ASIA AND PACIFIC DEPARTMENT

State-Dependent Exchange Rate Pass-Through

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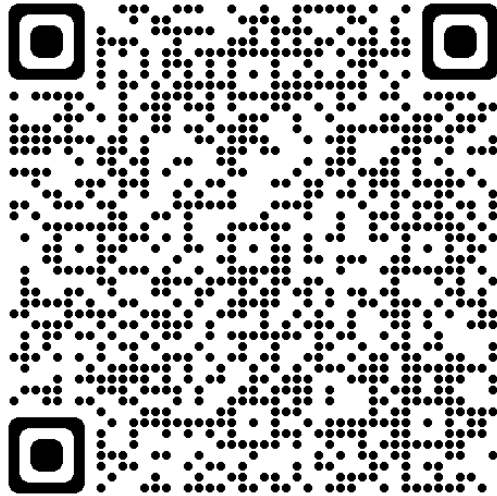
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State-Dependent Exchange Rate Pass-Through

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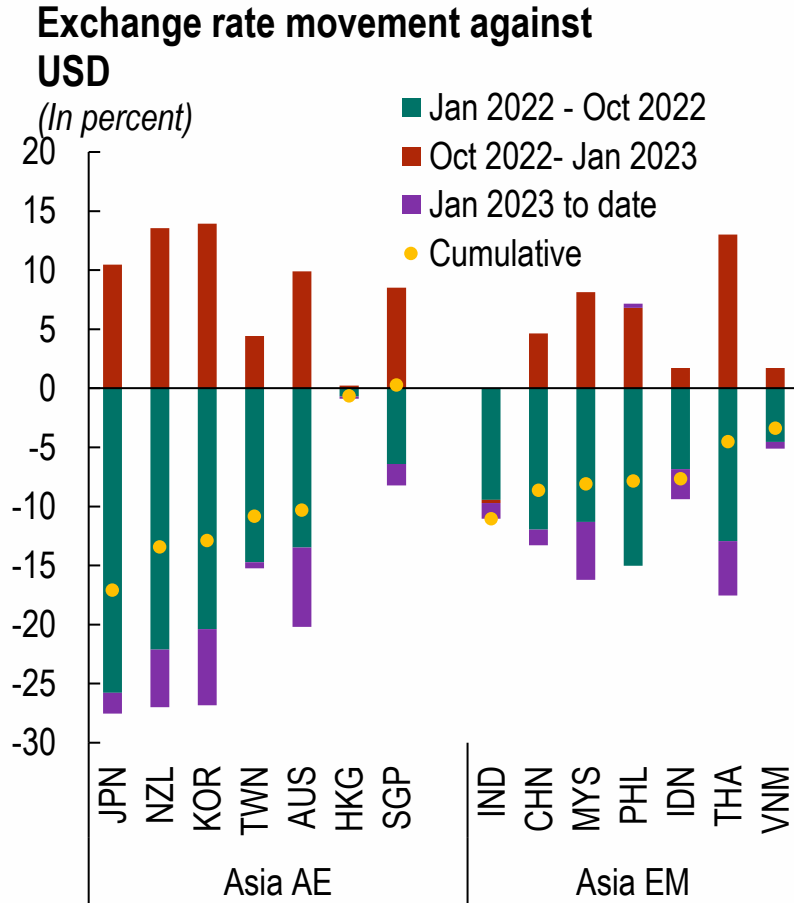
WORKING PAPER
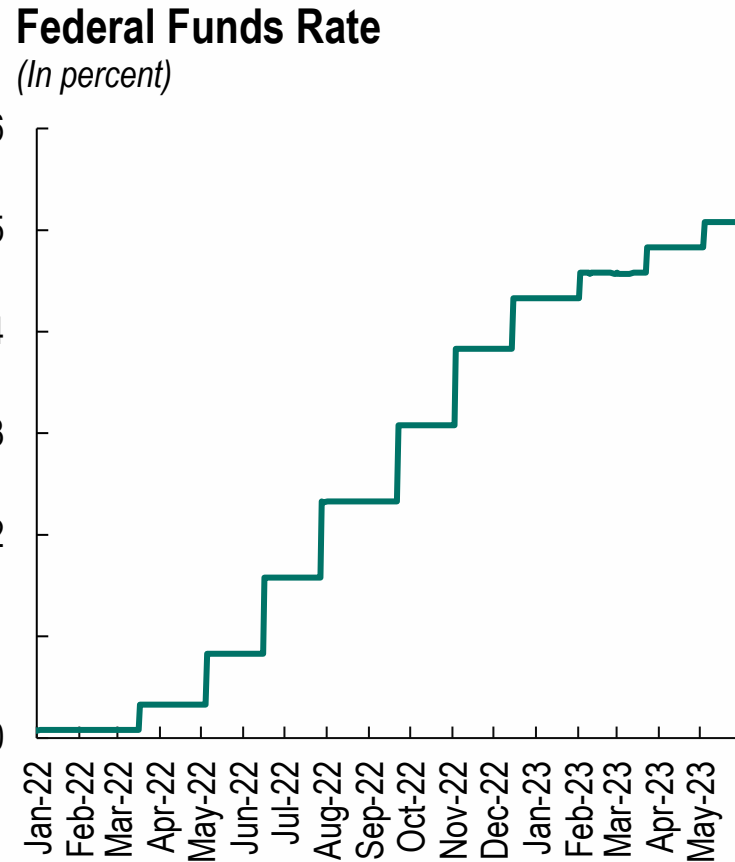
2023 APR

Motivation

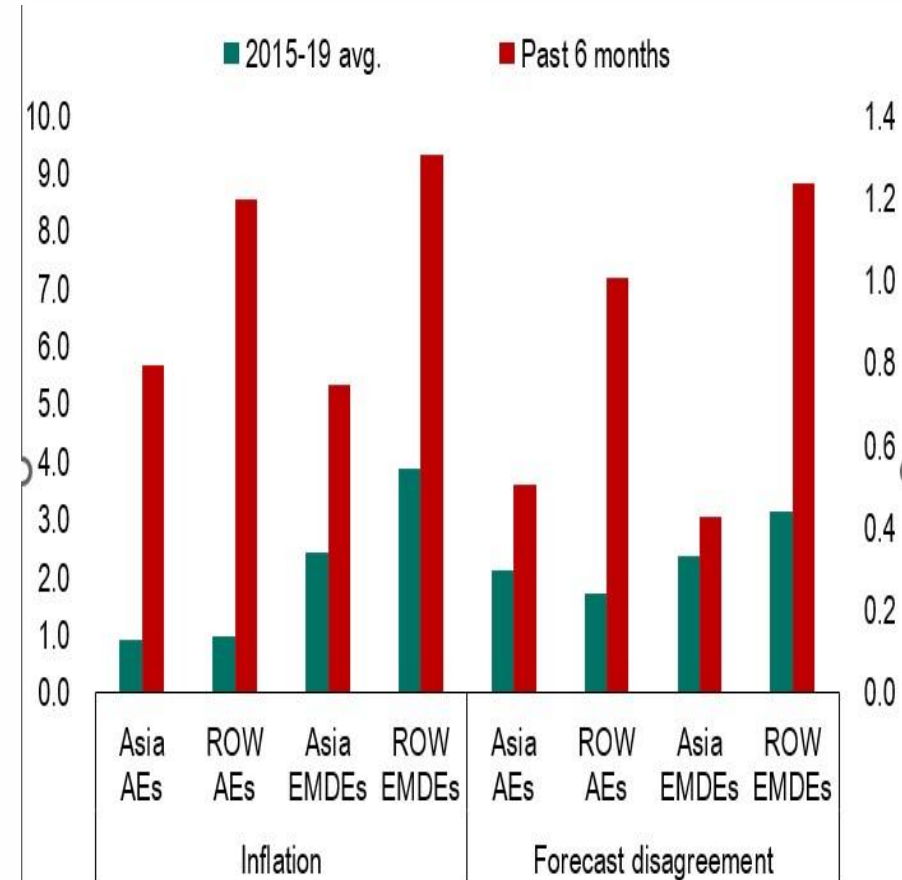**Strong exchange rate fluctuations in local currencies against the USD…**

…caused by monetary policy tightening cycle in the US…

…amid elevated inflation and uncertainty.

Exchange rate movement against USD
(In percent)

Legend:
- Jan 2022 - Oct 2022
- Oct 2022- Jan 2023
- Jan 2023 to date
- Cumulative

Asia AE: JPN, NZL, KOR, TWN, AUS, HKG, SGP
Asia EM: IND, CHN, MYS, PHL, IDN, THA, VNM

Federal Funds Rate
(In percent)

Source: Haver Analytics and IMF staff calculations.

Legend: 2015-19 avg., Past 6 months

Asia AEs, ROW AEs, Asia EMDEs, ROW EMDEs — Inflation

Asia AEs, ROW AEs, Asia EMDEs, ROW EMDEs — Forecast disagreement

- Motivated with these developments,

  - We are documenting exchange rate pass-through into consumer and import prices, and inflation expectations:

- How does it change over time, and in periods of high inflation and uncertainty?

- How does it vary across countries and examine the role of country characteristics?

- And when are they driven by US monetary policy tightening?

- Baseline: $$p_{i,t+h} - p_{i,t-1} = \boldsymbol{\beta_h} \Delta ER_{i,t} + \sum_{l=0}^{12} \theta_l^Z Z_{i,t-l} + \delta_i + \delta_t + \epsilon_{i,t}$$

  ▶ $\boldsymbol{\beta_h}$: Response of prices to a 1% increase (depreciation) in local currency/USD at horizon h

  ▶ $p_{i,t}$: Log CPI (or log import price index; log inflation expectations)

  ▶ $\Delta ER_{i,t}$: Log change in bilateral exchange rate (local currency/USD)

  ▶ $Z_{i,t}$: Output gap, lag inflation, lag change in exchange rate

- State/country-dependent: $$p_{i,t+h} - p_{i,t-1} = \beta_h^{\boldsymbol{g}} \boldsymbol{X_g} \times \Delta ER_{i,t} + \sum_{l=0}^{12} \theta_l^Z Z_{i,t-l} + \delta_i + \delta_t + \epsilon_{i,t}$$

  ▶ $\boldsymbol{X_g}$ country/time indicator dummy

- Sample (46 countries)—larger unbalanced sample as robustness check

  - 28 AEs and 18 EMs for the period 1990m1-2022m10

# Significant pass-through—high heterogeneity across countries

10% depreciation implies a 1.6% rise in consumer prices in 12-month

Average Exchange Rate Pass-Through

Sources: Haver Analytics; IMF staff calculations.
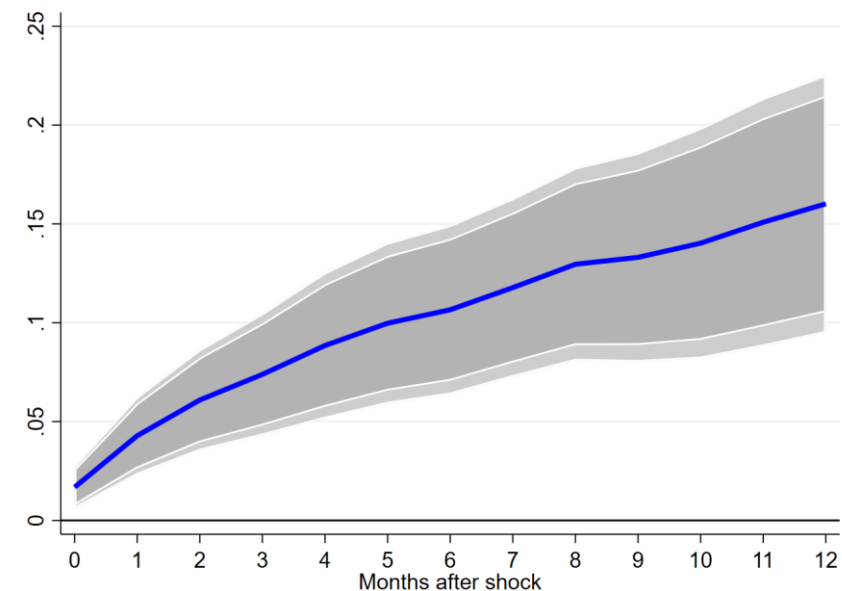
..with pass-through being lower in AEs than EMs

Exchange Rate Pass-Through Difference between AEs and EMs

Sources: Haver Analytics; IMF staff calculations.
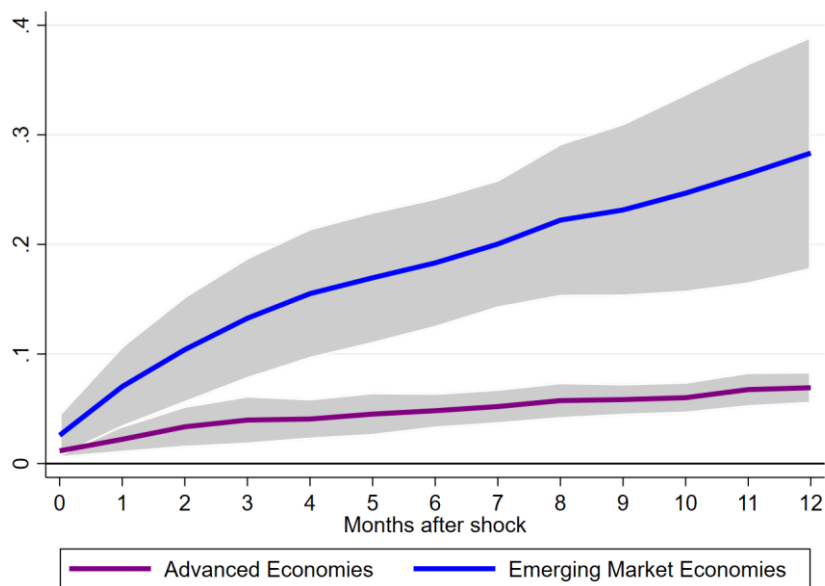
…and the pass-through variation across geographical regions is limited.

Exchange rate pass-through across different regions
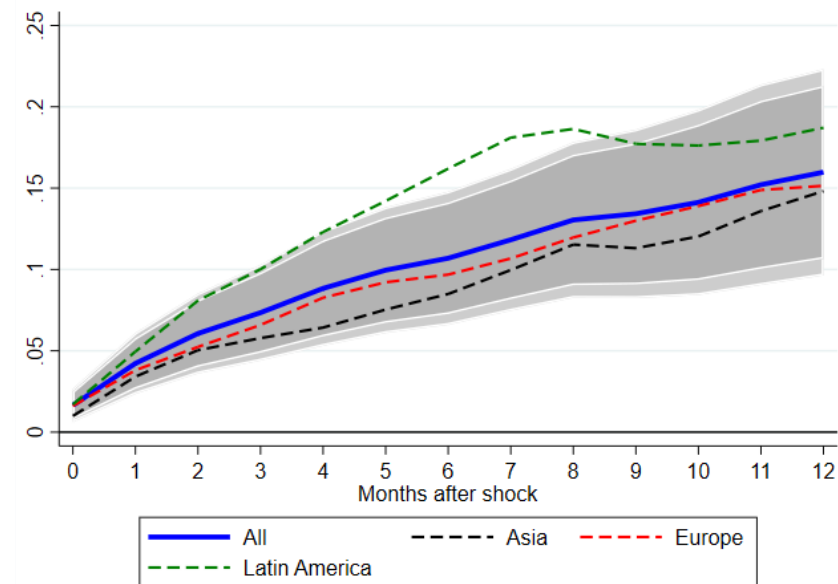
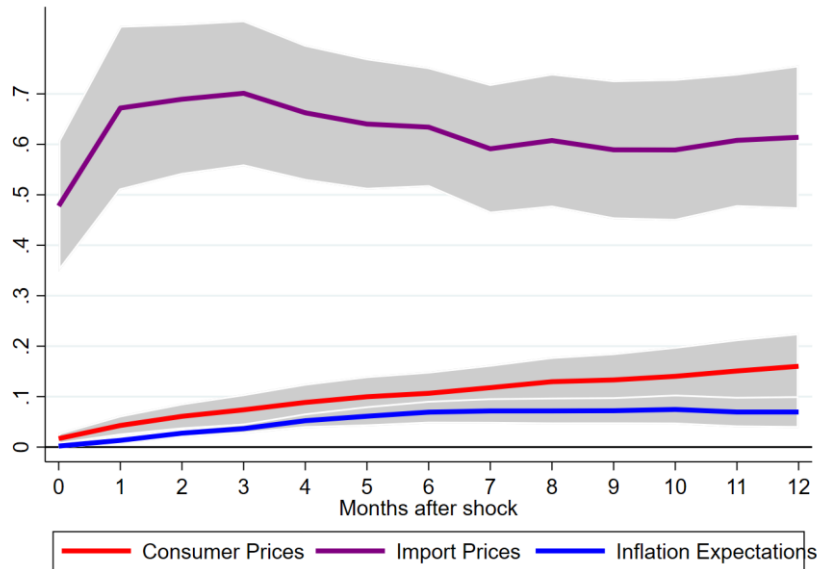Sources: Haver Analytics; IMF staff calculations.

# ...especially for the impacts on inflation expectations

Instant pass-through into import prices, slowly building for consumer prices and inflation expectations…

Pass-Through into Different Variables

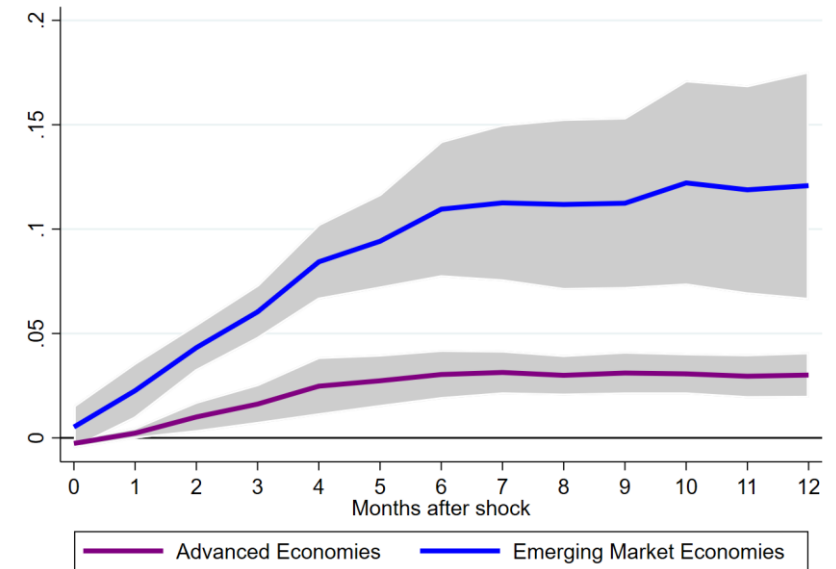

Sources: Haver Analytics; IMF staff calculations.

Pass-through into import prices are broadly similar between AEs and EMs, but..

Pass-Through into Import Prices: AE vs EM

Sources: Haver Analytics; IMF staff calculations.
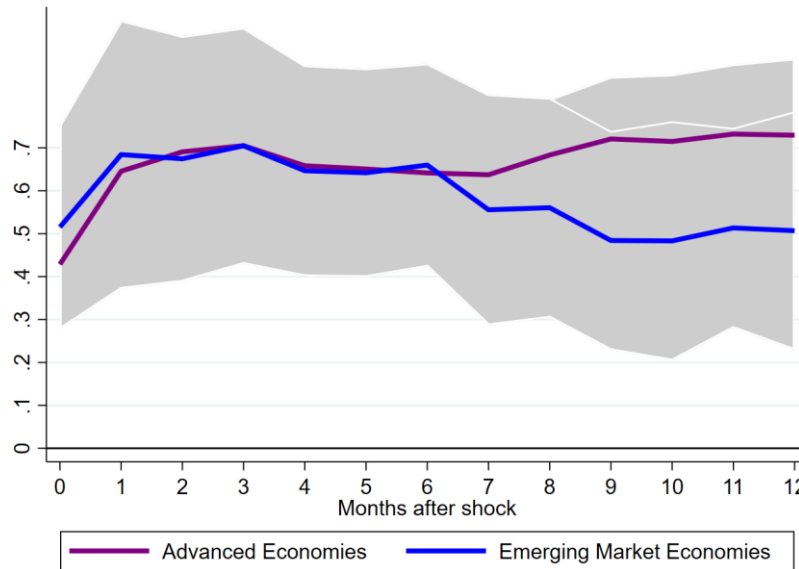
larger effects on inflation expectations in EMs

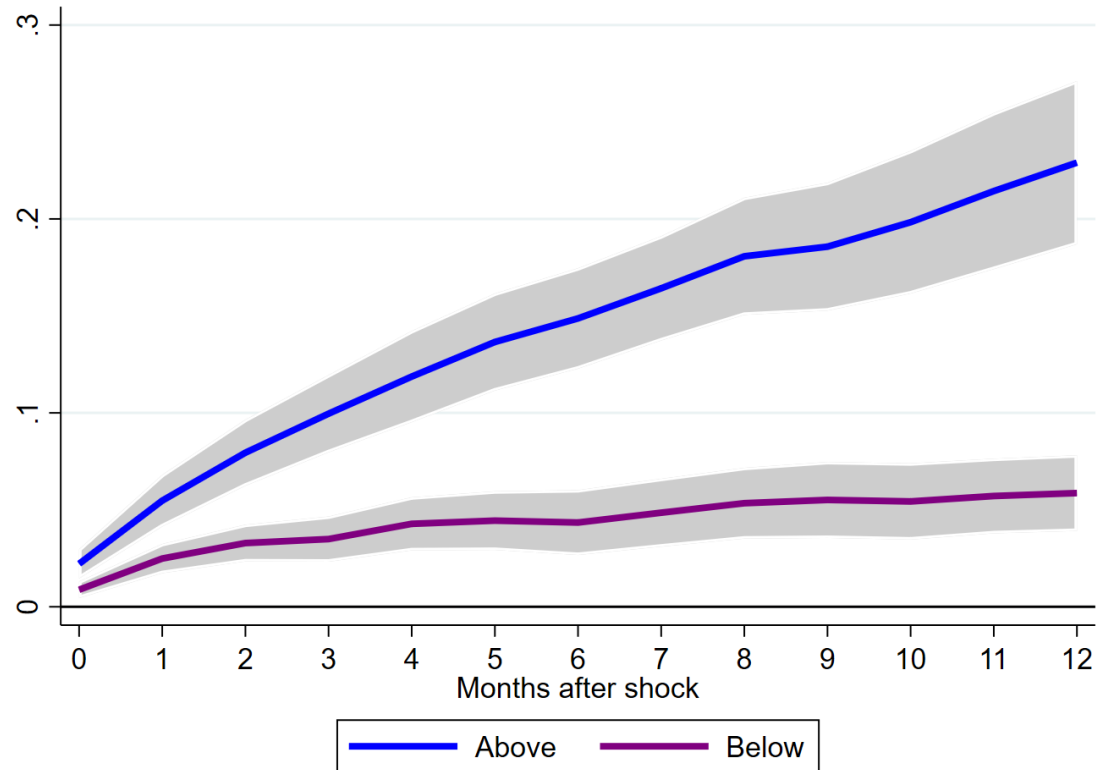### Pass-Through into Inflation Expectations: AE vs EM

Sources: Haver Analytics; IMF staff calculations.

Larger pass-through during high inflation

A depreciation in local currency/USD has more pressure on prices when inflation is above median...

...and pass-through is even much higher when inflation exceeds a certain threshold (4th Quartile).

Pass-Through Heterogeneity with Inflation: Low vs High

Sources: Haver Analytics; IMF staff calculations.

Pass-Through Heterogeneity with Inflation: Quartiles

Sources: Haver Analytics; IMF staff calculations.

Detailed Statistics

Larger pass-through during high uncertainty...

A depreciation in local currency/USD has more pressure on consumer prices when uncertainty is higher than median...
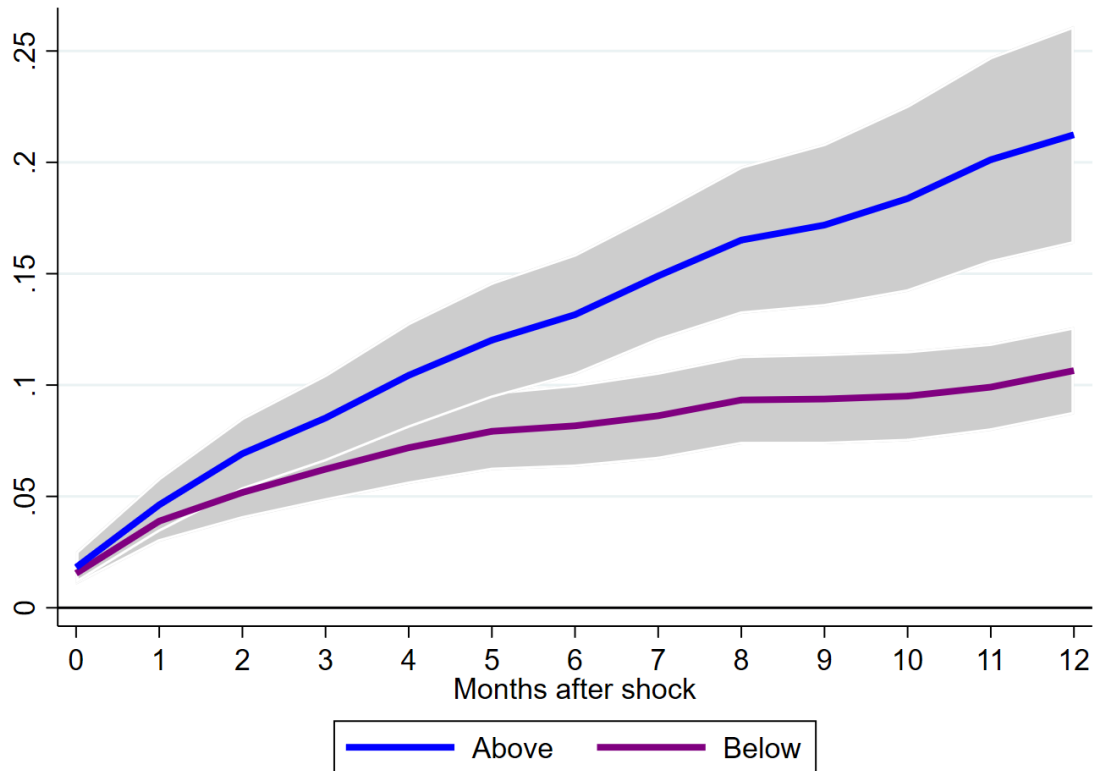
...and similar result for pass-through into inflation expectation.

Pass-Through Heterogeneity with Uncertainty: Consumer Prices

Pass-Through Heterogeneity with Uncertainty : Inflation Expectations

Sources: Haver Analytics; IMF staff calculations.

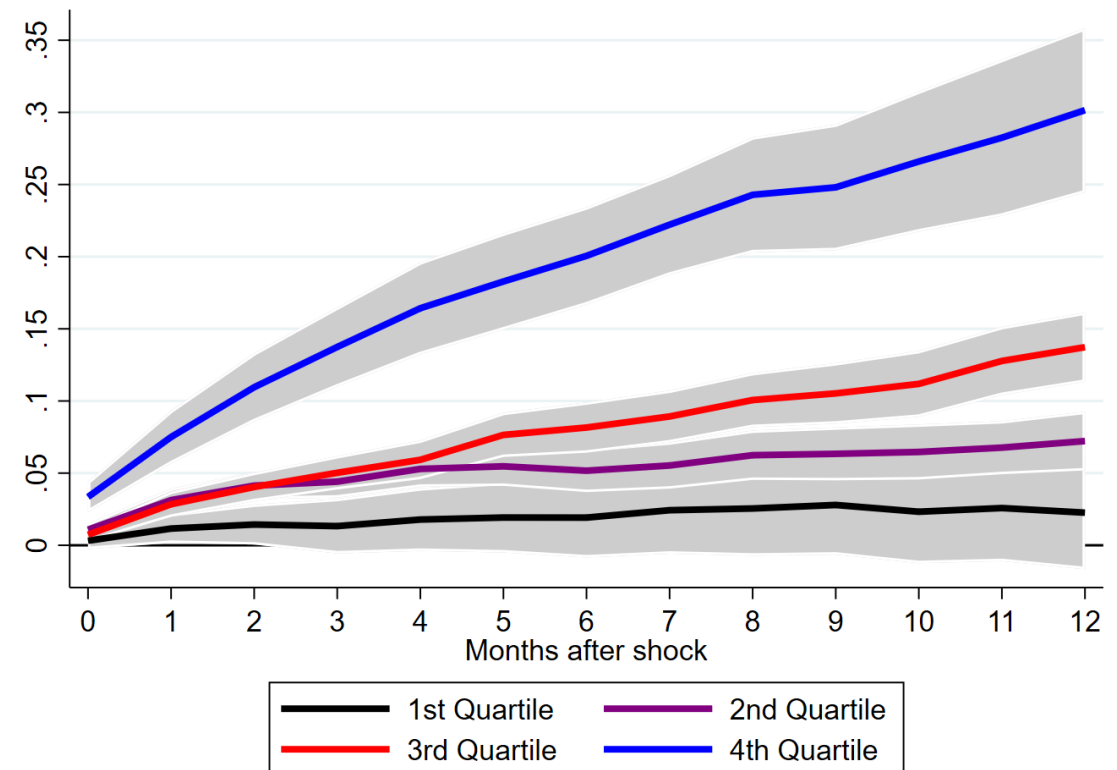Sources: Haver Analytics; IMF staff calculations.

Role of inflation anchoring determines the pass-through level

Stronger consumer prices and inflation expectations pass-through for countries with higher disagreement on inflation expectations.
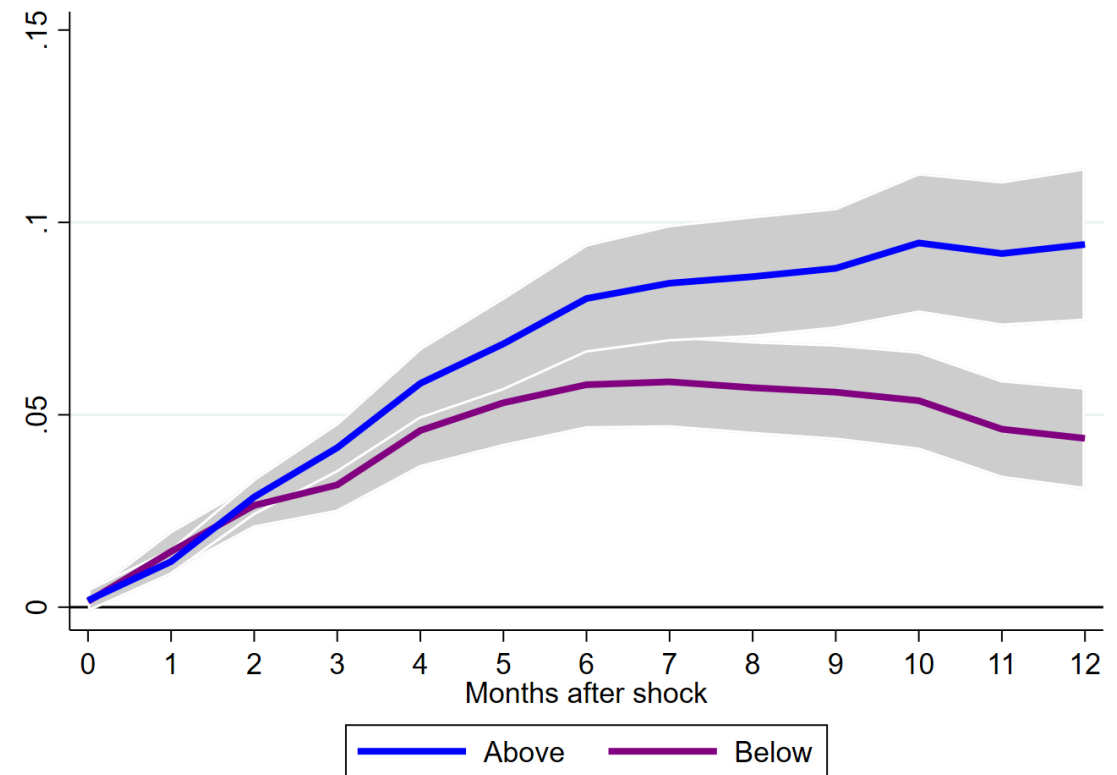

Pass-Through Heterogeneity with Inflation Uncertainty: Consumer Prices
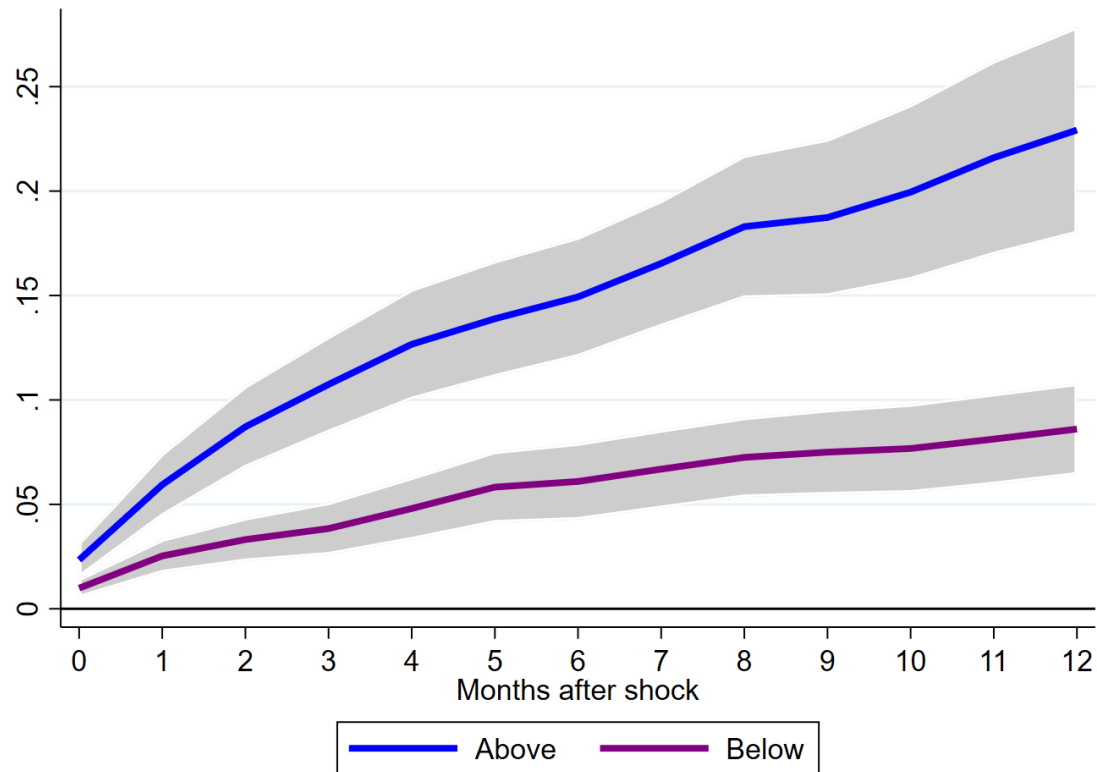
Sources: Haver Analytics; IMF staff calculations.

Pass-Through Heterogeneity with Inflation Uncertainty: Inflation Expectations
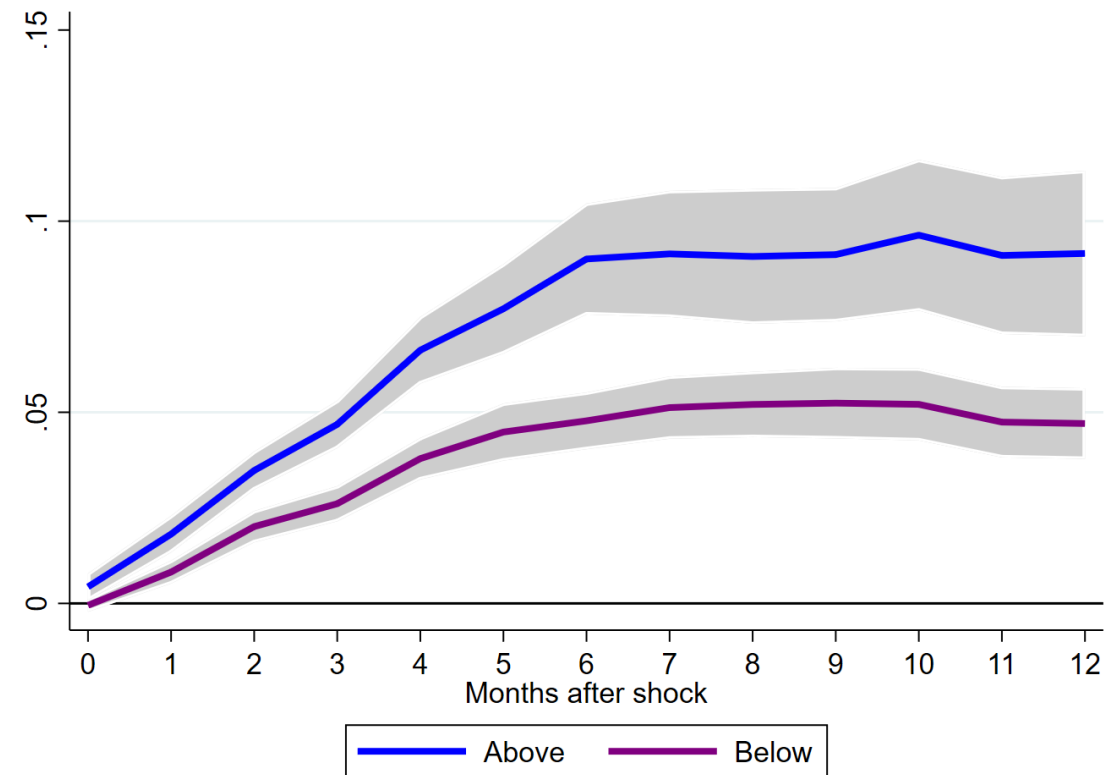
Sources: Haver Analytics; IMF staff calculations.

Exchange rate pass-through on consumer prices is higher in countries with higher USD invoice share of imports...

Pass-Through Heterogeneity with Currency of Invoice: Consumer Prices
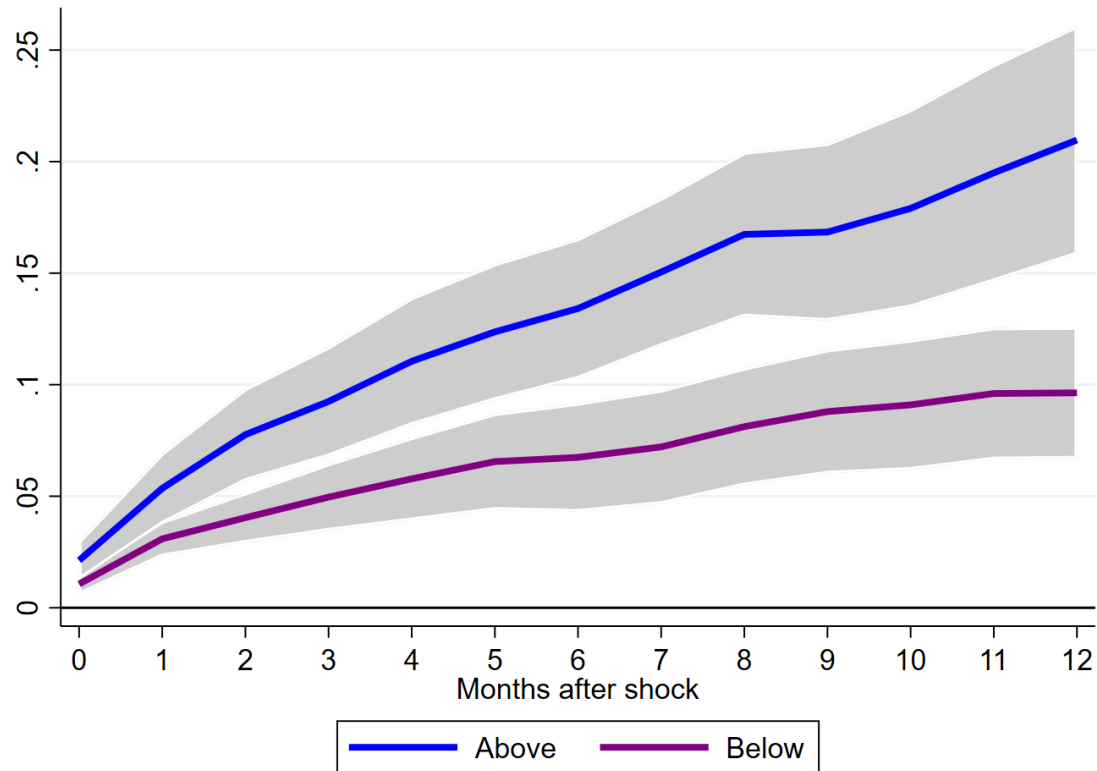
Sources: Haver Analytics; IMF staff calculations.

...and the difference is also apparent when we compare the pass-through into import prices.

Pass-Through Heterogeneity with Currency of Invoice: Import Prices

Sources: Haver Analytics; IMF staff calculations.
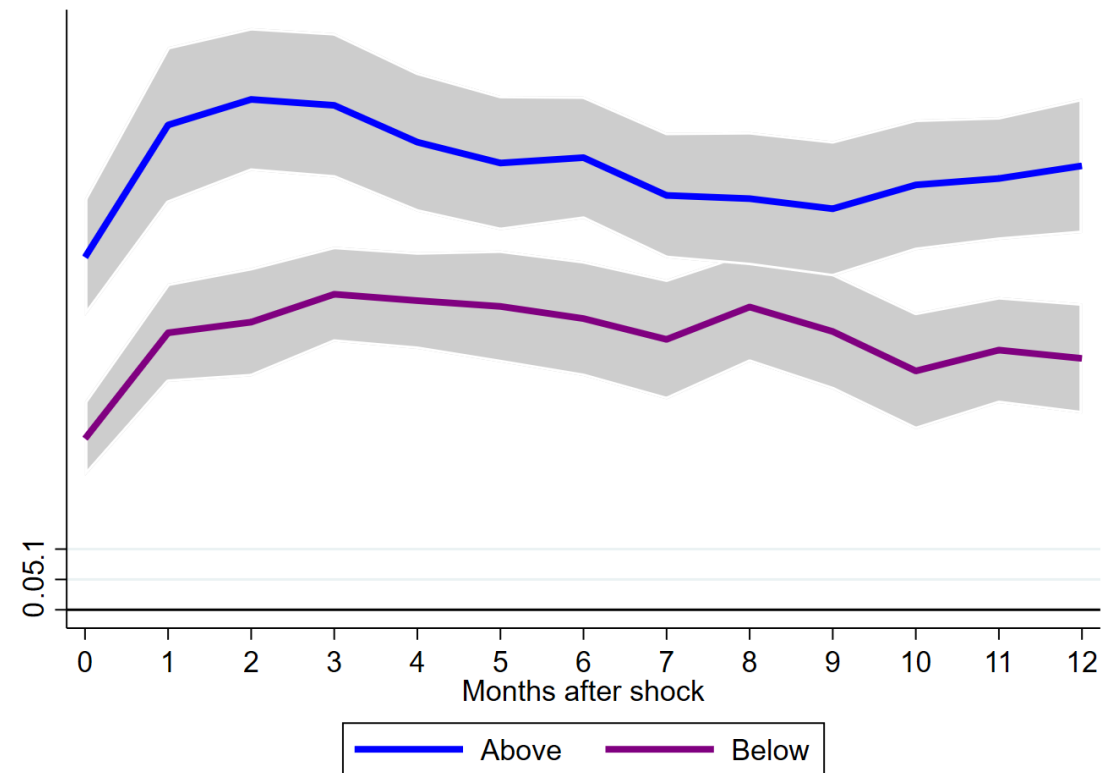
Detailed Statistics

Pass-through materializes faster following depreciations than appreciations

Pass-through from depreciations are more instant than from appreciations but price responses converge at 12-month…

…but the picture is valid only for EMs.

Appreciation vs Depreciation
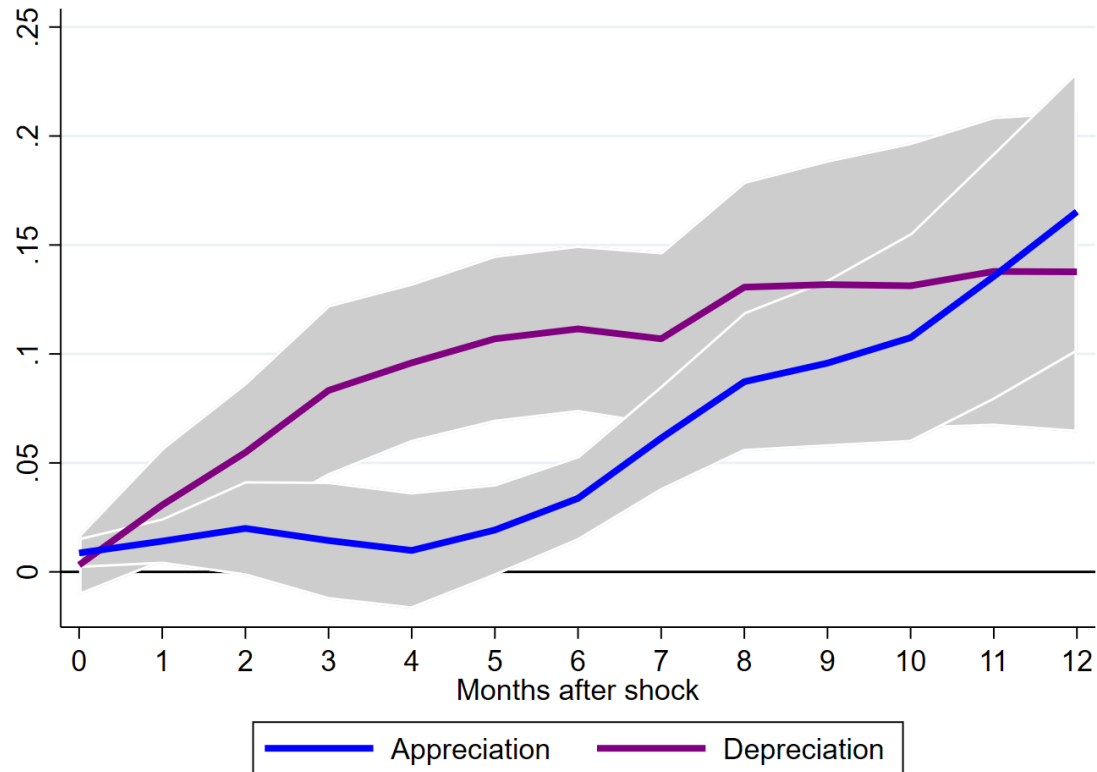
Appreciation vs Depreciation: AE vs EMs
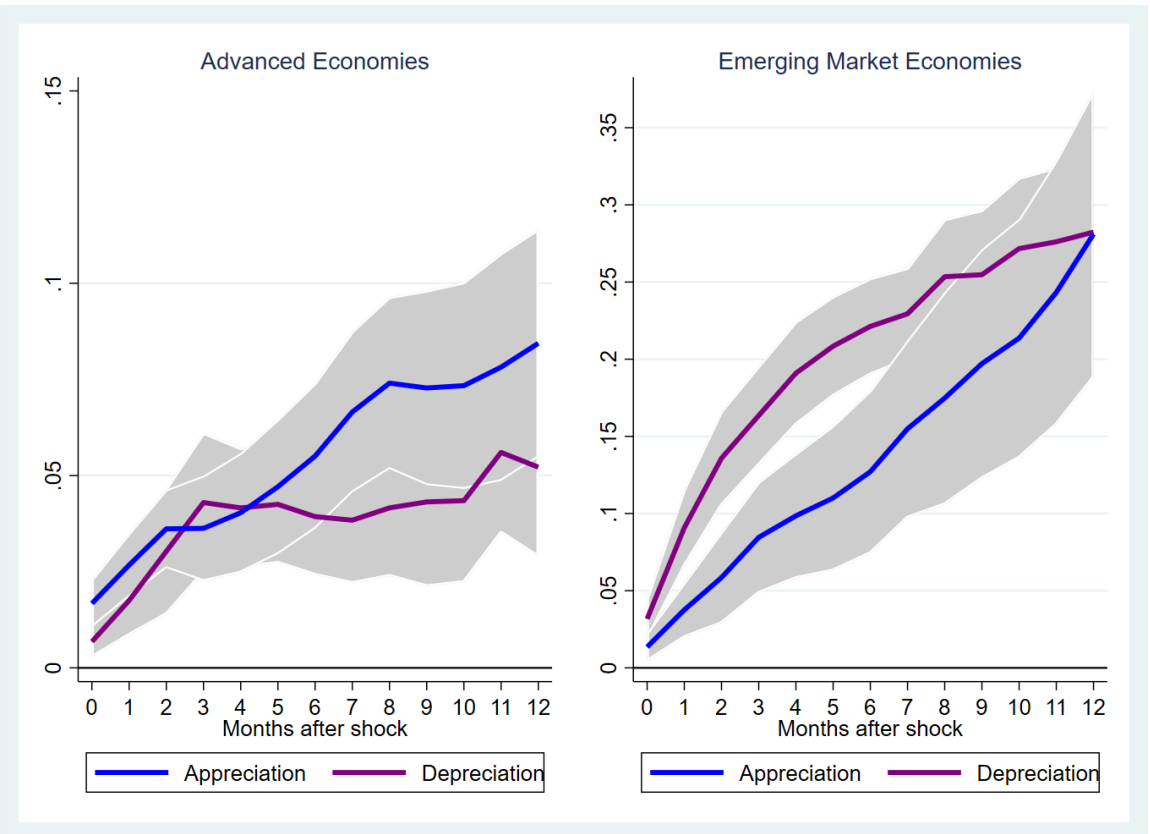
Sources: Haver Analytics; IMF staff calculations.

Sources: Haver Analytics; IMF staff calculations.

Sources of exchange rate fluctuations

- Exchange rate fluctuations are driven by different factors (Forbes et al., 2018)

- Instrument ER fluctuations using a diff-in-diff IV approach (Nunn and Qian, 2014)

  - $Instrument_{i,t} = CountryCharacteristic_i \times Shock_t$

  - $Shock_t$: U.S. monetary policy shock, $CountryCharacteristic_i$: Chinn-Ito index of country i

- First-stage

$$\Delta ER_{i,t} = \textcolor{red}{\beta_h^1} \, Instrument_{i,t} + \sum_{l=0}^{12} \theta_l^Z Z_{i,t-l} + \delta_i + \delta_t + \epsilon_{i,t}$$

- Second-stage

$$p_{i,t+h} - p_{i,t-1} = \textcolor{red}{\beta_h^2} \widehat{\Delta ER_{i,t}} + \sum_{l=0}^{12} \theta_l^Z Z_{i,t-l} + \delta_i + \delta_t + \epsilon_{i,t}$$

U.S. monetary policy shock & capital account openness

- 1st-stage implies, on average, a depreciation following an exogenous U.S. monetary policy tightening (Jarocinski-Karadi)
  - Larger depreciation for countries with more open capital account (Kalemli-Ozcan 2019)

- F-stats from the 1st stage suggest the instrument is strong

- 2nd-stage suggests a strong pass-through
  - The level is much higher than the pass-through with OLS estimations; consistent with evidence in Forbes et al., 2018.

Shock Dependent Pass-Through: Role of U.S. Monetary Policy Shock

1st Stage   **2nd Stage**
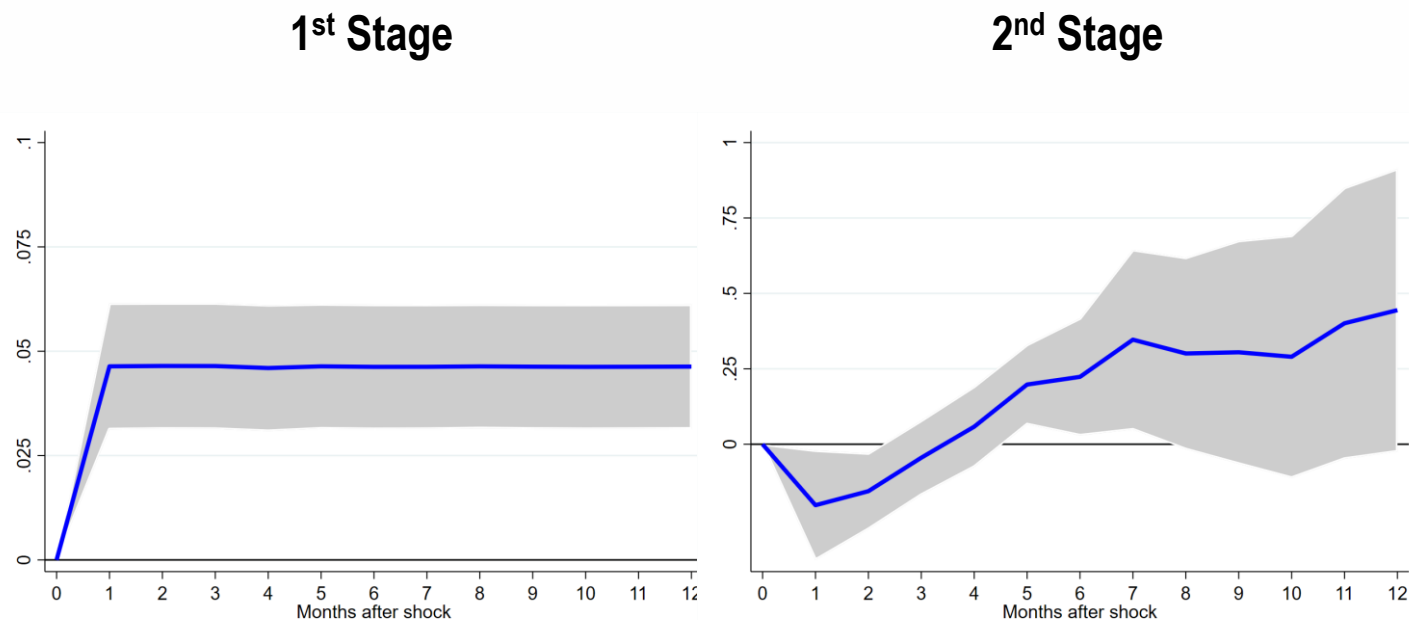
Source: U.S. monetary policy shocks are from Jarocinski and Karadi (2022). Chinn-Ito indexes are from Chinn, Menzie D. and Hiro Ito (2006). IMF staff calculations.
Note: **Kleibergen-Paap F-stat equals 11.1**. SEs are clustered at country and CI are at 68 percent.

Summing up

- Average pass-through is consistent with typical estimates in the literature…

- …but pass-through is likely to be larger *now* given the high inflation and uncertainty, and the fact that large depreciations are mainly determined by U.S. monetary tightening

  - Calls for revisiting the exchange rate pass-through literature,

  - Understanding which factors raises responses of prices to the exchange rate fluctuations

- Pass-through and risk of de-anchoring of inflation expectations are larger for EMs and countries with weaker monetary policy frameworks

  - Strengthening the monetary policy framework would contain the pass-through and mitigate risks highlighted in IPF framework

EXTRA SLIDES

Country sample

Advanced Economies		Emerging Market Economies	
Australia	Japan	Argentina	Malaysia
Austria	Korea	Armenia	Mexico
Belgium	Latvia	Brazil	Peru
Canada	Lithuania	Bulgaria	Philippines
Cyprus	Netherlands	Chile	Poland
Czech Republic	New Zealand	China	Romania
Denmark	Portugal	El Salvador	Sri Lanka
Estonia	Singapore	Hungary	Thailand
Finland	Slovak Republic	India	Turkey
France	Slovenia	Indonesia	Ukraine
Germany	Spain		
Greece	Sweden		
Hong Kong SAR	Switzerland		
Ireland	United Kingdom		
Italy			

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Country groups by disagreement

- Country level inflation forecast disagreement measures follow Brito, Carrière-Swallow and Gruss (2018).
  - Their measurement is based on surveys of professional forecasters collected by Consensus Economics
  - Inflation forecast disagreement level for each country is calculated as interquartile range in forecasts across individuals

- Using their disagreement measurements, we separate countries in our sample into 4 quartiles using 25th percentile, median and 75th percentiles

Country Groups by Disagreement

Low		High	
Group 1	Group 2	Group 3	Group 4
Austria	Australia	Hungary	Argentina
Canada	Belgium	Ireland	Armenia
Denmark	Chile	Korea	Brazil
Finland	Cyprus	Lithuania	Bulgaria
France	Czech Republic	Malaysia	China
Germany	Greece	Mexico	Estonia
Italy	New Zealand	Peru	Hong Kong SAR
Japan	Slovenia	Philippines	India
Netherlands	Sweden	Poland	Indonesia
Portugal	Taiwan Province of China	Singapore	Latvia
Spain	United Kingdom	Slovak Republic	Romania
Switzerland			Thailand

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Inflation statistics

- We calculate y/y change in log CPI for each month in every country.

- Then we separate country-time observations into four groups (quartiles) using the cross-country statistics from the table
  - Very High Inflation (4th Quartile): > 75th percentile (4.25%)
  - High Inflation (3rd Quartile): between median (2.38%) and 75th percentile
  - Low Inflation (2nd Quartile): between 25th percentile (1.17%) and median
  - Very Low Inflation (1st Quartile): < 25th percentile

- After assigning each country-time observation into a group, we estimate local projections to examine the differential responses across different groups.

Inflation Statistics	
25th percentile	1.17%
Median	2.38%
75th percentile	4.25%
Mean	4.05%
Standard Deviation	7.38%

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USD invoice share statistics

- Using the annual USD invoicing share of imports from Boz et al. (2022)

  - First, we calculate the average USD invoicing share for each country

  - Then, we separate countries into Low vs High Invoice groups if the USD invoice share of country is below or above the cross-country median

  - Countries are also separated into quartiles to examine the further nonlinearities

Invoice Stats

25th	23.00%
Median	32.54%
75th	72.26%
Mean	44.08%
Standard Deviation	25.76%

Country Groups by USD Invoice Share

Low		High	
Group 1	Group 2	Group 3	Group 4
Austria	Slovenia	Armenia	Argentina
Belgium	Spain	Australia	Brazil
Czech Republic	Bulgaria	Cyprus	Chile
Estonia	Denmark	Greece	India
France	Finland	Japan	Indonesia
Germany	Ireland	Lithuania	Korea
Hungary	Italy	New Zealand	Malaysia
Latvia	Netherlands	Thailand	Peru
Portugal	Poland	Turkey	Philippines
			Taiwan Province of China
Romania	Sweden	Ukraine	
Slovak Republic	Switzerland	United Kingdom	

Country groups by uncertainty

- We use monthly uncertainty indexes from Ahir, Bloom and Furceri (2022)
  - They calculate the country-time varying uncertainty indexes using the word "uncertainty" in the Economist Intelligence Unit country reports.

- Then, we separate each country time observation into quartiles using 25th percentile, median and 75th percentile of cross-country distribution.

- After separating country-time observations into groups we estimate local projections to examine the differential responses across different groups

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