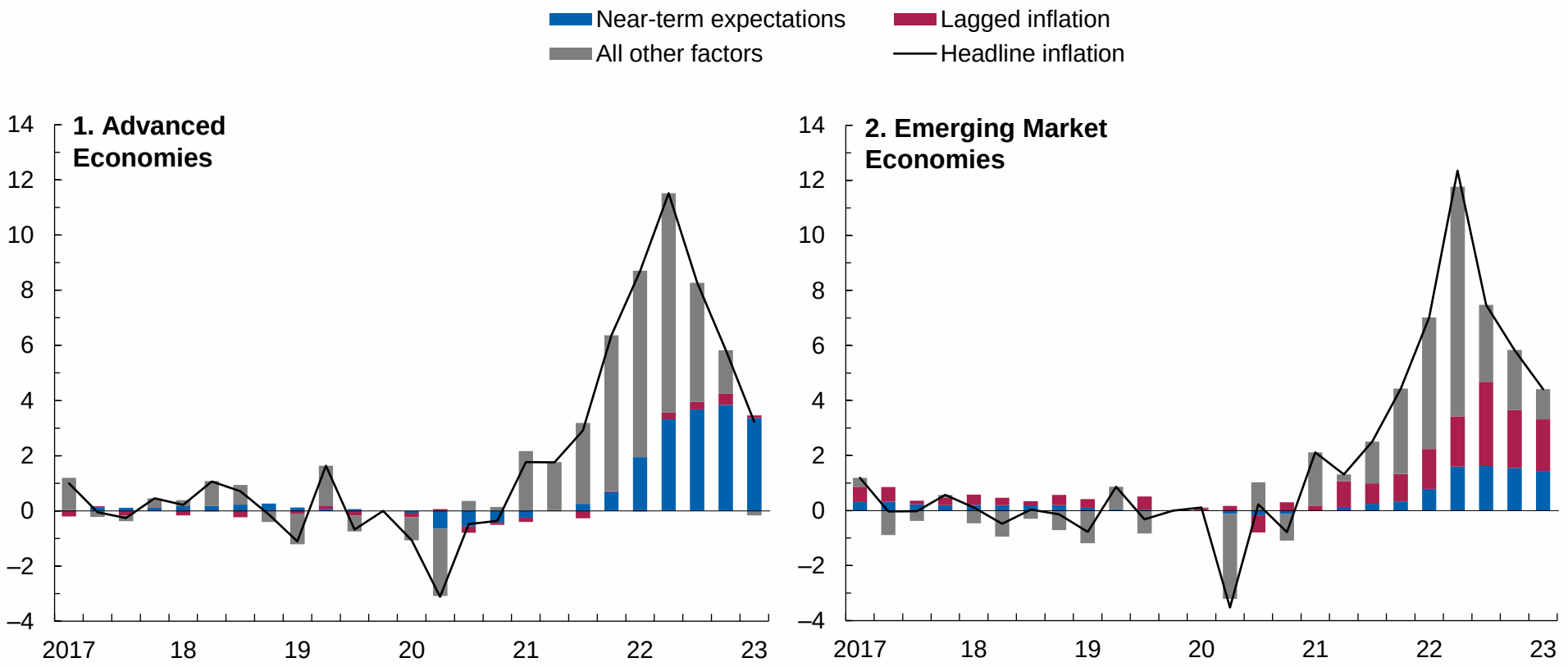


Source: IMF staff calculations.
Note: The figure shows coefficients from linear regressions estimated by pooled times series using quarterly data from 1991:Q2 through 2023:Q1. The dependent variable is quarterly headline inflation, seasonally adjusted at an annualized rate. See Online Annex 2.4 for details on the regression specification and additional control variables. Whiskers show the 90 percent confidence intervals with Driscoll-Kraay standard errors.

Growing importance of near-term inflation expectations, especially in advanced economies.

Contributors to Recent Inflation Dynamics

(Percentage point deviation from 2019:Q4)



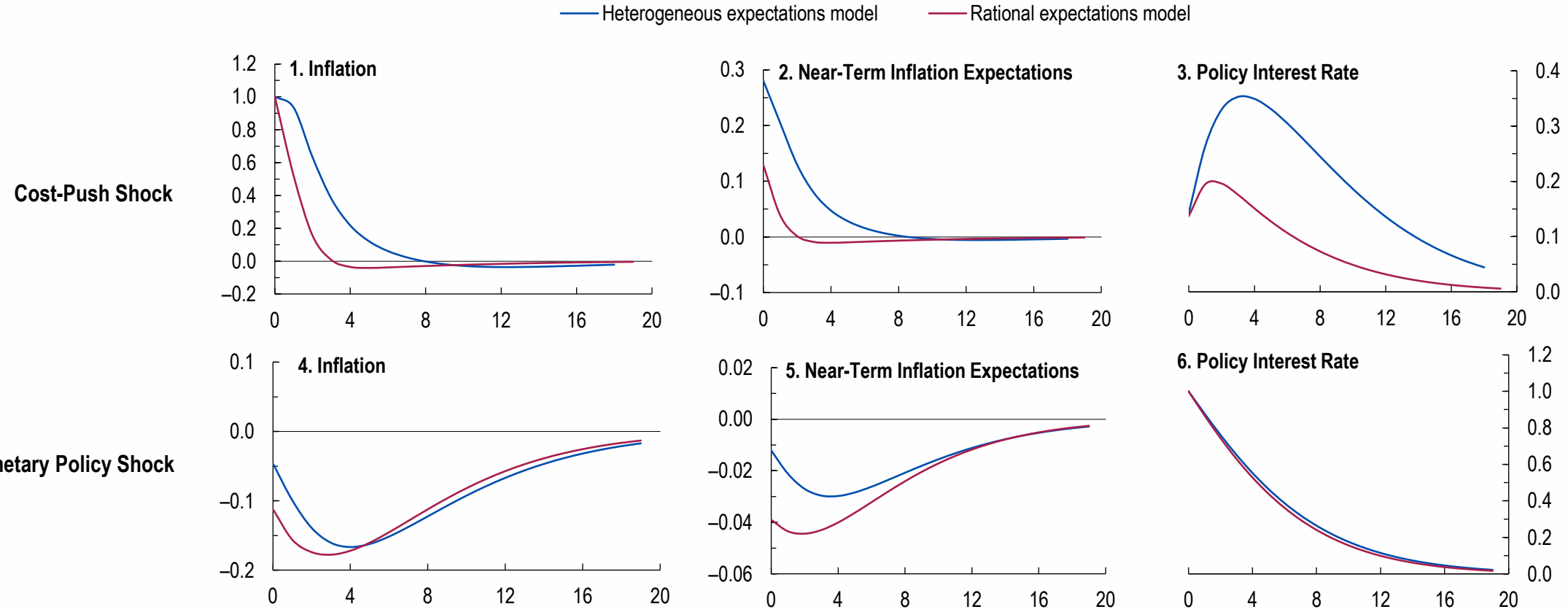
Source: IMF staff calculations.

Note: Bars in the figure show the contributions to average headline inflation by economy group relative to the contributions observed in 2019:Q4. Contributions are calculated using coefficients estimated by instrumental variables pooled time series with quarterly data over 1991:Q2–2023:Q1. The black lines in each panel show the average seasonally adjusted annualized quarter-on-quarter headline consumer price index inflation observed relative to 2019:Q4. The "All other factors" category includes the contributions from time fixed effects (common global factors), all other explanatory variables, and the regression residual.

Cost-push shocks are more persistent and policy less potent with more backward-looking learners in the economy.

Macroeconomic Responses to Shocks Conditional on Agents' Expectations Formation

(Percentage points)

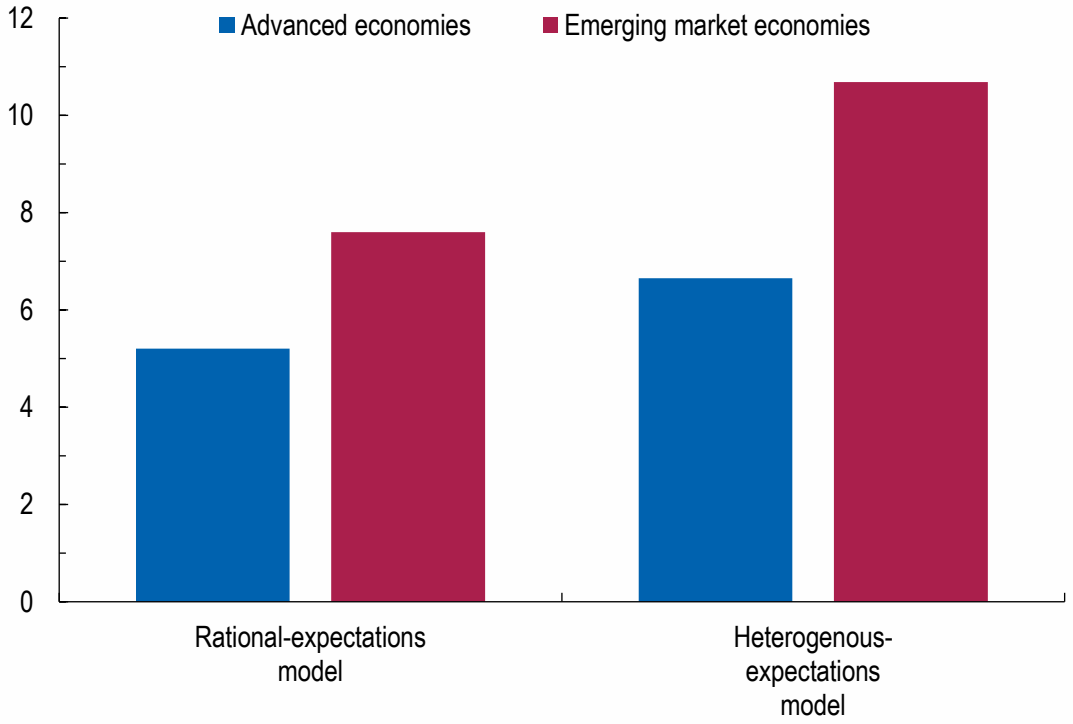


Source: IMF staff calculations.

Note: Numbers on the horizontal axes in the panels represent quarters after the shock at time 0. Panels 1–4 show the impulse responses to a cost-push shock that increases inflation by 1 percentage point. Note that the output gap increases after this shock, because potential output falls by more than real GDP. Panels 5–8 show the impulse responses to a temporary monetary policy shock that increases the policy rate by 100 basis points. Note that the monetary policy shock's impact on inflation peaks after five quarters in the heterogenous-expectations model and after three quarters in the rational-expectations model.

The sacrifice ratio is higher when there are more backward-looking learners in the economy.

Sacrifice Ratios under Alternative Expectations Processes
(Percent of output forgone to lower inflation by 1 percentage point)



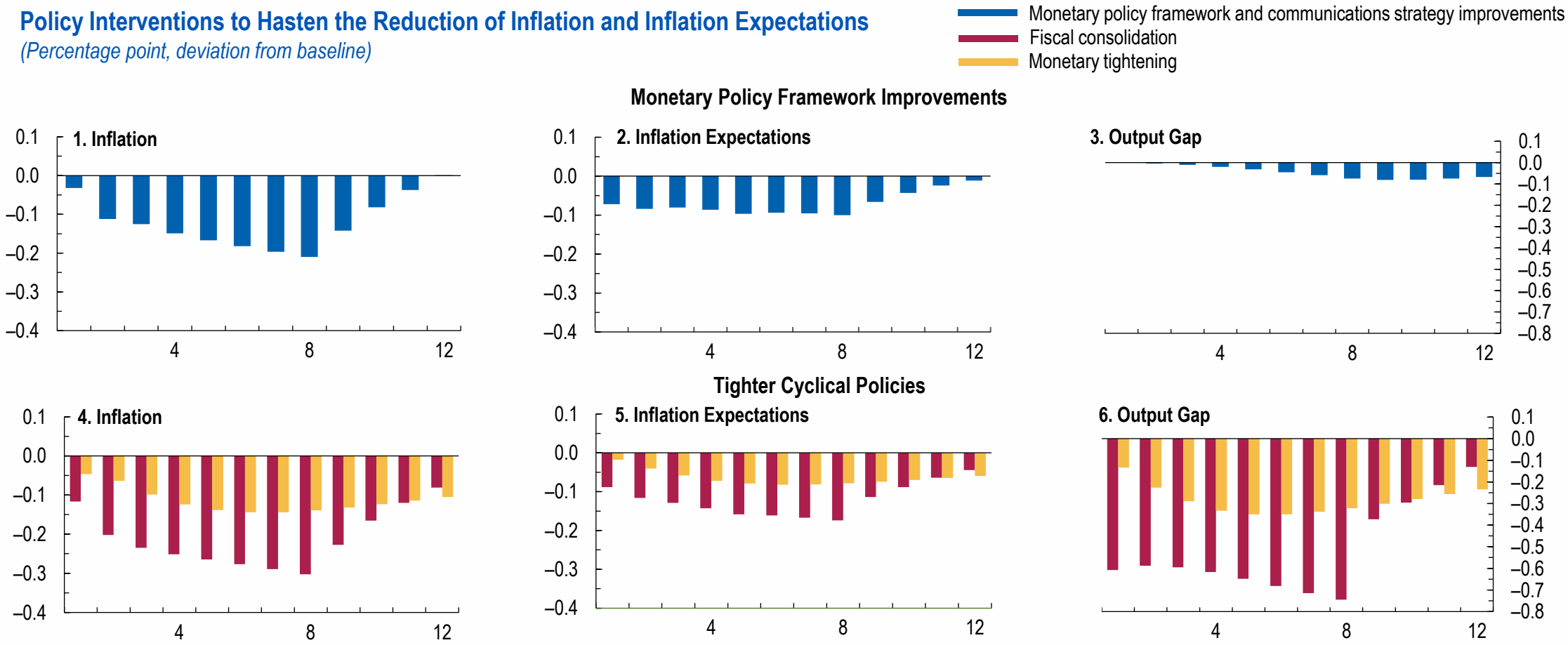
Source: IMF staff calculations.
Note: The sacrifice ratios in the figure are calculated under the assumption that monetary policy is implemented to bring the inflation rate down by 1 percentage point over three years.

- Higher sacrifice ratio is driven by backward-looking learners. These agents do not fully incorporate the anticipated impact of monetary policy going forward.
- The effect is higher in emerging market economies since they typically have a higher share of backward-looking learners.

How to increase the chance of a softer landing?

Policy Interventions to Hasten the Reduction of Inflation and Inflation Expectations

(Percentage point, deviation from baseline)



Source: IMF staff calculations.

Note: Improvements in communication strategies is calibrated as the difference of the forward-looking share between the representative advanced and emerging market economies. Fiscal consolidation shock is assumed to be a 1% consolidation maintained for 2 years. The monetary policy tightening exercise uses a standard 100bps tightening.

Policy implications

- Monitoring changes in agents' expectations formation process is key to understand the trade-off (speed of inflation convergence to target vs economy slowdown) and calibrate monetary policy actions

- A smoother transition toward inflation targets might be needed to minimize welfare losses, especially when expectations are more backward-looking and the shock is persistent.

- Improved monetary policy frameworks and communications can help achieving a softer landing, since are better informs agents’ expectations.

World Economic Outlook
October 2023

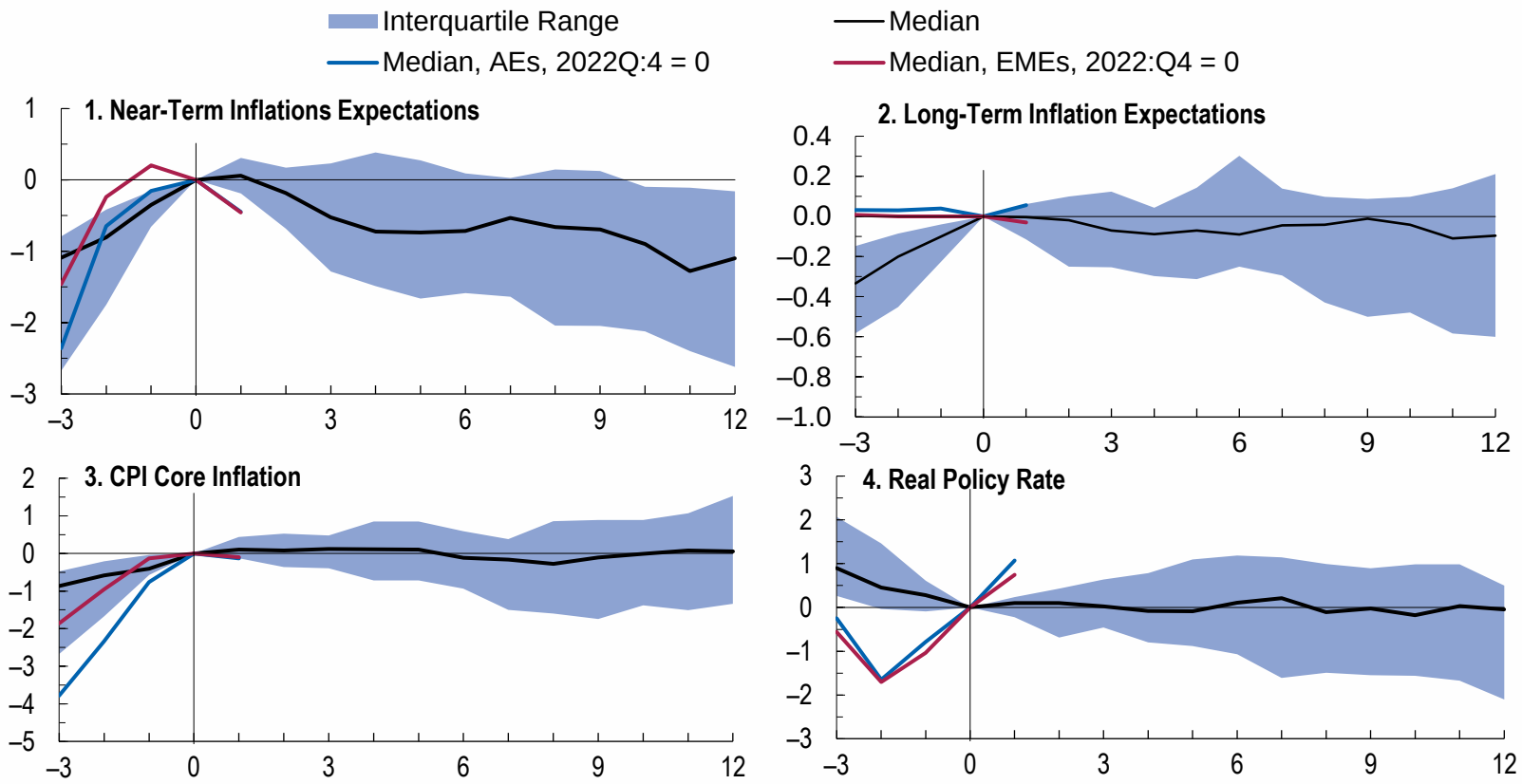
THANK YOU!

EXTRA SLIDES

Historical comparison

Historical Episodes with Persistently Rising Near- and Long-Term Inflation Expectations

(Percentage points relative to level at end of episode)



- **Historical episodes**: 4 quarters of rising 1-year- and 5-year-ahead inflation expectations.
- Sample covers 1989:Q4 to 2023:Q1, with exact coverage varying by economy.
- 32 past episodes identified (16 AEs and 16 EMEs).

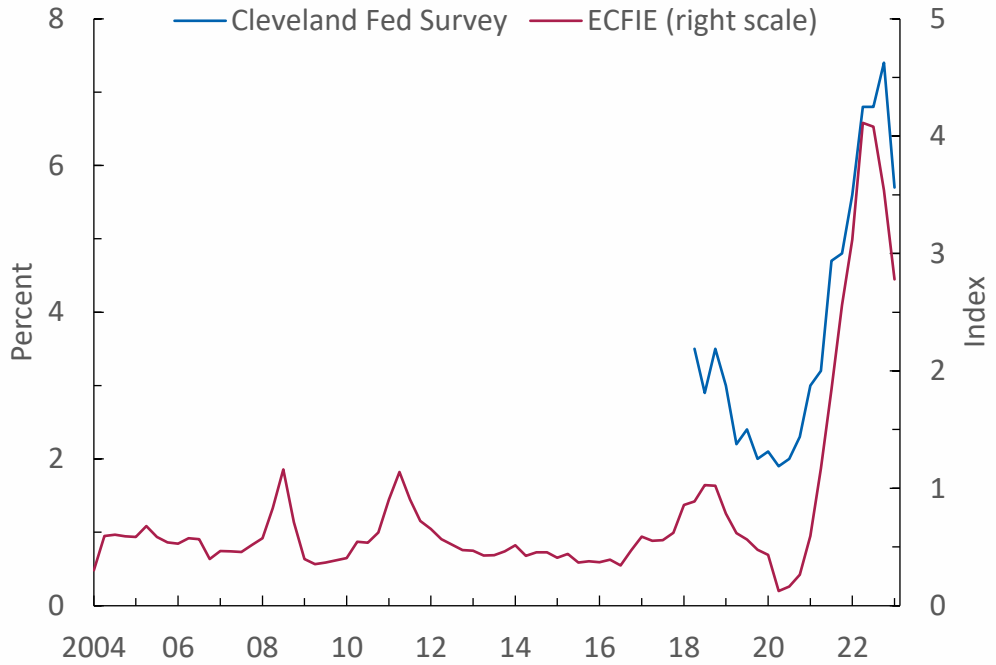
Sources: Consensus Economics: and IMF staff calculations.

Note: Horizontal axes show quarters after the end of the historical episode. All rates are expressed in annual terms. Near-term inflation expectations (panel 1) are expected inflation rates over the subsequent year on a rolling basis. Long-term inflation expectations (panel 2) are expected inflation rates in five years' time. Real policy rates are interest rates based on expected inflation. Inclusion as a historical episode requires four quarters in which both near- and long-term inflation expectations are rising. The sample spans 1989:Q4 to 2023:Q1, with exact time coverage varying by economy. A total of 32 historical episodes are identified, with 16 from AEs and 16 from EMEs. AEs = advanced economies; CPI = consumer price index; EMEs = emerging market economies; Exp. = expectations; Infl. = inflation; Med. = median.

ECFIE: Earning-Calls-based Firm Inflation Expectations

- New measure of firms' inflation expectations based on text analysis of firms' earnings calls to capture firms' intensity of discussion of near-term inflation expectations.
  - Human judgment and ChatGPT to identify two set of key words: **inflation** and **expectations** at the sentence level, Then Bag-of-words" (NL Analytis).
  - $ECFIE\ Index_{t,i} = \frac{\Sigma\ Inflation\ Expectation\ Sentences_{t,i}}{Total\ Sentences_{t,i}}$

US ECFIE Index and Survey-based Firms' Inflation Expectations

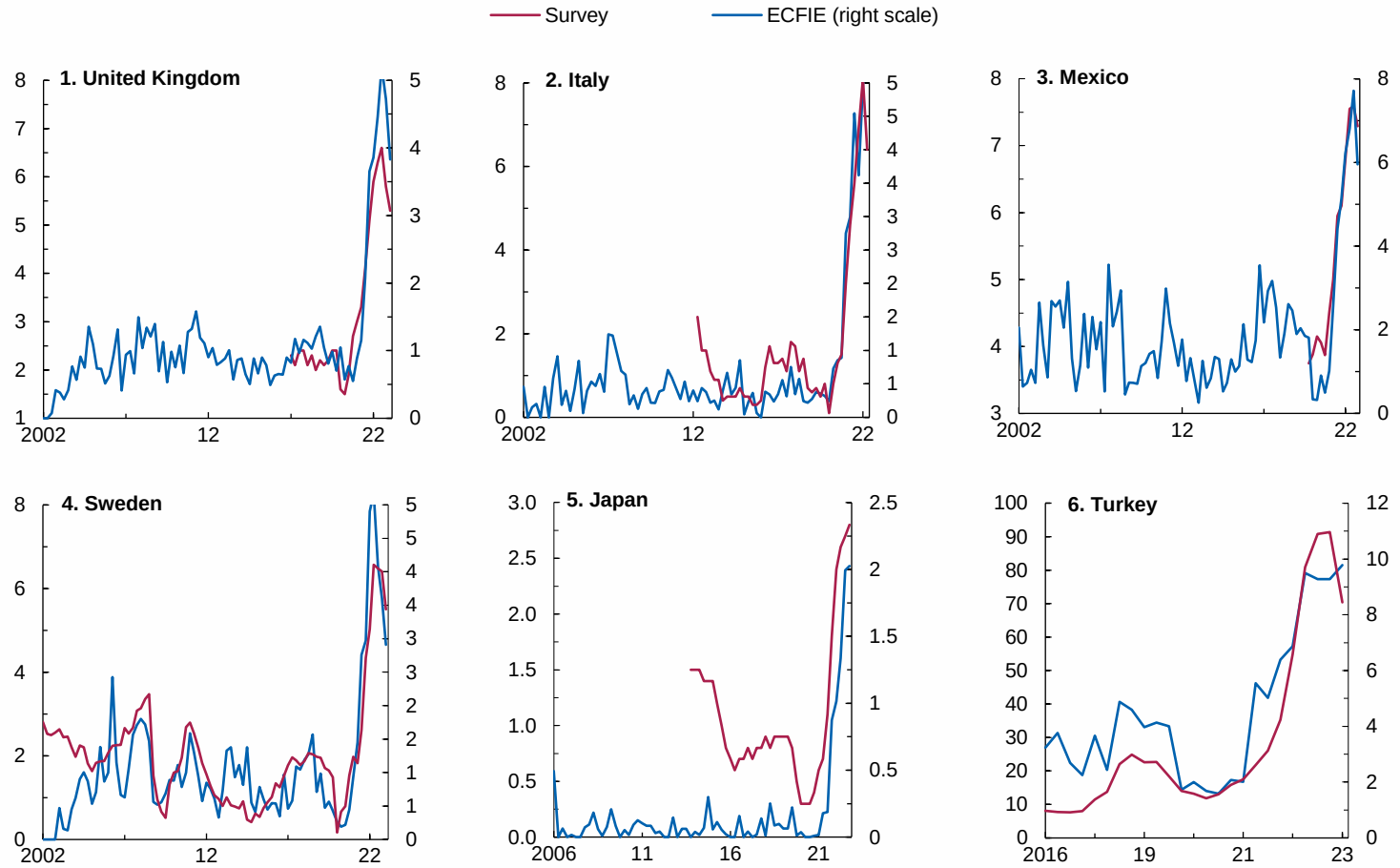


Source: Federal Reserve Bank of Cleveland; NL Analytics; S&P Capital IQ; and IMF staff calculations

Note:The figure shows ECFIE Index according to the information content extracted from the earnings call (right scale) and the US firms' survey is conducted by the Cleveland Fed (left scale) for US. The ECFIE is calculated from a text analysis using transcripts of US based companies. ECFIE = earnings call firm inflation expectations

ECFIE highly correlated with existing surveys

ECFIE Cross-Country Validation with Survey-based Next-12-Months Inflation Expectations by Firms
(Percent; index on right scale)

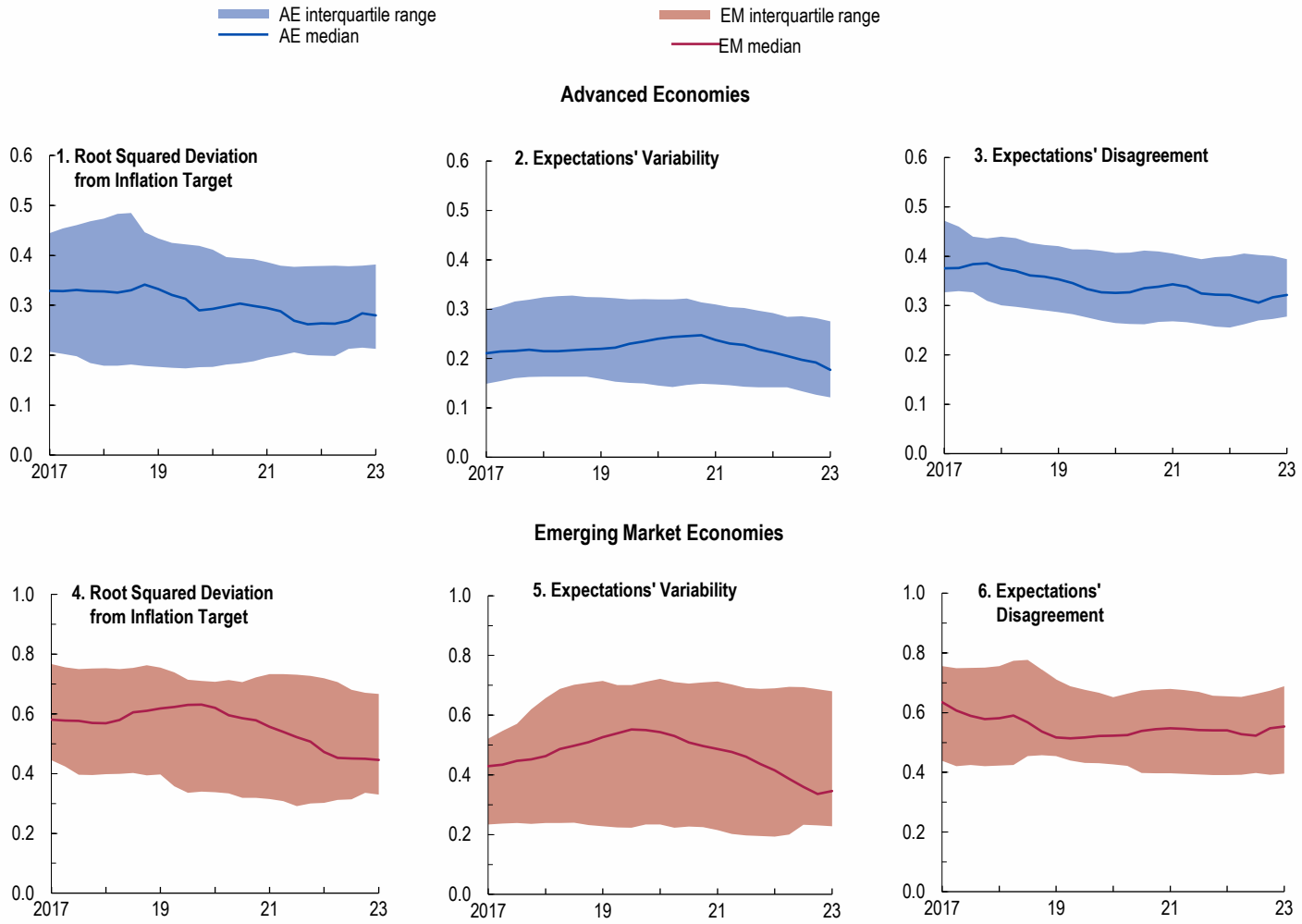


Sources: Bank of England; Bank of Italy, Bank of Japan; Central Bank of Mexico; Central Bank of the Republic of Türkiye, Sveriges Riksbank; NL Analytic; S&P Capital IQ; and IMF staff calculations.
Note: Next-12-months inflation expectations by firms come from existing survey-based measures, available for selected economies, shown in annualized percent. The ECFIE measure is an index, with a higher number indicating higher inflation. See the discussion and Dizioli, Simon, and Albrizio (forthcoming) for further details.

Long-term expectations remain anchored.

Metrics of Inflation Expectations Anchoring

(Percentage points)



Source: Consensus Economics, central bank websites, Haver Analytics, and IMF staff calculations.
Note: Root Squared Deviation from Target, Expectations' Variability, and Expectations' Disagreement in percentage points. The plots are smoothed with a trailing average of six years, but quarterly figures show similar trends in all three metrics.. AE = Advanced Economies; EM = Emerging Market Economies.

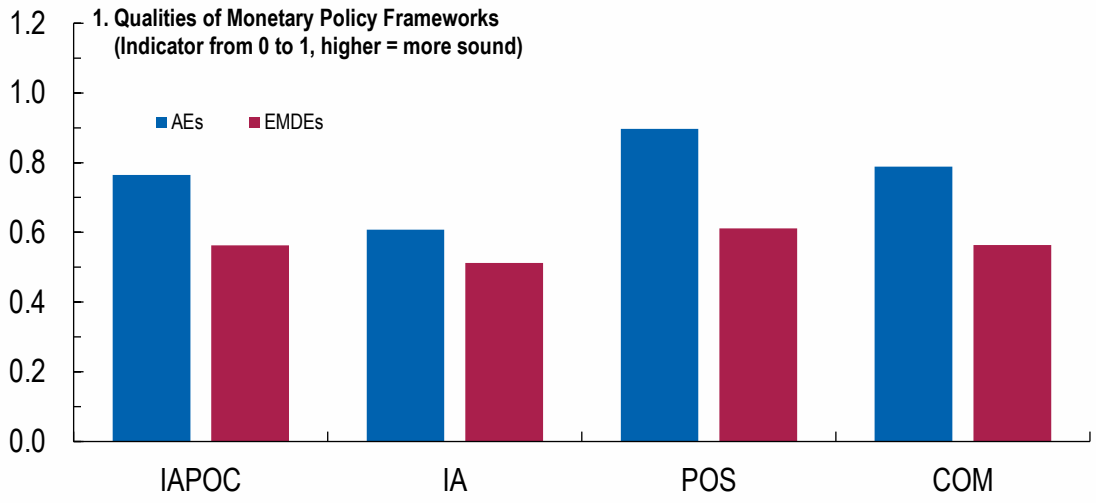
OLS estimates of the effect of expectations in the Phillips curve are upward biased.

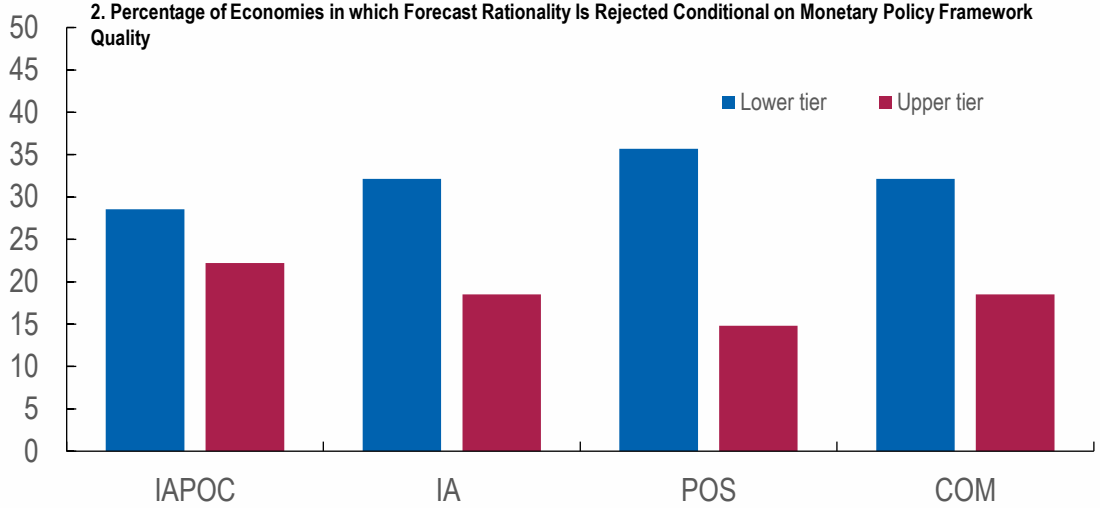
	AE	AE	AE	EME	EME	EME
	Mean groups OLS	Common OLS	Common IV	Mean groups OLS	Common OLS	Common IV
Near-term expectations	1.14***	1.24***	0.82***	0.66***	0.89***	0.42***
	(0.10)	(0.10)	(0.08)	(0.11)	(0.09)	(0.10)
Output gap	0.06***	0.06***	0.12***	0.13***	0.09**	0.14**
	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.06)
Lagged inflation	-0.09*	-0.10**	-0.01	0.26***	0.18***	0.35***
	(0.05)	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)
R-squared	0.70	0.72	0.48	0.67	0.68	0.56
Countries	31	31	31	17	17	17
Observations	3379	3379	3379	1757	1757	1757
First stage F-stat Expectations			1745			250
First stage F-stat Output gap			478			92
Overidentification (p-value)			0.94			0.21

Coefficients estimated by pooled time series using quarterly data from 1991Q2 through 2023Q1. All regressions also include country and time fixed effects, and changes in global energy prices and nominal effective exchange rate depreciation interacted with country fixed effects. Excluded instruments for the IV models are: lagged 12-month ahead expecations for inflation and GDP growth, lagged output gap and policy interest rates. Driscoll-Kraay standard errors in parentheses. First stage F-stat report values from the Sanderson-Windmeijer test for weak identification. Overidentification reports for the p-value of the Hansen J-statistic for the joint null hypothesis of instrument validity. * p<0.10, **p<0.05, ***p<0.01.

Better central bank framework is associated with more forward-looking expectations.

Soundness of Monetary Policy Frameworks and Forecast Rationality Tests across Economies





Sources: Unsal, Papageorgiou, and Garbers (2022); and IMF staff calculations.
Note: Panel 1 shows the mean of the indicator by economy group for which data is available (2007–21). Panel 2 of the figure shows the share of economies (among those with expectations from professional forecasters) for which a simple forecast rationality test (Lovell 1986) rejects the hypothesis of rational expectations. See Online Annex 2.7 for further details. AEs = advanced economies; EMDEs = emerging market and developing economies; IAPOC = Overall Monetary Policy Framework index, which is composed of three pillars: Independence and Accountability (IA), Policy and Operational Strategy (POS), and Communications (COM).

Heterogenous expectations' DSGM model: main equations

$$y_t = \alpha_{yL} y_{t-1} + \alpha_{yF} y_{t+1} + \gamma(\pi_{t+1} - r_t) + s_{yt} \quad \text{(IS curve)}$$

$$s_{yt} = \rho_{\varepsilon} s_{y_{t-1}} + \varepsilon_{y_t} \quad \text{(AR1 shock to IS curve)}$$

$$\pi_t = \alpha_{\pi L} \pi_{t-1} + \alpha_{\pi F} \pi_{t+1} + k_{\pi} \bar{w}_t + \varepsilon_{\pi t} \quad \text{(Phillips curve depends on real wage gap)}$$

$$\pi_{wt} = \bar{w}_t - \bar{w}_{t-1} + \pi_t \quad \text{(nominal wage inflation gap definition)}$$

$$\pi_{wt} = -\alpha_{wL} w_{t-1} + \alpha_{wF} \pi_{wt+1} + K_w y_t + \varepsilon_{wt} \quad \text{(nominal wage depends on output gap)}$$

$$r_t = \rho r_{t-1} + (1-\rho)(\rho_{\pi} \pi_{t+1} + \rho_y y_t) + \varepsilon_{rt}$$

Heterogenous expectations' DSGM model: new model equations on expectations

$$\pi_{t+1} = \alpha_{1\pi L}\pi_{t-1} + \alpha_{2\pi F}\pi^{*}_{t+1} + \varepsilon_{\pi t} \quad \text{(expectation equation)}$$

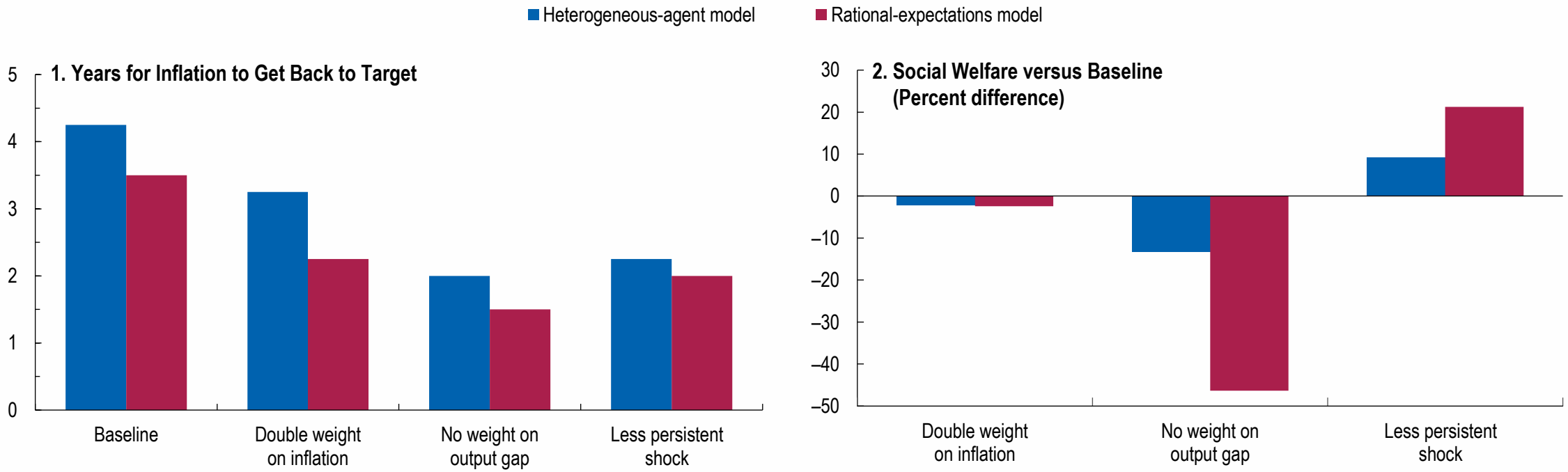
$$\pi^{*}_{t} = \alpha^{*}_{1\pi L}\pi_{t-1} + \alpha^{*}_{2F}\pi^{*}_{t-1} + \varepsilon^{*}_{\pi_t} \quad \text{(long run expectation equation)}$$

$$\pi_{t+1} = \pi^{obs}_{t+1} + \varepsilon^{obs}_{t+1} \quad \text{(measurement equations)}$$

$$\pi^{*}_{t+1} = \pi^{* obs}_{t+1} + \varepsilon^{* obs}_{t+1} \quad \text{(measurement equations)}$$

Optimal monetary policy implies a slow path to get inflation back to target with heterogenous agents.

Policy Objectives, Social Welfare, and Expectations Formation



Source: IMF staff calculations.

Key conclusions and findings

- **How have inflation expectations behaved pre- and post-pandemic?**
  - Near-term inflation expectations rose sharply (up to 4 standard deviation rise).
  - Long-term expectations do not show signs of de-anchoring on average.
  - Inflation is so far roughly in line with the median from historical episodes. On average, it took 3 years to revert to pre-episode inflation rates.

- **How important are expectations for inflation dynamics?**
  - Near-term inflation expectations play a more important role for inflation than long-term measures, with raising explanatory power in the recent period.
  - In emerging markets, past inflation still play a predominant role.
  - The passthrough tends to be higher when inflation is already elevated.