

Is Inflation Domestic or Global? Evidence from Emerging Markets

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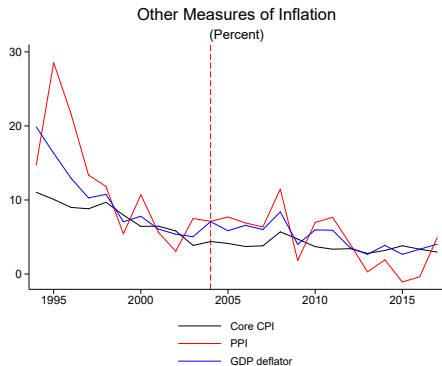
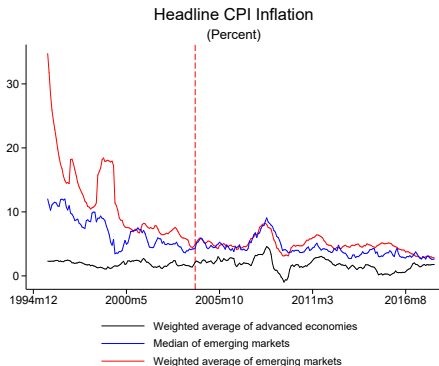
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Motivation

- Following a period of disinflation during the 1990s and early 2000s, inflation in EMs remained low and stable despite commodity price swings, GFC, and appreciation of the US dollar



Sources: Haver Analytics; IMF, World Economic Outlook; and authors' calculations.

Notes: The vertical dashed line marks the start of the post-disinflation period. The vertical axis in the left panel is truncated at 35 percent to ease visualization.

- Is this due to **improved macro-frameworks** or **offsetting global forces**?

Mixed views

- Lively debate about the so-called “globalization of inflation hypothesis” (IMF, 2005; Ball, 2006; Fisher 2006; Kohn, 2006; Yellen, 2006; Carney, 2017)
 - ▶ Weakening of the relationship between inflation and domestic slack
 - ▶ Strengthening of the relationship between inflation and global factors
- Two views:
 - ① Pessimists argue that opposing external forces have contributed to inflation stability (e.g., China’s integration, weak global demand, low US yields/compressed spreads/no crises) \implies good luck
 - ② Optimists point to substantial supportive changes in institutional and policy frameworks (e.g., IT, fiscal rules) \implies good job
 - ▶ Important implications for monetary policy!
- The empirical evidence on advanced economies is mixed:
 - ▶ Pro: Borio and Filardo (2007) and Auer et al. (2017)
 - ▶ Against: Ihrig et al. (2010)

Research questions and preview of the results

- This paper

- Reviews inflation performance in 19 large EMs
- Quantifies the impact of domestic and global factors in determining inflation since mid-2000s

- Contribution

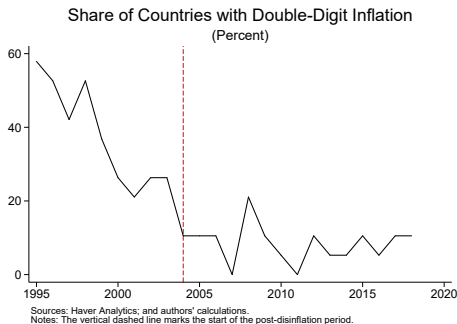
- First attempt to quantify the contribution of domestic and global factors in EMs

- Results

- Significant cross-country heterogeneity in inflation performance
- While some external factors have a statistically significant impact on domestic inflation, they played a minor role in driving inflation dynamics
- Domestic factors are the main contributor to the gains in inflation performance

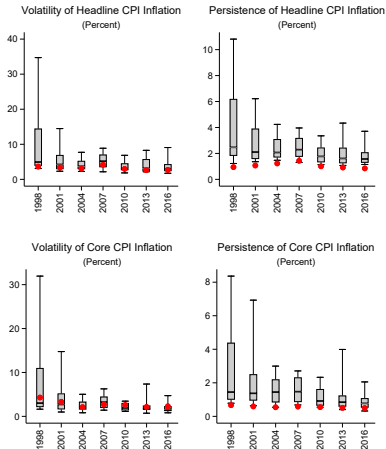
Inflation performance in EMs

- Low and stable inflation
 - ▶ The weighted avg (median) of headline CPI inflation for the 19 EMs in the sample declined by more than 100pp (from 20 to 5 percent) from 1995 to 2004
 - ▶ Since then, inflation leveled off at about 5 percent (3pp above AEs')
- But some heterogeneity remains



Inflation performance compared to AEs

- Volatility and persistence declined, remaining somewhat above AEs', but cross-country distributions show variety of experiences

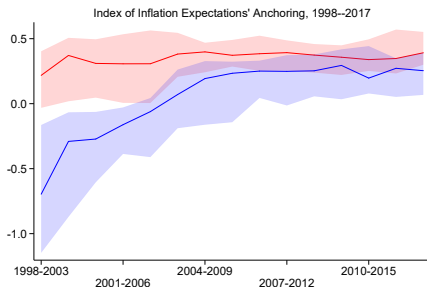


Sources: Haver Analytics; and authors' calculations.

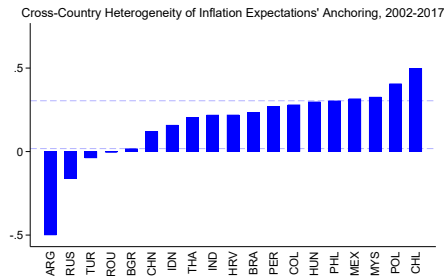
Notes: The volatility is computed as the standard deviation of detrended inflation. Persistence is calculated as the standard deviation of the permanent component of inflation based on Stock and Watson (2007). The horizontal lines in each box denote the medians, the upper and the lower edges of each box show the top and bottom quartiles, the vertical lines denote the ranges between the top and bottom deciles, and the red dots denote the averages for advanced economies. The labels on the horizontal axis denote the start of the three-year windows.

A summary anchoring index

- A synthetic index of inflation expectation anchoring suggests that monetary policy credibility improved significantly in EMs (Bems, Caselli, Grigoli, and Gruss, 2018)
- However, heterogeneity remains



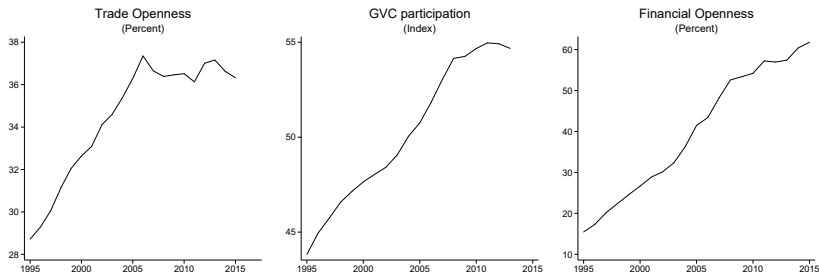
Source: Bems et al. (2018).
Notes: AEs in red, EMs in blue.



Source: Bems et al. (2018).
Notes: the figure shows the average anchoring index, by country computed during the period 2002–17. The value for Argentina is -1.5, but we set the minimum of the vertical axis to -0.5 to ease visualization.

Globalization of inflation hypothesis (~good luck)

- EMs became more integrated in global markets, and competition likely put downward pressure on prices
- Outsourcing and offshoring increased the substitutability of production stages \implies convenient to relocate where slack is larger and prices are lower
- This led to a “global-centric” view of the inflation process (Auer et al., 2017) = **stronger sensitivity of prices to external conditions**

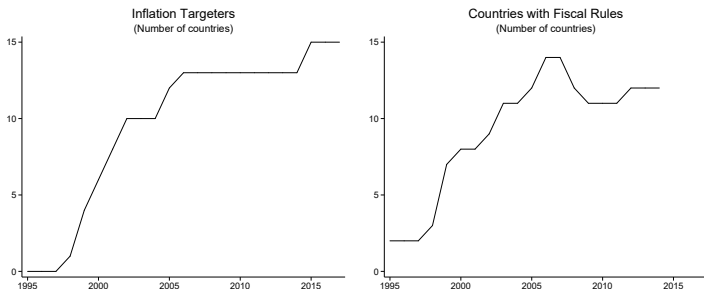


Sources: Aquib et al. (2017); IMF, Balance of Payments Statistics; IMF, World Economic Outlook; and authors' calculations.

Notes: Trade openness is defined as imports in percent of GDP, GVC participation is defined as sum of backward participation (imported intermediate inputs used to generate output for export) and forward participation (exports of intermediate goods used as inputs for the production of exports of other countries) as a ratio of gross exports, financial openness is defined as the sum of foreign direct investment and portfolio equity liabilities in percent of GDP. All variables are expressed as five-year moving averages.

Institutional changes (~good job)

- The last two decades witnessed important institutional changes
- Out of the 19 countries, ITers went from 0 to 15 and countries with fiscal rules from 2 to 12
- Rule-based policy-making generally comes with predictability and increased price stability = **stronger sensitivity of prices to domestic factors**



Sources: IMF, Balance of Payments Statistics; national authorities; and authors' calculations.

Notes: The number of countries with fiscal rules is the sum of the countries with any fiscal rule, as defined in the IMF Fiscal Rules Dataset (2016).

Empirical strategy

- To study what drove inflation in 19 large EMs during the period of stable and low inflation, we focus on the post-disinflation period from 2004q1 to 2018q1
- Several shocks: commodity price fluctuations, GFC, US dollar appreciation
- Hybrid variant of the New-Keynesian Phillips Curve (Gali and Gertler, 1999; Gali et al., 2001; Gali et al., 2003) augmented with foreign variables (Borio and Filardo, 2007; Ihrig et al., 2010; Auer et al., 2017):

$$\pi_{i,t} = \gamma^b \pi_{i,t-1} + \gamma^f \pi_{i,t}^e + \beta Y_{i,t}^{gap} + \theta Z_{i,t}^* + \eta_i + \epsilon_{i,t} \quad (1)$$

- Median regressions to account for a few extreme observations (and with robust regressions and constrained regressions setting $\gamma^b + \gamma^f = 1$)

Empirical strategy

- Z^* includes the foreign output gap:

$$\Delta Y_{i,t}^{*gap} = \sum_{j=1}^J \omega_{ij,t} Y_{j,t}^{gap} \quad (2)$$

and external price pressures:

$$\Delta P_{i,t}^* = \Delta mPPI_{i,t} + \Delta neer_{i,t} - \Delta P_{i,t} \quad (3)$$

where:

$$\Delta mPPI_{i,t} = \sum_{j=1}^J \omega_{ij,t} \Delta PPI_{j,t}$$

$$\Delta neer_{i,t} = \sum_{j=1}^J \omega_{ij,t} (\Delta e_{i,t} - \Delta e_{j,t})$$

Estimation results

- About half of the variation in core and headline inflation is explained by the regressors

	(1)	(2)		(3)	(4)		(5)		(6)
		Core inflation				Headline inflation			
	Median regression	Robust regression	Constrained regression	Median regression	Robust regression	Constrained regression	Median regression	Robust regression	Constrained regression
Inflation expectations 3 years ahead	0.587*** (0.111)	0.631*** (0.077)	0.566*** (0.062)	0.396*** (0.134)	0.303*** (0.067)	0.564*** (0.088)			
Lag of core/headline inflation	0.494*** (0.037)	0.500*** (0.023)	0.434*** (0.062)	0.422*** (0.047)	0.481*** (0.028)	0.436*** (0.088)			
Output gap	0.159*** (0.045)	0.168*** (0.037)	0.103 (0.070)	0.188** (0.086)	0.182*** (0.067)	0.110 (0.095)			
Lag of external price pressure	0.018*** (0.004)	0.018*** (0.003)	0.032*** (0.011)	0.005 (0.008)	-0.001 (0.007)	0.020 (0.014)			
Foreign output gap	0.021 (0.050)	0.060 (0.053)	0.070 (0.100)	0.117 (0.087)	0.085 (0.103)	0.169 (0.130)			
Lag of food price inflation				0.013*** (0.004)	0.018*** (0.004)	0.025*** (0.006)			
Lag of energy price inflation				0.000 (0.002)	-0.001 (0.002)	-0.001 (0.003)			
Countries	18	18	18	19	19	19			
Observations	633	633	633	668	668	668			
R-squared	0.525			0.445					

Source: Authors' calculations.

Notes: All specifications include country-fixed effects. Constrained regression force the sum of the coefficients on past inflation and expected inflation to be one. Robust regressions report the pseudo R -squared. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Estimation results

- Price setting is to some extent forward looking

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Estimation results

- Domestic cyclical conditions matter, while the foreign output gap is not significant

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Estimation results

- External price pressures and food prices turn out significant, but the effects are economically small

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A dynamic simulation exercise

- As in Yellen (2015), we run a dynamic simulation of the model:

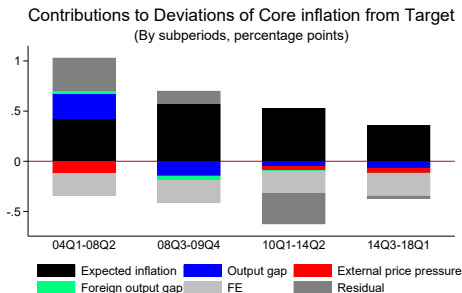
$$C_{i,t}^x = C_{i,t-1}^x \gamma^b + (\varphi^x x_{i,t}) \quad (4)$$

where $C_{i,t}^x$ is the contribution to inflation dynamics for each variable of the vector $X = [\pi^e, Y^{Gap}, Z^*, \eta_i]$

- The initial value of X is set to zero, and the coefficient on lagged inflation is used to incorporate the effects of inflation persistence that are attributable to previous movements in the explanatory variables
- The contribution of π^e is re-expressed in terms of deviation from the target ($\pi^e - \pi^*$), either explicit (i.e., IT) or implicit (i.e., 10-year ahead inflation expectations)

Contributions to deviations of core inflation from target

- 4 subperiods: pre-crisis boom, GFC, recovery, oil price decline
- π^e is the largest contributor $\implies \pi^e > \pi^*$ during the sample period
- External price pressures were generally small and deflationary
- Domestic cyclical conditions played a smaller role
- The contribution of foreign slack is economically insignificant
- The dynamics are largely explained by output gaps

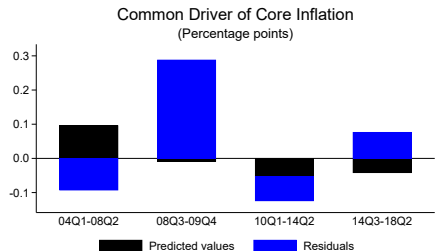


Source: Authors' calculations.

Notes: The bars represent the average contribution of each factor averaged across countries.

Are we underestimating the role of global factors?

- We obtain the common component by
 - ① Including time fixed effects in a PC specification without external variables
 - ② Regressing the common component on the cross-country averages of the domestic determinants
- Common component captures the 2008 commodity-induced surge, otherwise it is small
- It correlates with domestic variables, reducing the risk of neglecting external forces



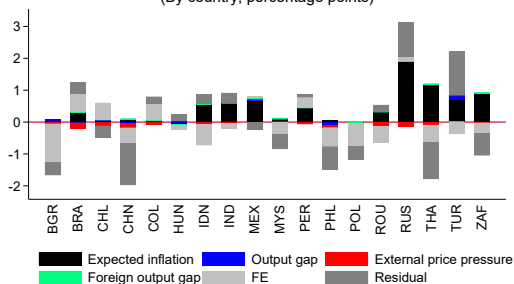
Source: Authors' calculations.

Notes: Time fixed effects are based on a panel regression that excludes external variables. Residuals are from a regression of these time fixed effects on country averages of the domestic determinants of core inflation. Predicted values are displayed in terms of deviation from the mean over the sample period.

Contributions to deviations of core inflation from target

- 19 EMs at different stages of institutional development
- The impact of expectations is sizable for half of the countries
 - Chile and Poland show small contributions from $(\pi^e - \pi) \implies$ maturity of the monetary framework
 - Russia and Thailand present the largest deviations
- External price developments exerted downward pressure for most of the countries, but the contribution is small

Contributions to Deviations of Core Inflation from Target
(By country, percentage points)



Source: Authors' calculations.

Notes: The bars represent the average contribution of each factor averaged across periods.

A variance decomposition-like exercise

- To assess **what factors contributed to the variation** of inflation, we calculate the ratio of the avg abs value of the contribution of each variable to the sum of the same avg abs value of the contributions of all variables:

$$C_i^{var,x} = \frac{1/T \sum_t^T |C_{i,t}^x|}{\sum_x^X 1/T \sum_t^T |C_{i,t}^x|} \quad (5)$$

where $C_i^{var,x}$ is expressed in terms of deviations from the target

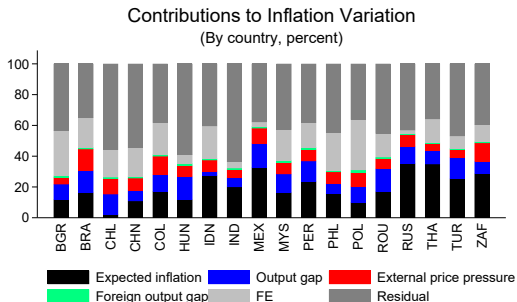
- To establish the **relative importance of domestic and foreign** factors, we group the contributions into subsets S^n :

$$C_i^{var,S^n} = \frac{\sum_x^{S^n} 1/T \sum_t^T |C_{i,t}^x|}{\sum_x^{S^n} 1/T \sum_t^T |C_{i,t}^x|} \quad (6)$$

where the contribution *is not* expressed in terms of deviations from the target

Contribution to inflation variation

- Inflation expectations explain on average 20 percent of the variation in inflation
 - The share varies from 2 to 35 percent
 - There are cases where $(\pi^e - \pi^*)$ play an important role in short-term inflation dynamics, but average contribution over the sample period is small (e.g., Colombia)
- External price developments played a minor role

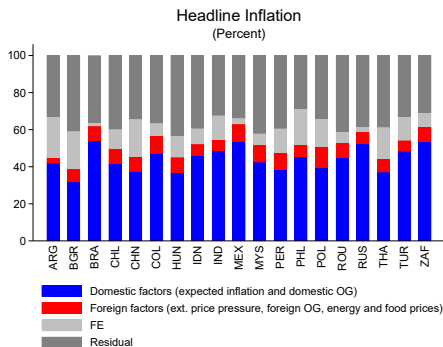
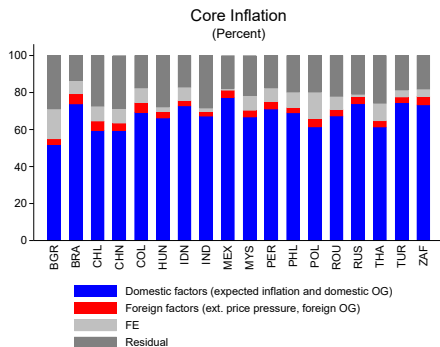


Source: Authors' calculations.

Notes: The bars represent the average of the absolute values of the country-specific contributions over the period 2014Q1-2018Q1, as a percent of the overall deviation of core inflation from the target.

Domestic vs foreign factors

- Domestic contributions > foreign contributions
 - ▶ Domestic account for 52 to 77 percent for core inflation and 32 to 55 percent for headline inflation
 - ▶ Foreign account for 3 and 5 percent for core inflation and 3 and 11 percent for headline inflation



Source: Authors' calculations.

Notes: The bars represent the average of the absolute values of the country-specific contributions (accounting for persistence of inflation) over the period 2014Q1-2018Q2, as a percent of the sum of all contributions.

Robustness tests

- Inflation expectation could capture external developments
 - (residual + external factors) is still smaller than domestic factors
 - Add—or replace external factors with—time fixed effects, and consider those external factors
 - Use the orthogonalized component of inflation expectations wrt external variables in the regressions
 - Interact energy and food with their CPI weights
- Increased integration and competition are not fully captured
 - Add interactions of external variables with trade openness or participation in the GVCs
- China became an important trading partner of many EMs since it joined the WTO, putting downward pressure to their inflation
 - Decompose external price pressure variable into its Chinese and non-Chinese component
- 3-year ahead inflation expectations still include the effect of transitory shocks and the response to monetary policy
 - Replace 3-year ahead inflation expectations with inflation expectations up to 7 years ahead

Conclusions

- Domestic factors accounted for the lion's share of inflation dynamics in EMs
- Fluctuations in longer-term inflation expectations were the main driver of average deviations of inflation from the target and inflation variability
- The contribution of global variables is not always statistically significant and, in any case, much smaller than the one from domestic factors

The gains in inflation performance are largely attributable to domestic factors \implies although EMs are increasingly integrated in the global economy, inflation remains largely under the control of their policymakers