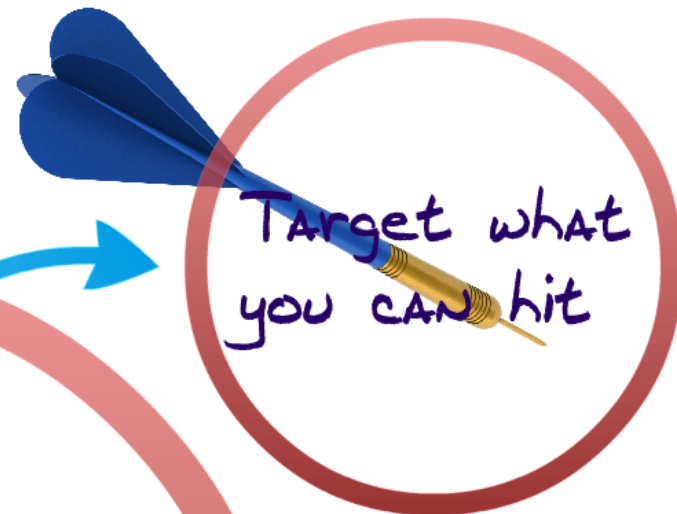# Commodity price swings and Monetary Policy

John Simon, Daniel Leigh, Andrea Pescatori, Ali Alichi, Luis Catao, Ondra Kamenik, Hejin Kim, Douglas Laxton, Rafael Portillo, and Felipe Zanna

Target what you can hit

The Facts

- Commodity prices are volatile and unpredictable

- Commodity prices have greatest effect in emerging and developing economies
  - Higher pass-through
  - Higher food shares
  - Less credibility

The Model

- Small open economy model
- Endogenous credibility
  - Credibility grows by hitting targets
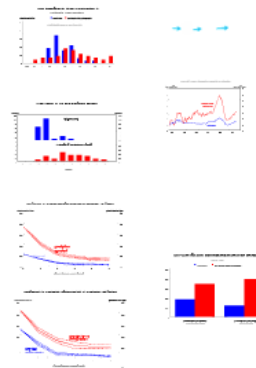- Compare headline and core targets

The Advice

- Targeting underlying inflation helps build credibility and, thus, achieves superior economic outcomes.

- Economies with credible central banks and economic slack can afford to look through high headline inflation caused by commodity prices.

- Food price shocks can have even larger second-round effect in overheating economies - which argues for a more aggressive policy response.
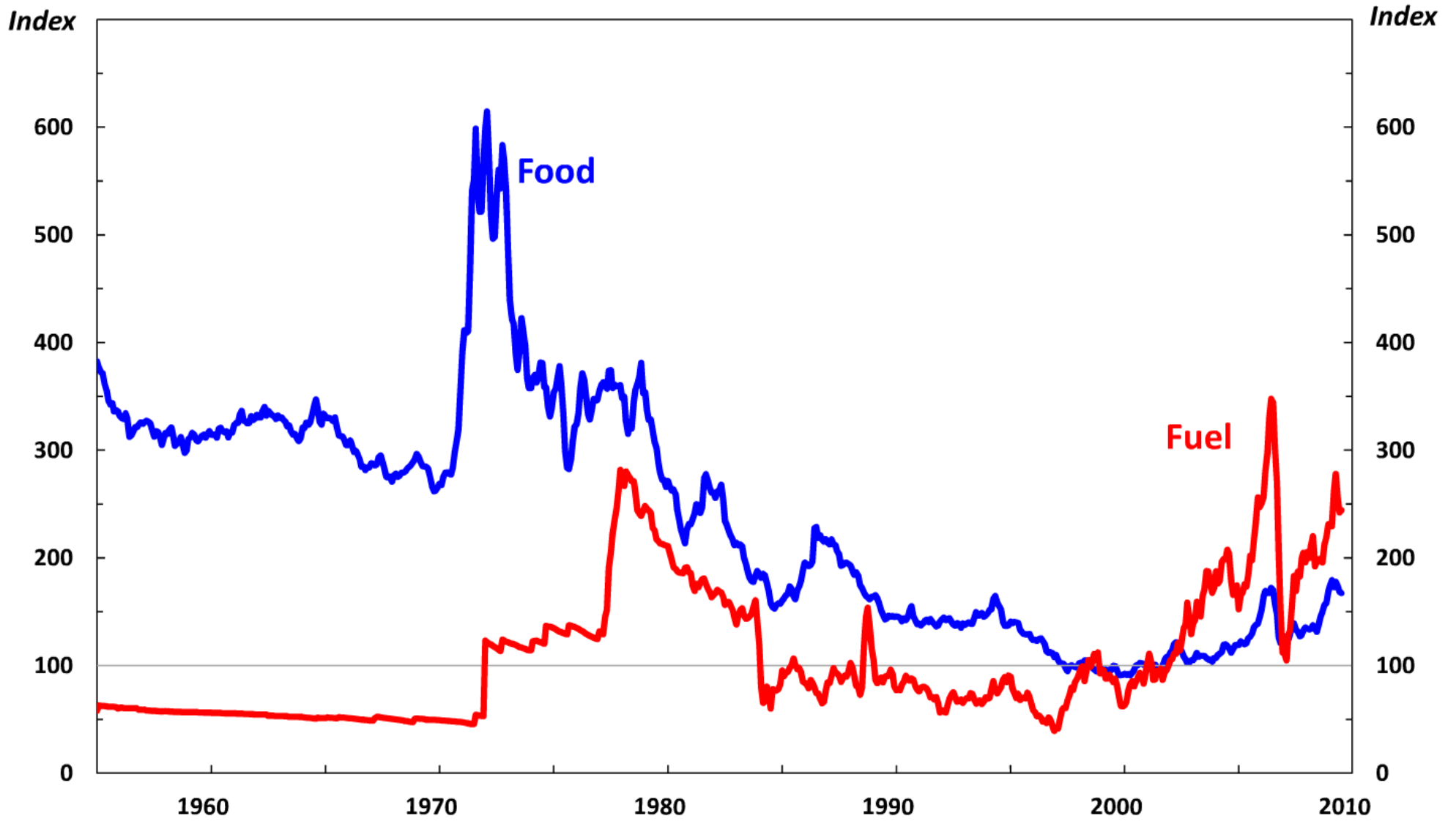
INTERNATIONAL MONETARY FUND
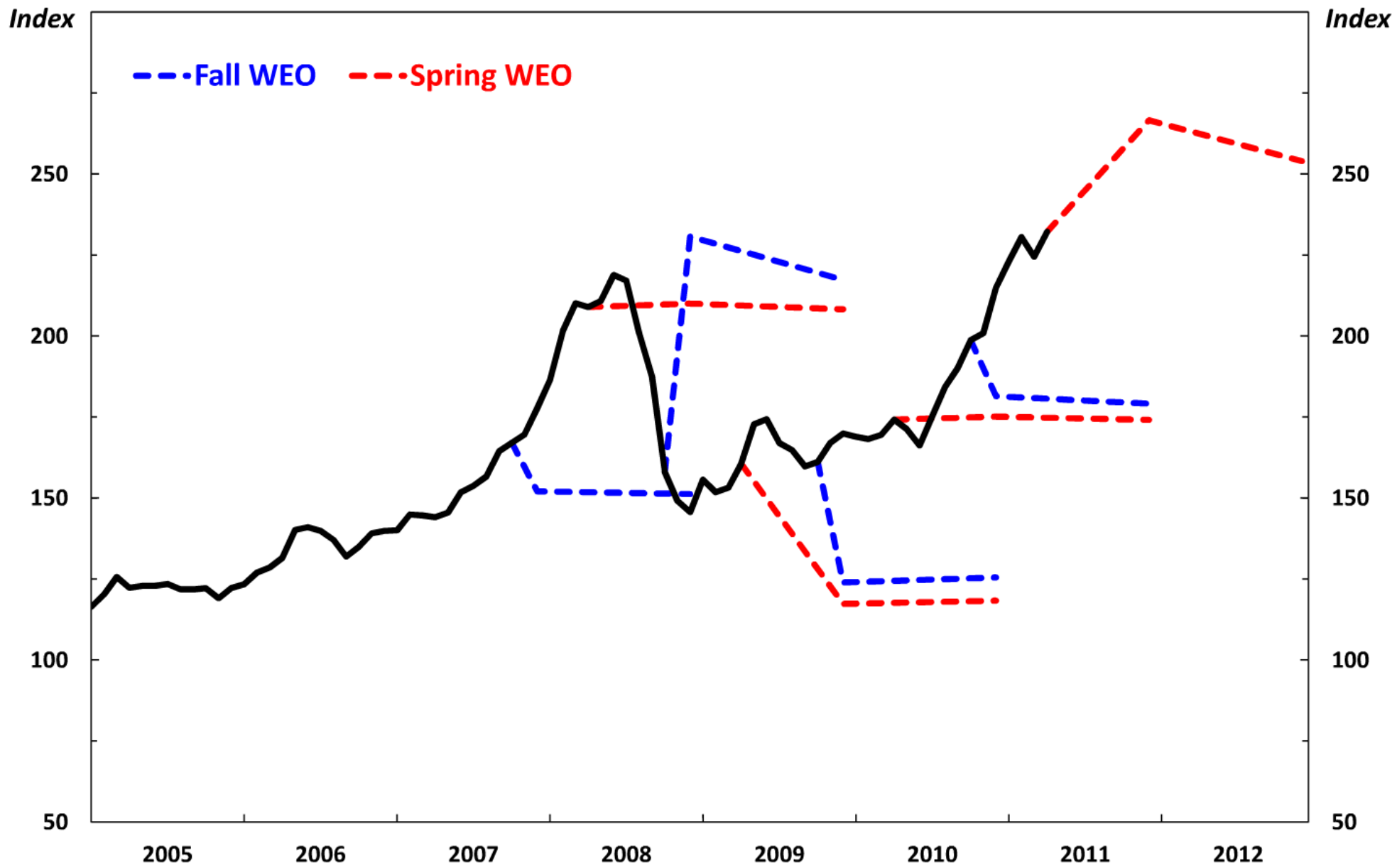
The Facts

- Commodity prices are volatile and unpredictable

- Commodity prices have greatest effect in emerging and developing economies

  - Higher pass-through
  - Higher food shares
  - Less credibility

World Commodity Prices
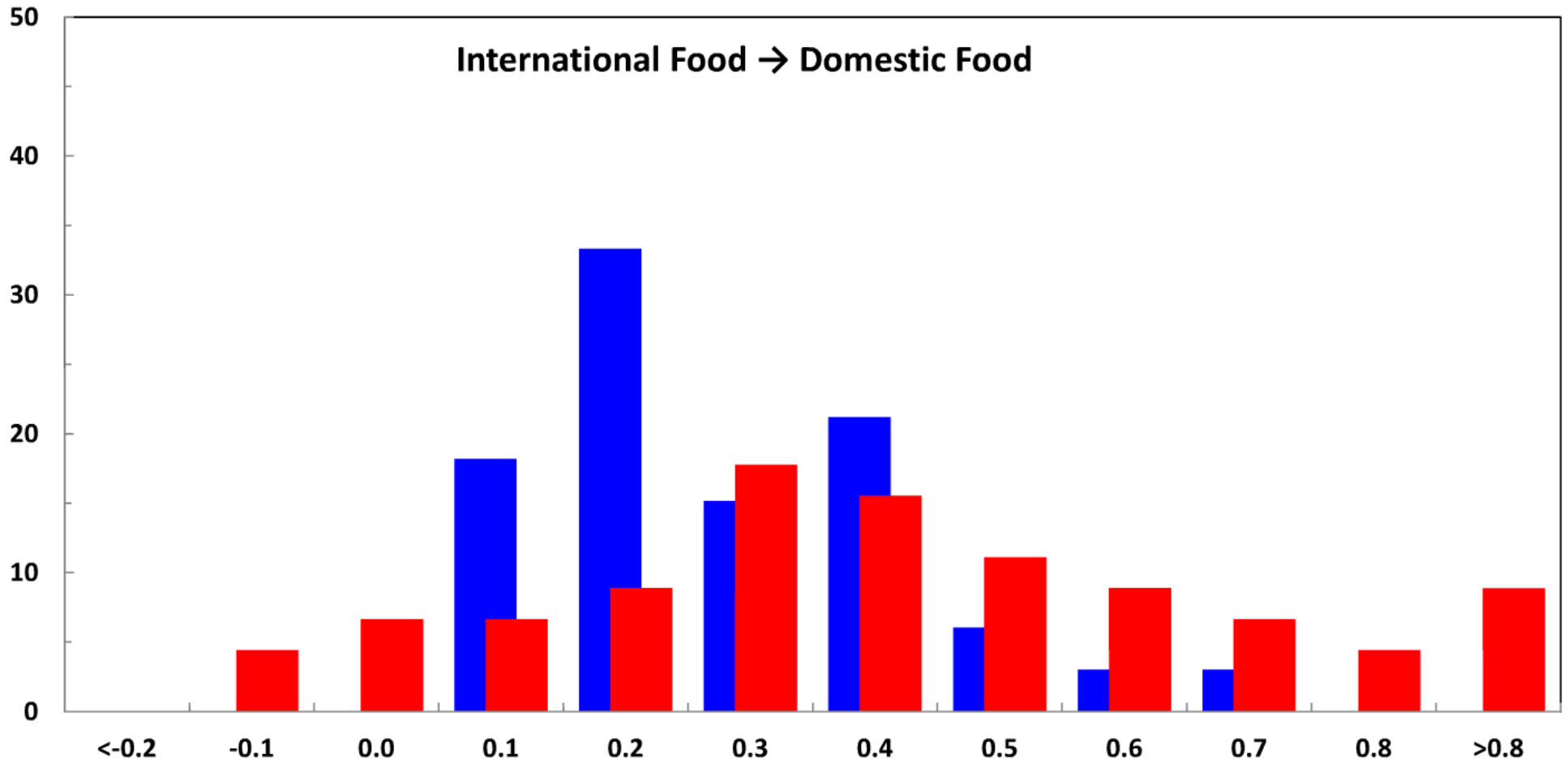
Food Price Forecasts

Pass-Through from World Food Inflation to Domestic Food Inflation

Food Share in the Consumption Basket
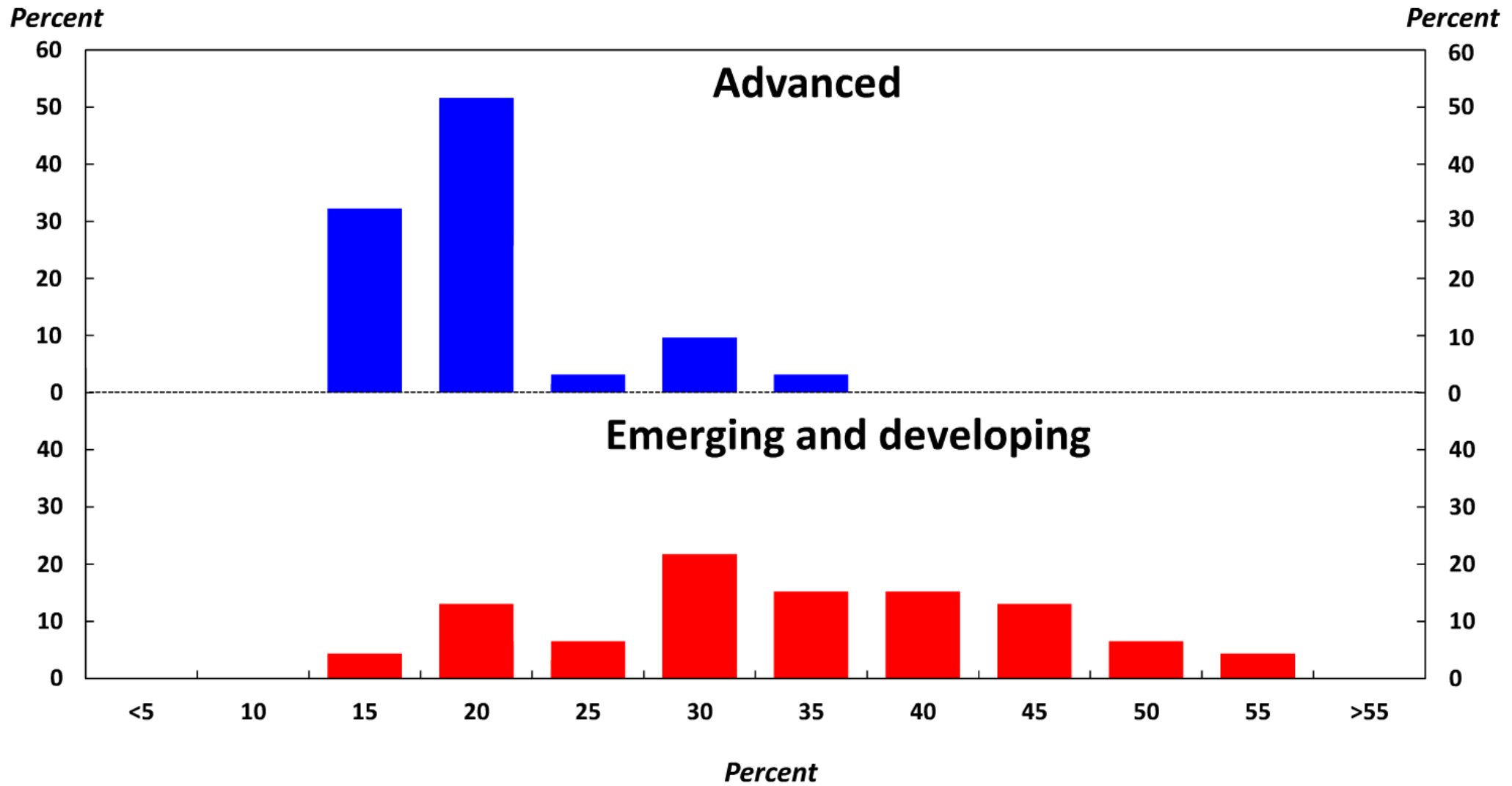
Contribution of Food to Headline Inflation

Response of Inflation Expectations to Inflation Surprises

Response of Inflation Expectations to Inflation Surprises

Percentage points

Percentage points
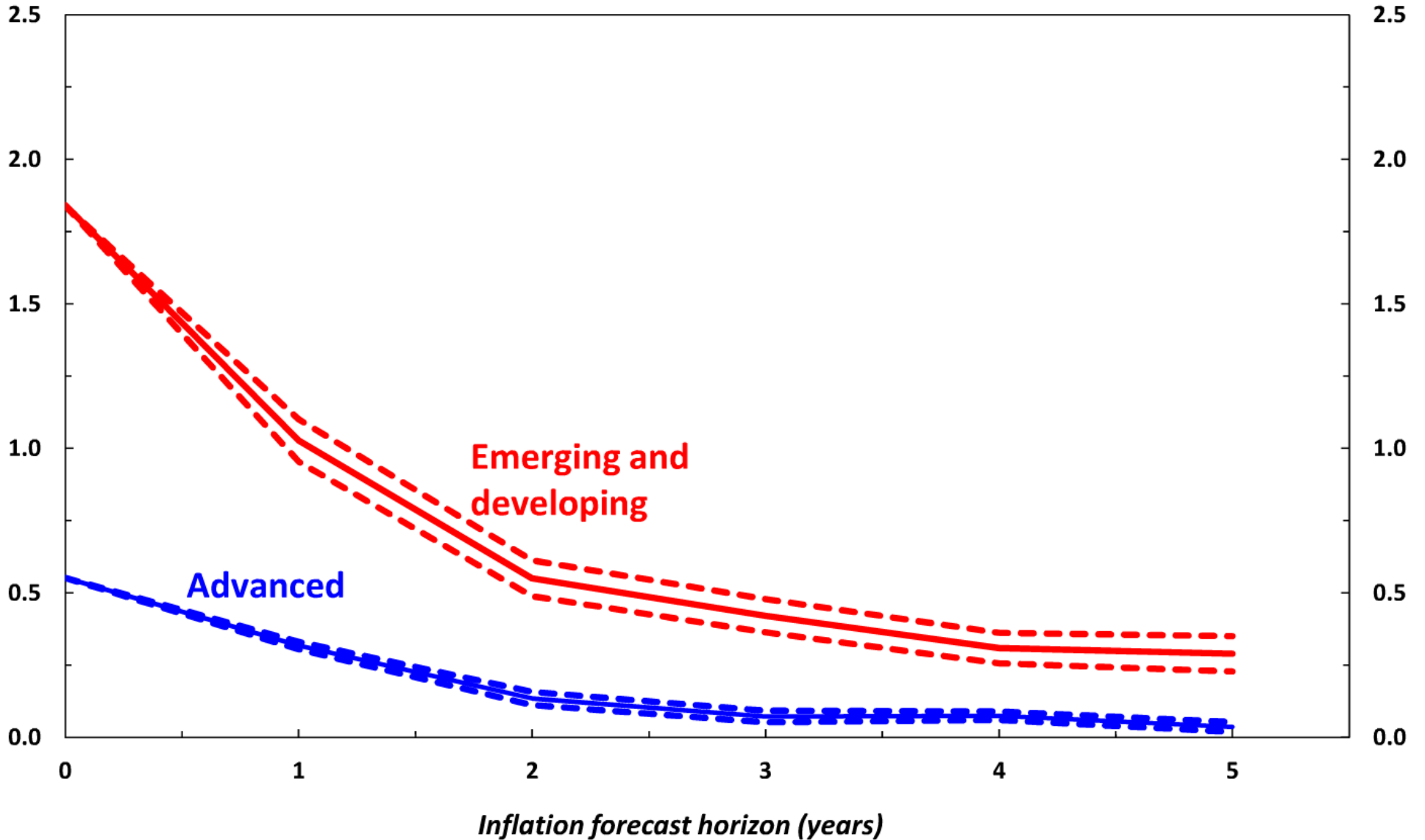
EMs that do not target inflation

EMs that target inflation

Inflation forecast horizon (years)

16
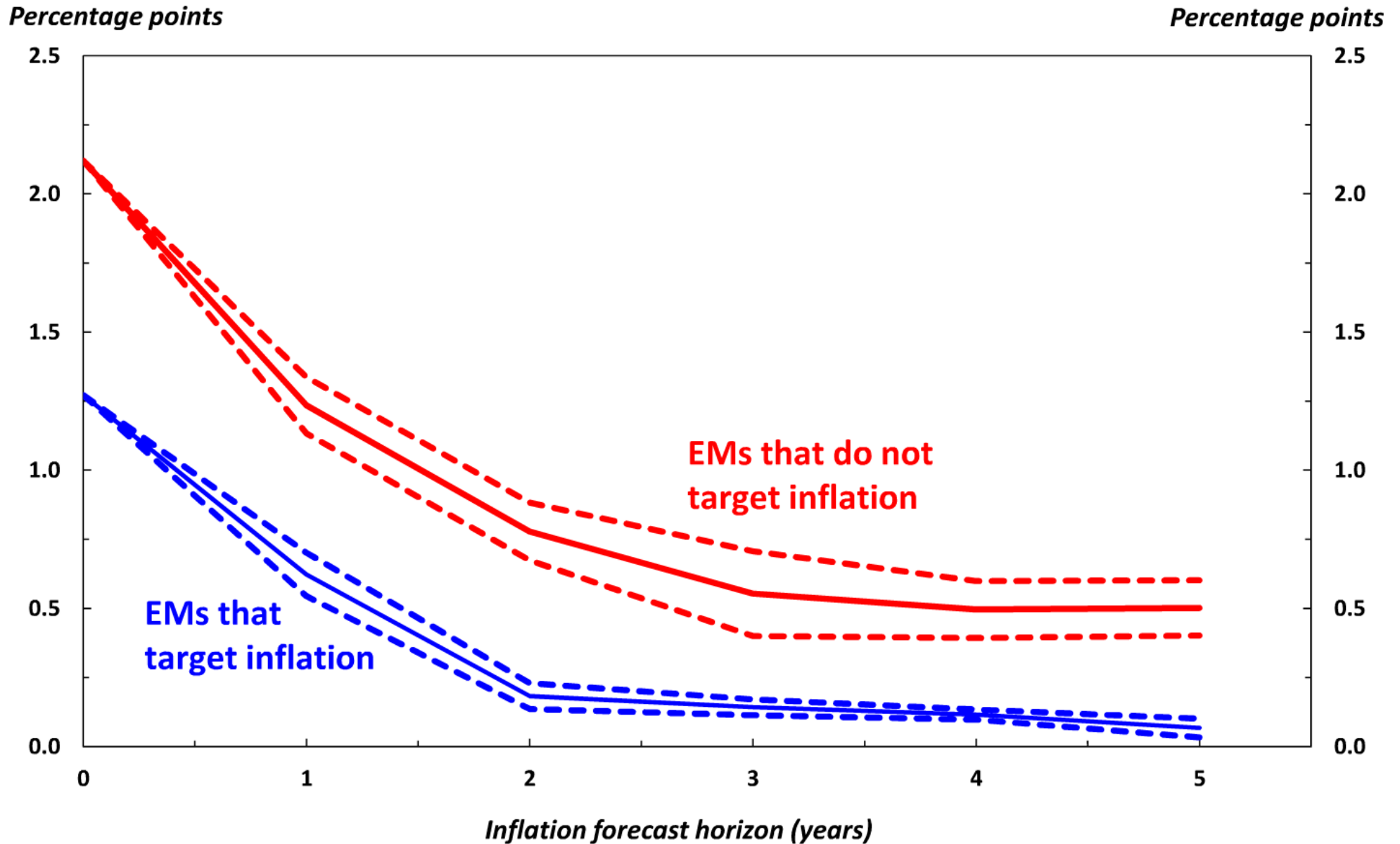
Pass-Through from International to Domestic Food Price Inflation

■ **Advanced**　　■ **Emerging and developing**
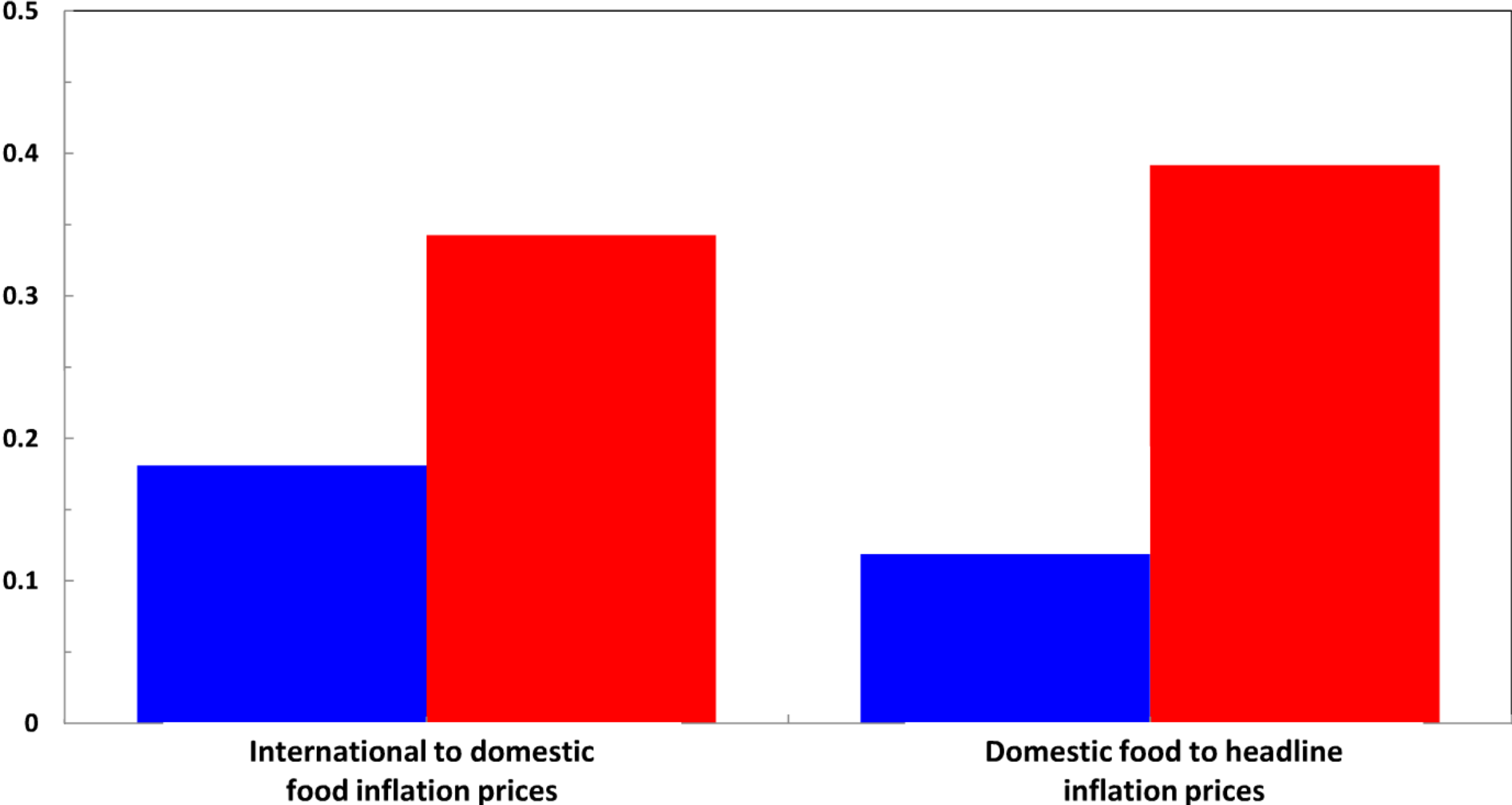
The Model

- Small open economy model
- Endogenous credibility
  - Credibility grows by hitting targets
- Compare headline and core targets

Response to a Food Price Shock in a Stylized Emerging and Developing Economy

Inflation-Output Policy Frontier

Response to a Food Price Shock in a Stylized Advanced Economy

LOWING GROWTH, RISING RISKS
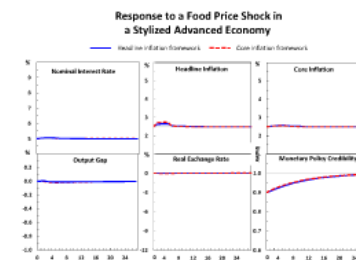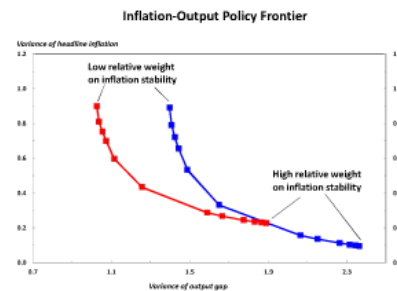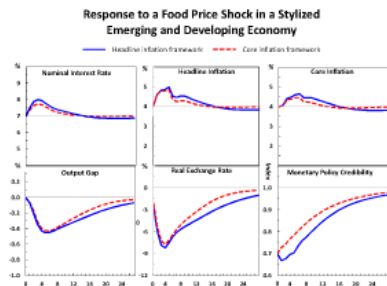
onomies in the Data Set

Emerging and Developing Economies
Albania
Argentina
Bahrain
Bosnia and Herzegovina
Botswana
Brazil
Bulgaria
Chile
Colombia
Croatia
Ecuador
Egypt
Hungary
India
Jordan
Kazakhstan
Kuwait
Latvia
Lebanon
Lithuania
Former Yugoslav Republic of Macedonia
Macao SAR
Malaysia
Mauritius
Mexico
Montenegro
Nigeria
Oman
Pakistan
Peru
Philippines
Poland
Qatar
Romania
Russia
Saudi Arabia
Serbia
South Africa
Thailand
Tunisia
Turkey
Uganda
Ukraine
United Arab Emirates
Uruguay
Venezuela
West Bank and Gaza

(partial row labels at left: ce of China, m)

Appendix 3.2. Technical Appendix

Simulation Model Details

Headline inflation π_t^H is the weighted average of domestic food inflation π_t^F and core inflation π_t:

$$\pi_t^H = (1 - \omega_F)\pi_t + \omega_F\pi_t^F. \tag{3.1}$$

The parameter ω_F represents the share of food in the consumption basket.

A Phillips curve relates current core inflation to past and expected core inflation, previous period output gap x_{t-1}, the change in the real exchange rate change, ΔRER, and a term related to second-round effects from food to core inflation.

$$\pi_t = \alpha\pi_{w,t} + (1 - \alpha)\pi_{b,t-1} + g(x_{t-1}) + \beta_e\Delta RER_t$$
$$+ (1 + \delta - S_t)\omega_F(\pi_{t-1}^F - \pi_{t-1}). \tag{3.2}$$

The function $g(x)$ is increasing and convex in its argument, S is the credibility stock bounded between zero and 1, and α and δ are parameters.[39] The variables π_w and π_b represent the forward- and backward-looking terms of the Phillips curve, which are defined as follows:

$$\pi_{w,t} = S_t\pi_{b,t+4} + (1 - S_t)(\pi_{b,t-1} + bias_t) \tag{3.3}$$

$$\pi_{b,t} = \sum_{i=0}^{4} \frac{\pi_{t-1}}{4}. \tag{3.4}$$

The lower the current credibility stock, S_t, the higher the importance of past inflation and the inflation bias term ($bias$) associated with imperfect credibility. The current stock of credibility has the following law of motion:

$$S_t = \vartheta S_{t-1} + (1 - \vartheta)\sigma_t \tag{3.5}$$

$$\sigma_t = \frac{(m_{h,t} - \pi_t^{tg})^2}{(m_{h,t} - \pi_t^{tg})^2 + (m_{l,t} - \pi_t^{tg})^2}. \tag{3.6}$$

The credibility signal σ_t is bounded between zero and 1, and the parameter ϑ $(0 < \vartheta < 1)$ governs the rate at which credibility converges to σ_t. The variables m_h and m_l represent the inflation rates prevailing in the high- and low-inflation regimes, as perceived by the private sector. The variable π_t^{tg}

[39]The parameter δ is set to zero and 0.25 for the high- and low-credibility cases, respectively.

represents the inflation measure for which the central bank is held accountable. The closer π_t^{tg} is to the high-inflation level, the greater the loss in credibility. The perceived inflation rates prevailing in the high- and low-inflation regimes are as follows:

$$m_{h,t} = \alpha_h\pi_{t-1}^{tg} + (1 - \alpha_h)\pi^{high} \tag{3.7}$$

$$m_{l,t} = \alpha_l\pi_{t-1}^{tg} + (1 - \alpha_l)\pi^{low} . \tag{3.8}$$

We interpret π^{low} as the (constant) target chosen by the central bank, and we assume $\pi^{high} \gg \pi^{low}$ such that we can focus on cases where $\pi_t^{tg} \le m_{h,t}$ at all times. The lowest level of credibility occurs when $m_{h,t} = \pi_t^{tg}$, implying that credibility, S_t, declines to zero at rate ϑ.

The choice of the framework boils down to the choice of π_t^{tg}. In the case of the core framework, we have $\pi_t^{tg} = \sum_{i=0}^{4} \frac{\pi_{t-1}}{4}$, while in the case of the headline framework we have $\pi_t^{tg} = \sum_{i=0}^{4} \frac{\pi_{t-1}^H}{4}$.

The output gap is governed by an intertemporal aggregate demand (IS) equation that links the output gap to the previous period real rate, r_{t-1}, and the current real exchange rate, RER. An uncovered interest parity equation relates the nominal policy interest rate, R_t, to the expected depreciation of the nominal exchange rate, e_t. All φs are positive parameters. Asterisks indicate values for the rest of the world.

$$x_t = \varphi_1 x_{t-1} + \varphi_2 E_t x_{t+1} - \varphi_r(r_{t-1} - r)$$
$$+ \varphi_e(RER_t - RER), \tag{3.9}$$

$$R_t = R_t^* + \varphi_u(E_t e_{t+1} - e_t). \tag{3.10}$$

Finally, other equations that close the model are the definitions of the inflation bias, the real exchange rate, and the real rate, which is:

$$r_t = R_t - E_t\pi_{t+1}^H. \tag{3.11}$$

The domestic food price is

$$\pi_t^F = 0.6\pi_t + 0.4(\pi_t^{*F} + \Delta e_t), \tag{3.12}$$

where π_t^{*F} is the international food-inflation process, which is taken as exogenous:

$$\pi_t^{*F} = \rho\pi_{t-1}^{*F} + \varepsilon_t. \tag{3.13}$$

In the calibration, we set the persistence parameter, ρ, equal to zero and 0.5 for temporary and persistent shocks, respectively.

Analysis of Pass-through from International Food Prices to Domestic Food Prices

The pass-through analysis is based on a country-by-country regression of monthly domestic food price inflation on current and 12 lags of monthly international commodity price inflation (converted to domestic currency), controlling for 12 lags of domestic food price inflation. The economies included in the database are listed in Appendix 3.1. The regression is run on the inflation rates because, despite long-term trends in the price levels, there is no evidence of a long-term relationship between the world food price index and domestic CPI food baskets. (Likely reasons for this are discussed in the section "From International to Domestic Commodity Prices.") In particular, the estimated equation is as follows:

$$\pi_t^{dom} = \sum_{j=1}^{12} \beta_j\pi_{t-j}^{dom} + \sum_{k=0}^{12} \gamma_k\pi_{t-k}^{int} + \varepsilon_{i,t}, \tag{3.14}$$
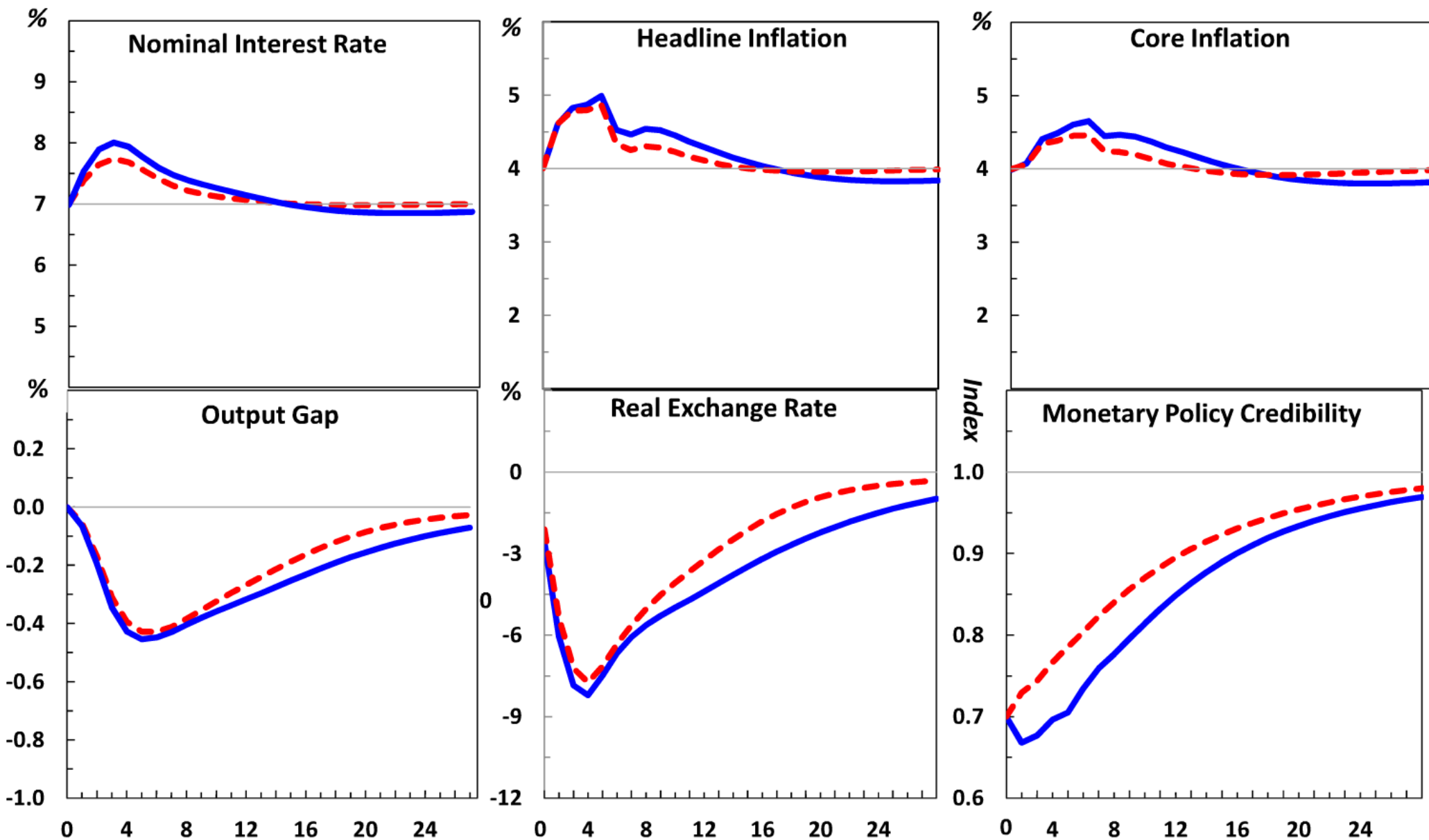
where π_t^{dom} denotes domestic food inflation in month t, and π_{t-k}^{int} denotes international food inflation in month t. The long-term pass-through coefficient is computed as the sum of the coefficients on international food price inflation (γ_k) divided by 1 minus the sum of the coefficients on lagged domestic food inflation (β_j). An analogous equation is estimated to investigate the pass-through from international oil prices to domestic transportation prices. The sample includes 31 advanced economies and 47 emerging and developing economies over the period 2000–11. The long-term coefficients are generally statistically significant.

Analysis of Inflation Expectations

The change in future inflation expectations is the dependent variable on the left side of equation 3.15, and the explanatory variable on the right side is the unexpected change in current-year inflation, defined as the revision of expectations for inflation in year
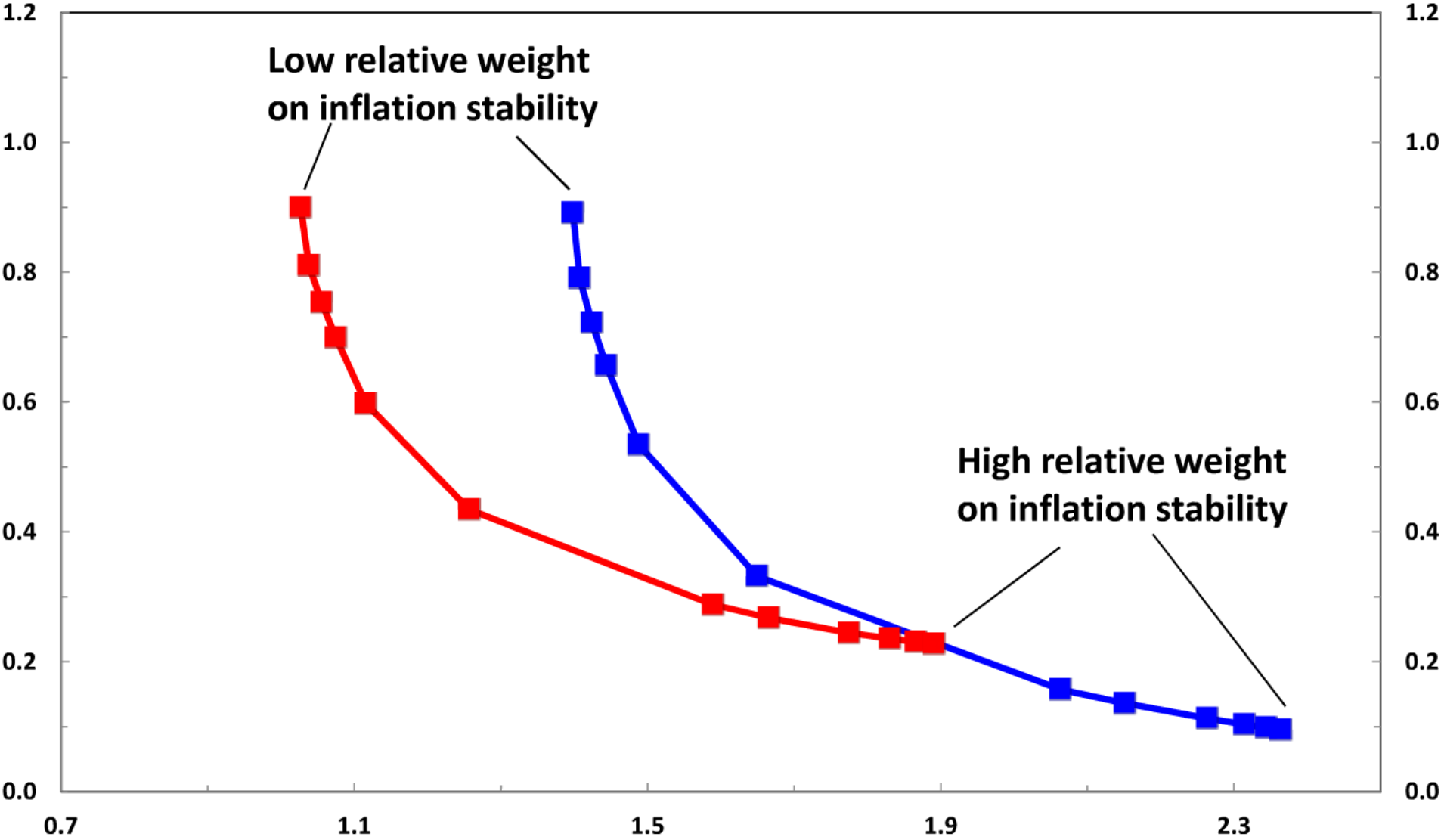
Response to a Food Price Shock in a Stylized Emerging and Developing Economy

Legend: Headline inflation framework (solid blue line) — Core inflation framework (dashed red line)

Panels: Nominal Interest Rate (%), Headline Inflation (%), Core Inflation (%), Output Gap (%), Real Exchange Rate (%), Monetary Policy Credibility (Index)

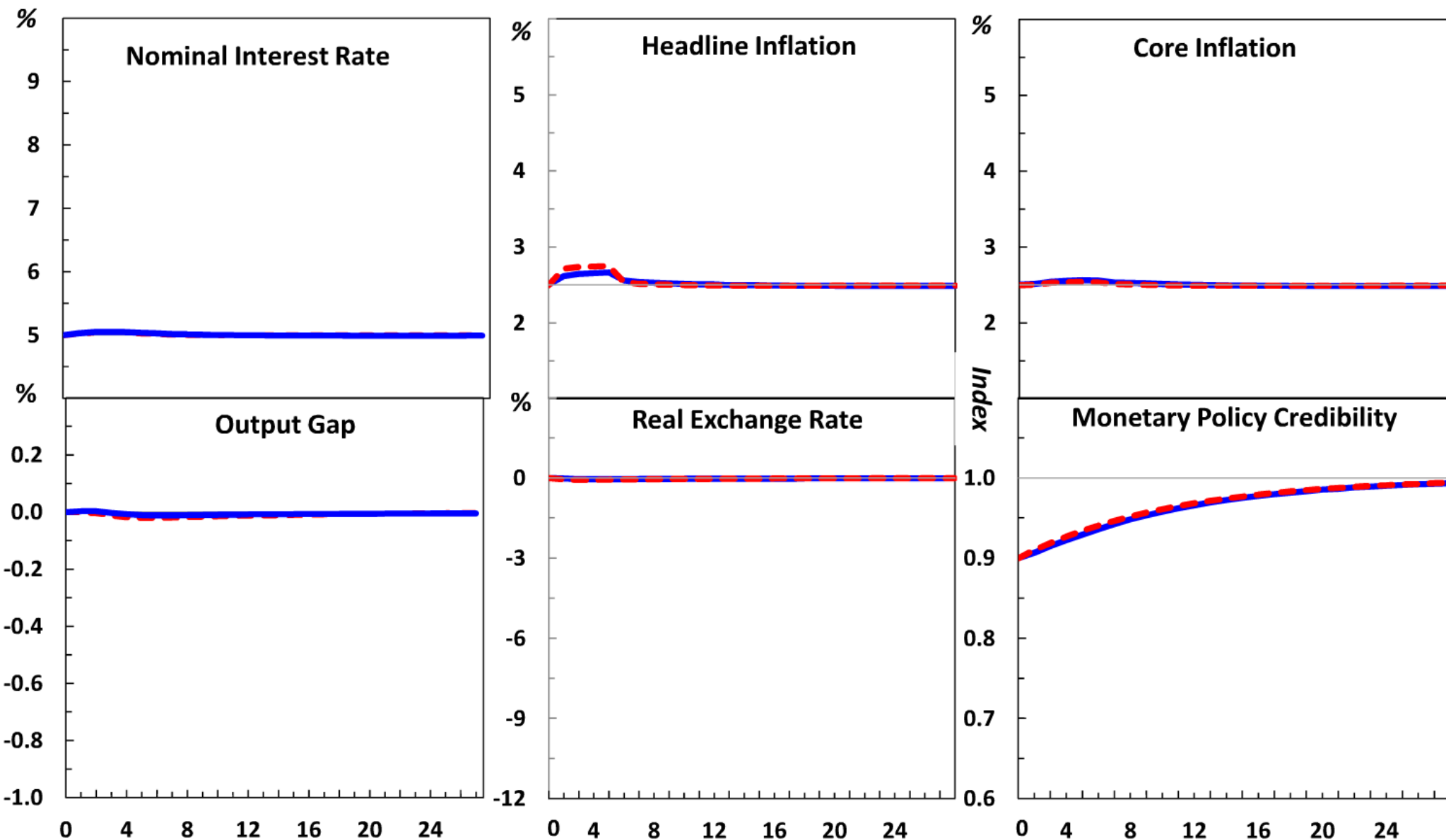**Inflation-Output Policy Frontier**

Variance of headline inflation

Low relative weight
on inflation stability

High relative weight
on inflation stability

Variance of output gap

Response to a Food Price Shock in a Stylized Advanced Economy

——— Headline inflation framework   **- - - - Core inflation framework**

The Advice

- Targeting underlying inflation helps build credibility and, thus, achieves superior economic outcomes.

- Economies with credible central banks and economic slack can afford to look through high headline inflation caused by commodity prices.

- Food price shocks can have even larger second-round effect in overheating economies - which argues for a more aggressive policy response.

Target what you can hit