

The Journal of International Trade & Economic Development

An International and Comparative Review

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rjte20

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To cite this article: Mustafa Çakır & Ahmet Ekrem Kaya (07 Oct 2024): Dynamics of inflation in emerging markets: Is it local or global?, The Journal of International Trade & Economic Development, DOI: [10.1080/09638199.2024.2407793](https://doi.org/10.1080/09638199.2024.2407793)

To link to this article: <https://doi.org/10.1080/09638199.2024.2407793>



Published online: 07 Oct 2024.



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Dynamics of inflation in emerging markets: Is it local or global?

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ABSTRACT

This paper investigates inflation dynamics in emerging markets. We apply a multi-country model (GVAR) and a time-varying Granger causality test (TVGC) to examine the drivers of inflation in Brazil, China, India, Indonesia, South Africa, and Türkiye over the period 1980Q1-2022Q4. The aim is to ascertain whether these drivers are locally or globally determined and vary over time. The GVAR model results indicate that local and global factors drive domestic inflation, collectively contributing to inflationary pressures in emerging countries. The TVGC results, on the other hand, provide strong evidence of the causality from local and global factors to domestic inflation. Local factors appear to have a stronger influence than global ones, suggesting that local dynamics play a more significant role in explaining inflation in these countries. Consequently, globalization and economic/trade integration, seen as tools to suppress inflation, can turn into factors that cause inflation in the face of a supply shock such as the one caused by the pandemic.

KEYWORDS Inflation dynamics; Emerging markets; GVAR model; TVGC test

JEL CLASSIFICATIONS C32, C51, E31, F41, F62

ARTICLE HISTORY Received 9 March 2024; Accepted 6 September 2024

1. Introduction

Over the last century, globalization has led to greater liberalization and interdependence among countries (Nayyar 2006). In a world of high globalization and trade openness, the spillover effect of inflation across countries or the impact of global shocks on domestic inflation cannot be ignored (Finck and Tillmann 2022; Ha et al. 2023; Istiak et al. 2021; Monacelli and Sala 2009; Osorio and Unsal 2013). Globalization has many effects on national economies. It makes countries vulnerable to external shocks. It also makes local inflation more sensitive to the global output gap by expanding the global value chain, which causes supply-side global shocks and inflation to spread worldwide (Auer, Borio, and Filardo 2017). On the other hand, globalization has recently emerged as a possible reason for low and stable inflation in emerging and advanced economies through trade and financial linkages (Ahmad and Civelli 2016; Nagy and Tengely 2018).

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Considering previous studies, we argue that globalization and trade linkages among countries, which have been seen as tools to suppress inflation, may turn into an inflationary factor, especially in the face of a supply shock. As Auer and Mehrotra (2014) note, the growing interconnectivity between economies will likely lead to domestic price dynamics being more sensitive to imported input costs and supply chains. Therefore, identifying inflation dynamics in emerging economies, namely Brazil, China, India, Indonesia, South Africa, and Türkiye, is essential for designing and implementing optimal monetary policy. Many studies have examined the issue using different approaches and may have ignored the strong international trade and time-varying linkages. This paper aims to investigate how global and local factors influence domestic inflation and whether the response of domestic prices to the same global shock varies across countries and over time using two appropriate methods.

Our study is closely aligned with the work of Feldkircher and Siklos (2019) and contributes to the literature by extending the study in the following main aspects. Firstly, we employ the GVAR model proposed by Pesaran, Schuermann, and Weiner (2004, 2009) with a data span from 1980Q1 to 2022Q4, which includes the pandemic period and considers the inflationary impact of economic policy uncertainty. The main advantage of the GVAR model is that it simultaneously estimates the effects of local and global shocks on domestic inflation by considering international trade linkages across countries. Secondly, this paper applies the time-varying Granger causality (TVGC) test developed by Shi, Hurn, and Phillips (2020) in order to assess the time-varying causality between exchange rate, interest rate, oil price, and inflation for the focus economies. Analyzing the time-varying Granger causality of the effects of domestic and global dynamics is also a new approach for the countries involved in the study. The TVGC test provides empirical evidence that different monetary policy practices in the face of the same global shock can lead to different inflation results. Türkiye's monetary policy during COVID-19 differed from the rest of the world, so its inclusion in the analysis provides an opportunity to examine how domestic dynamics can be strong and vary across countries in the face of the same global shock. Consequently, this study will be one of the first empirical studies employing the GVAR methodology and TVGC test to analyze the local and global factors affecting domestic inflation in emerging markets.

The remainder of the paper is organized as follows. Section 2 critically reviews the relevant literature, focusing on key ideas and research methodologies employed in existing studies. Section 3 briefly explains the research methodology, data used in the analysis, and estimations. Section 4 discusses the empirical results. Section 5 concludes the paper.

2. Literature review

Globalization has many effects on national economies. Some argue that economic integration may lead to increase global competition, keeping prices low and stable through low labor wages, low import prices, and productivity growth spurred by innovation (IMF 2006; Nagy and Tengely 2018; Sbordone 2007). Others suggest that economic integration can reduce inflationary pressures by lowering production costs due to the ever-expanding global supply chain (Borio and Filardo 2007). Globalization has recently emerged as a possible reason for low and stable inflation in emerging and advanced economies through trade and financial linkages (Ahmad and Civelli 2016; Nagy and Tengely 2018). Accordingly, some seminal papers of the literature suggest that openness, trade integration, and globalization can reduce inflation (Bernanke 2007; Rogoff 2003; Romer 1993).

However, globalization makes countries vulnerable to external developments. It can deteriorate income distribution and foreign trade balances and spread economic crises across countries (Keller 2010; OECD 2010). As Auer and Mehrotra (2014) note, increasing interconnectedness will likely lead to domestic price dynamics being more sensitive to imported input costs and supply chains. For example, China's shutdown due to COVID-19 caused prices to rise in sectors that import intermediate goods from China, particularly the US (Meier and Pinto 2024). China's role in lowering the cost of production as a world producer and its increasing demand for commodities has also led to the spread of global inflation across countries (Eickmeier and Kühnlenz 2018). In this context, it is possible to define the surge in inflation worldwide after the COVID-19 pandemic as global supply chain disruptions or, more broadly, as a supply shock effect (Bańbura, Bobeica, and Hernández 2023). In this regard, it is argued that openness and/or globalization can also cause inflation in the face of a supply shock because inflation is not only a monetary fact but also a general equilibrium phenomenon (Engel 2013).

Global developments substantially impact inflation dynamics in emerging economies (Kabundi, Poon, and Wu 2023; Kamber and Wong 2020). However, some empirical studies also show that country-specific factors cannot be ignored (Woodford 2007) and can be considered crucial domestic inflation dynamics (Finck and Tillmann 2022; Gao, Abbas, and Lan 2024; Kamber and Wong 2020). Although there is a relative consensus on what determines domestic inflation, the literature shows that there are significant differences across countries. Some studies show that many countries have experienced divergence in inflation compared to their peers in the face of the same global shocks (Ciccarelli and Mojon 2010; Gao, Abbas, and Lan 2024; Kamber and Wong 2020; Yilmazkuday 2022). On the other hand, many researchers have analyzed whether domestic prices are affected by global rather than local shocks (Ahmad and Civelli 2016; Borio and Filardo 2007; Ciccarelli and Mojon 2010; Eickmeier and Pijnenburg 2013; Kabukçuoğlu and Martínez-García 2018; Milani 2010; Mumtaz, Simonelli, and Surico 2011; Sbordone 2007; and Kabundi, Poon, and Wu 2023). There are also varying results regarding the effectiveness of central banks across global developments. For instance, Monacelli and Sala (2009) and Istiak et al. (2021) find that the ability of central banks to control inflation may remain weak due to the importance of global influences. On the other hand, Woodford's findings (2007) contradict these results, suggesting that national central banks will not lose their ability to control inflation under further globalization. The same study provides empirical evidence that countries implementing inflation targeting can achieve their targets. Ciccarelli and Mojon (2010) also argue that the impact of global inflation is weak in countries committed to price stability.

A large body of literature suggests that global factors are more determinant of inflation than domestic dynamics (Borio and Filardo 2007; Kabukçuoğlu and Martínez-García 2018; Kabundi, Poon, and Wu 2023). This phenomenon is expressed as the decrease in the sensitivity of inflation to the domestic output gap or the flattening of the Philips curve (Calza 2009; Gilchrist and Zakrajšek 2019; IMF 2006; Kabundi, Poon, and Wu 2023). However, it is also a fact that this approach may not be valid for all countries (Gao, Abbas, and Lan 2024). We consider the divergence of inflation trends in the relevant countries after the pandemic to indicate this. Specifically, as shown in Figure 1, the average annual inflation rate between 1996–2022 is generally higher and much less stable in Brazil (6.6%), Indonesia (8.8%), and Türkiye (27.8%) than in China (2.2%), India (5.5%) and South Africa (5.7%).

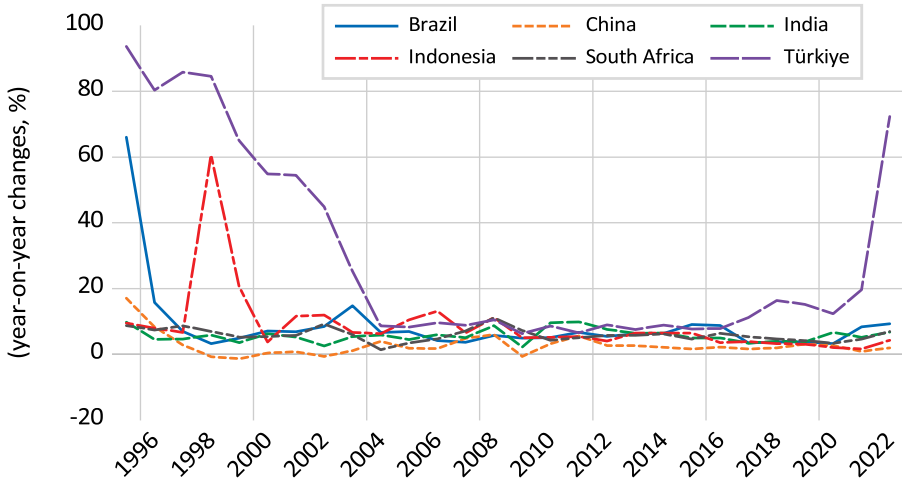


Figure 1. Annual inflation rates in emerging economies (1996-2022).

However, empirical findings on this issue are not clear. Although some empirical studies accept that globalization suppresses inflation through competitive advantage and productivity, others argue that country-specific factors remain significant drivers of inflation, especially in emerging economies (Calza 2009; Ciccarelli and Mojon 2010; Gao, Abbas, and Lan 2024; Ha et al. 2023; Ihrig et al. 2010). For instance, Neely and Rapach (2011) found that around 49% of domestic inflation is explained by country-specific factors. Similarly, Calza (2009) and Ihrig et al. (2010) find that the impact of external dynamics on inflation is weak in the euro area and industrialized countries, respectively. Gao, Abbas, and Lan (2024) consider the domestic output gap the leading cause of inflation, while the external output gap is not the determinant of inflation in developing countries. Considering the findings of Kamber and Wong (2020) and Finck and Tillmann (2022), the inflationary impact of domestic shocks may be more dominant in some countries despite the impact of global shocks, such as oil supply shocks and global demand shocks on inflation. In other words, according to the authors, even if external shocks are significant, inflation is ultimately a domestic phenomenon.

Our results also support this. For example, the fact that a positive output gap has inflationary results in China, Indonesia, Türkiye, Brazil, and India indicates that domestic dynamics are strong. Output gap shock creates inflation for different periods in these countries, another dimension that emphasizes the importance of domestic dynamics. It is also worth noting that exchange rate shocks cause inflation in some countries. China's strategy to mitigate the risk of cost inflation resulting from the dollar appreciation by moderating monetary growth in the context of US money supply growth suggests that the exchange rate plays an important role in domestic inflation dynamics (Bi and Anwar 2017). Tian and Wang (2024) also find that US monetary policy has led to a depreciation of the Yuan and reduced real output, both of which are potentially inflationary. Kara et al. (2007) and Kara and Ögünç (2008) also provide evidence for exchange rate pass-through in Türkiye. We also conclude that negative domestic interest rate shocks have a suppressive effect on inflation in some countries due to the cost effect. Our results confirm that higher US interest rates lead to lower capital inflows in China (Tian, Wang, and Wang 2022), pointing to the importance of the financing cost channel.

3. Methodology

This study investigates inflation dynamics in emerging countries and whether they vary across countries and over time by employing the GVAR approach (Pesaran, Schuermann, and Weiner 2004; et al. 2007) and the TVGC tests (Shi, Phillips, and Hurn 2018, 2020). The GVAR model combines country-specific models into a global framework that yields results that do not vary by country and order of variables. The TVGC method, however, allows for the analysis of whether the causal relationship between variables changes over time.

3.1. The GVAR model

The model assumes $N + 1$ countries in the global economy. For each country, the general VARX (q_i, q_i^*) is modeled as:

$$x_{it} = c_{i0} + c_{i1}t + \sum_{j=1}^{q_i} \alpha_{ij}x_{i,t-j} + \sum_{j=0}^{q_i^*} \beta_{ij}x_{i,t-j}^* + \sum_{j=1}^{q_i} \gamma_{ij}d_{t-j} + \varepsilon_{it} \quad (1)$$

where x_{it} is a $(k_i \times 1)$ vector of domestic variables, x_{it}^* is a $(k_i^* \times 1)$ vector of foreign variables, and d_t is a vector of global variables for each country model. The foreign variables are treated as weakly exogenous in the models. The error term ε_{it} is a $(k_i \times 1)$ vector of serially uncorrelated country-specific shocks, $\varepsilon_{it} \sim iid(0, \Sigma_{\varepsilon,i})$, $i = 0, 1, 2, \dots, N$ represents the country, and $t = 1, 2, \dots, T$ refers to time indices in the models.

The foreign variables are calculated as weighted cross-country averages as:

$$x_{i,g,t}^* = \sum_{h=1}^N w_{i,g,h} x_{h,g,t} \quad (2)$$

where $w_{i,g,h}$ is a weight that accounts for interconnectedness between countries and captures the exposure of country i to country h from variable g . $w_{i,g,h} = 0$ for $h = i$ and $\sum_{h=0}^N w_{i,g,h} = 1$. The foreign variables are treated as weakly exogenous in the models.

Country-specific shocks, ε_{it} , are allowed to be weakly correlated with shocks in other countries, $E(\varepsilon_{it}\varepsilon_{jt}') = \begin{cases} \Sigma_{ij} & \text{for } t = t' \\ 0 & \text{for } t \neq t' \end{cases}$.

Country-specific VARX* models in equation (1) are solved simultaneously for all domestic variables, where global variables are assumed to be domestic for the reference country (0 serves as a reference country in the model) and foreign for other countries. To construct the GVAR model, we define domestic and foreign variables for each country as $z_{it} = \begin{pmatrix} x_{it} \\ x_{it}^* \end{pmatrix}$ and set $p_i = \max(q_i, q_i^*)$. Thus, equation (1) can be written as

$$A_{i0}z_{it} = \sum_{j=1}^{p_i} B_{ij}z_{i,t-j} + \varepsilon_{it} \quad (3)$$

where $A_{i0} = (I_{k_i}, -\beta_{i0})$ and $A_{ij} = (\alpha_{ij}, -\beta_{ij})$.

Then, country-specific endogenous variables are combined to form a global vector, $y_t = (y'_{0t}, y'_{1t}, \dots, y'_{Nt})'$, with $K \times 1$ vector where $k = \sum_{i=0}^N k_i$ represents the number of

all domestic variables in the model. The country-specific variables, z_{it} , are linked to the global vector via the link matrix L_i :

$$z_{it} = L_i y_t, i = 0, 1, 2, \dots, N \quad (4)$$

where L_i is a $(k_i + k_i^*) \times K$ dimensional matrix consisting of country-specific trade weights, w_{ij} , that capture bilateral exposures between countries. Accordingly, the country-specific model in equation (1) is equivalent to the following.

$$A_{i0} L_i y_t = \sum_{j=1}^{p_i} A_{ij} L_i y_{t-j} + \varepsilon_{it} \quad (5)$$

where $A_i L_i$ and $B_i L_i$ are both $k_i \times k$ dimensional matrices. Finally, all these country-specific VARX models are combined to yield the model that includes all the variables in the GVAR model y_t :

$$G_0 y_t = \sum_{j=1}^p G_j y_{t-j} + \varepsilon_t \quad (6)$$

where

$$G_0 = \begin{pmatrix} A_{00} & L_0 \\ A_{10} & L_1 \\ \vdots & \vdots \\ A_{N0} & L_N \end{pmatrix}, \quad G_j = \begin{pmatrix} A_{0j} & L_0 \\ A_{1j} & L_1 \\ \vdots & \vdots \\ A_{Nj} & L_N \end{pmatrix}, \quad \varepsilon_t = \begin{pmatrix} \varepsilon_{0t} \\ \varepsilon_{1t} \\ \vdots \\ \varepsilon_{Nt} \end{pmatrix} \sim iid(0, \Sigma_\varepsilon)$$

and $p = \max(p_1, \dots, p_N)$

By inverting the $k_i \times k$ dimensional and nonsingular G matrix, a reduced version of the GVAR(p) model is obtained:

$$y_t = b_0 + b_1 t + F_j y_{t-j} + \mu_t \quad (7)$$

where y_t is the global vector that contains all the variables and their lagged values, y_{t-1} , for all countries. $F_j = G_0^{-1} G_j$, b_0 and b_1 are $k \times 1$ dimensional coefficient vectors as $b_0 = G_0^{-1} c_0$, $b_1 = G_0^{-1} c_1$, and μ_t $k \times 1$ dimensional vector of reduced shocks, $\mu_t = G_0^{-1} \varepsilon_t$. Equation (7) is solved recursively to generate generalized impulse response and variance decomposition analyses. We used procedures from the GVAR Toolbox provided by Smith and Galesi (2014) to estimate this model.¹

3.2. Time-varying granger causality test

This paper also analyses the time-varying causality relationship between exchange rate, interest rate, oil price, and inflation using the time-varying Granger causality (TVGC) test developed by Shi, Hurn, and Phillips (2020), which is an improved version of the standard Granger causality (Baum, Hurn, and Otero 2021). The traditional

Granger causality relationship is based on VAR models, and the two-variable stationary VAR(m) model can be written as follows.

$$y_{1t} = \Phi_0^{(1)} + \sum_{k=1}^m \Phi_{1k}^{(1)} y_{1t-k} + \sum_{k=1}^m \Phi_{2k}^{(1)} y_{2t-k} + \varepsilon_{1t} \quad (8)$$

$$y_{2t} = \Phi_0^{(2)} + \sum_{k=1}^m \Phi_{1k}^{(2)} y_{1t-k} + \sum_{k=1}^m \Phi_{2k}^{(2)} y_{2t-k} + \varepsilon_{2t} \quad (9)$$

where y_{1t} and y_{2t} represents two time-series variables. The null hypothesis here involves testing the joint significance of $\Phi_{1k}^{(2)}$ ($k = 1, \dots, m$) through the Wald test that there is no Granger causality from y_1 to y_2 .

The heteroscedastic-consistent Wald statistic of the null hypothesis, $W_{1 \rightarrow 2}$, is expressed as

$$W_{1 \rightarrow 2} = T(R_{1 \rightarrow 2} \hat{\pi})' [R_{1 \rightarrow 2} (\hat{V}^{-1} \hat{\Sigma} \hat{V}^{-1}) R_{1 \rightarrow 2}']^{-1} (R_{1 \rightarrow 2} \hat{\pi})$$

where the coefficient restriction matrix is $R_{1 \rightarrow 2}$. Under this restriction, the null hypothesis that there is no Granger causality from y_1 to y_2 is $R_{1 \rightarrow 2} \pi = 0$, are obtained that detect changes in the causality relationship. This framework is claimed to be valid for Granger causality based on a VAR model estimated using stationary variables (Shi, Phillips, and Hurn 2018). To account for integrated variables, the lag-augmented VAR model is estimated as suggested by Toda and Yamamoto (1995). Thus, the original VAR(m) model augmented with d lags becomes VAR ($m + d$). In the LA-VAR model, Granger causality is tested precisely as before, without adding the coefficients associated with the additional d in the testing restrictions. Granger causality tests require recursive estimation for time variation and date-stamping the changes' timing (Baum, Hurn, and Otero 2022).

Shi, Hurn, and Phillips (2020) also suggest three algorithms to generate a sequence of test statistics, namely a forward recursive algorithm (FE), a rolling window algorithm (RO), and a recursive evolving algorithm (RE). These three algorithms work as follows (Baum, Hurn, and Otero 2021, 2022; Shi, Hurn, and Phillips 2020): First, the Wald test statistic for the FE algorithm is calculated for the minimum window length, and then the sample size is expanded one observation at a time until the final test statistic is reached and covers the entire sample. The first data point is the starting point of each sub-sample in these iterations. When the Wald statistics obtained in the periods of change exceed the 95% confidence level, the causality relationship starts, and when it falls below the critical values, the causality relationship ends (Shi, Phillips, and Hurn 2018, 2020). Second, in the RO algorithm, one observation advances at a time, showing that a new window size is rolled across the sample, and a Wald test statistic is calculated for each window. Finally, the RE algorithm generates a set of test statistics that are the upper norms of the Wald statistics at each observation. RE runs a test regression for each possible sub-sample of zero or greater, with the corresponding observation providing the common endpoint for all sub-samples. This procedure is repeated by observing every point in the sample, except the first sub-sample, depending on the minimum window size, and the final result is obtained by associating each observation in the sample with a set of Wald test statistics (Baum, Hurn, and Otero 2021). Therefore, the RE algorithm includes FE and RO iterations (Phillips, Shi, and Yu 2015; Shi, Hurn, and Phillips 2020).

Table 1. List of countries and regions in the GVAR model

Regions	Countries	Abbreviations	Regions	Countries	Abbreviations
Euro Area	Austria	AUR	Developed Countries	Japan	JPN
	Belgium	BEL		Australia	AUS
	Finland	FIN	Canada	CAN	
	France	FRA	New Zealand	NZL	
	Germany	GER	United Kingdom	UK	
	Italy	ITL	United States	USA	
	Netherlands	NTH	Asian Countries	Indonesia	INS
Spain	SPN	Korea		KOR	
Norway	NOR	Malaysia		MAL	
Rest of Europe and Middle East	Sweden	SWE	Singapore	SIN	
	Switzerland	SWT	Thailand	THA	
	Saudi Arabia	SAR	Philippines	PHLP	
	Türkiye	TUR	BRICS	Brazil	BRA
Latin America	Argentina	ARG		India	IND
	Chile	CHL	China	CHN	
	Mexico	MEX	South Africa	SA	
	Peru	PER			

TVGC tests whether a given variable causes another variable at any point in time with four different types of causality, three of which are a forward recursive algorithm (FE), a rolling window algorithm (RO), and a recursive evolving algorithm (RE) and one full sample for the whole period. Since TVGC can capture time-varying causal relationships among variables, we consider it more useful for our research. We, therefore, applied the TVGC test in a three-variable VAR specification for quarterly data, namely the logarithm of consumer prices (dp), exchange rate (ep) interest rate (r), and the logarithm of the price of crude oil (p_t^{oil}).

3.3. Data

This study uses a quarterly data set for 33 countries that account for approximately 90% of global GDP (see Table 1). Most data are obtained from the GVAR Toolbox database that Mohaddes and Raissi updated (2024).² To capture the inflation dynamics within and across countries, we update and include additional data from various sources, including the IMF's IFS database.

Accordingly, the GVAR model has 26 countries,³ and each country-specific VARX model includes five domestic variables, x_{it} , six foreign variables, x_{it}^* , and one global (oil price) variable, except the US VARX model:

$$x_{it} = (y_{it}, yg_{it}, r_{it}, ep_{it}, dp_{it}, ui_{it}) \text{ and } x_{it}^* = (y_{it}^*, dp_{it}^*, yg_{it}^*, r_{it}^*, ui_{it}^*, p_t^{oil})$$

where y_{it} is the log of real GDP, yg_{it} refers to the output gap⁴, ep_{it} is the log of the real bilateral exchange rate against the US dollar, r_{it} is the short-term interest rate, dp_{it} is year-on-year log changes of the CPI, ui_{it} is the log of the uncertainty index, and p_t^{oil} is the log of the oil prices. All economic models except the US include oil prices as a weakly exogenous variable. Due to its dominant role in the world economy and the use of a trade-weighted average of the US dollar exchange rate against the other countries, the real exchange rate is used as a foreign variable in the US model. In contrast, the interest rate and oil price are entered as a domestic variable.⁵

To determine the degree of integration of all series, we use conventional Augmented Dickey-Fuller (ADF) and Weighted Symmetric Augmented Dickey-Fuller (WS-ADF)

Table 2. WS-ADF unit root test statistics for domestic and global variables.

Variables			Brazil	China	India	Indonesia	South Africa	Türkiye
Domestic variables	Real GDP	y	-17.060	-13.139	11.027	-0.0433	-22.990	-0.4768
		Δy	-62.466	-23.683	-36.158	-78.684	-83.773	-79.995
	Inflation	Dp	-48.386	-42.885	-31.819	-39.148	-23.828	-15.999
		ΔDp	-89.337	-69.711	-109.231	-66.274	-75.841	-101.208
	Real Exchange Rates	ep	-32.296	-95.976	-77.188	-80.243	-66.878	-36.534
		Δep	-113.376	-99.246	-112.393	-94.941	-132.594	-104.456
	Output Gap	yg	-48.369	-52.118	-46.702	-53.771	-63.415	-62.691
		Δyg	-78.244	-56.563	-127.900	-97.782	-65.902	-85.451
	Uncertainty Index	ui	-37.205	-43.483	-72.508	-46.948	-78.309	-54.180
		Δui	-117.089	-92.851	-101.153	-94.573	-104.237	-130.158
	Short-term Interest Rate	ys	-32.777	-19.263	-25.731	-45.193	-15.268	-16.269
		Δys	-108.822	-50.534	-71.579	-74.407	-48.485	-106.466
Global variables	Oil Price	poil			-21.594			
		$\Delta poil$			-102.043			

Note: The modified AIC is used to choose the WS-ADF test statistics, with a 5% significant level. The 95% critical value of the WS-ADF statistics for regressions with a trend is -3.24, and without a trend is -2.55.

Table 3. Trade weights.

Country	Brazil	China	India	Indonesia	South Africa	Türkiye
Brazil	0	0.0064	0.0189	0.0112	0.0180	0.0104
China	0.1789	0	0.1524	0.1460	0.1570	0.1065
India	0.0233	0.0270	0	0.0483	0.0496	0.0248
Indonesia	0.0098	0.0220	0.0395	0	0.0092	0.0092
South Africa	0.0077	0.0017	0.0155	0.0052	0	0.0107
Türkiye	0.0055	0.0022	0.0415	0.0067	0.0084	0
Rest	0.7749	0.9408	0.7322	0.7826	0.7578	0.8383

tests on levels, first and second differences for all variables. To save space, we only present the WS-ADF test results in Table 2. According to the results, the variables included in the GVAR model are integrated of order 1 or I(1).

Trade weight is the key to building global linkages. In the GVAR model, we constructed the foreign variables using fixed trade weights calculated from annual trade flow data for the 33 countries (average of imports and exports over the period 1980-2016), averaged over the years between 2003-2016.⁶ Foreign variables are defined as $y_{it}^* = \sum_{j=0}^N w_{ij} y_{jt}$. The weights, w_{ij} , capture the importance of country j for country i and indicates the share of country j in the total trade of country i such that $w_{ii} = 0$ and $\sum_{j=0}^N w_{ij} = 1$. The rationale for using trade weights is that they can capture the effects of external shocks that may be reflected in macroeconomic variables in all countries. Consequently, it can be assumed that country-specific foreign variables represent global dynamics affecting inflation in emerging economies. Table 3 presents the trade shares of our focus economies with other countries in the model.⁷

4. Empirical results

This section presents the results estimated with the GVAR model and the time-varying Granger causality (TVGC) test between the selected variables, presented under four sub-headings. The first one comprises Figures 2-5, which illustrate the impact of local shocks on inflation. The second one includes Figures 6-9, which demonstrate the influence of global shocks on inflation. The third one is Table 4, which presents the full sample results

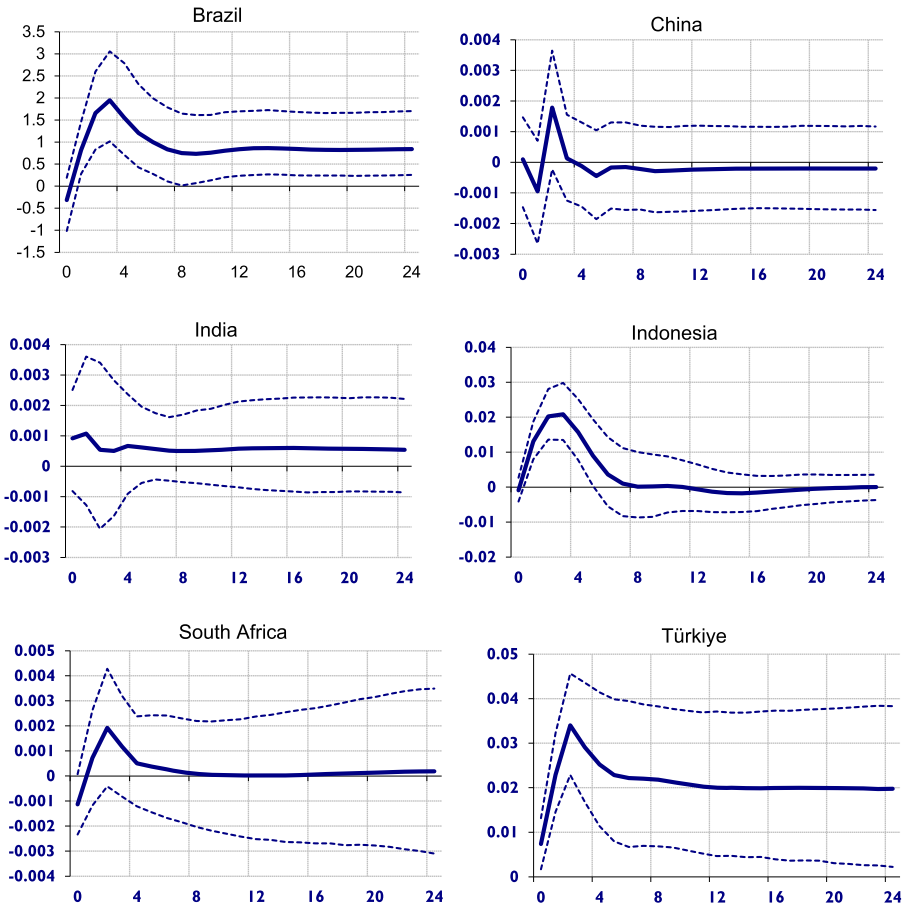


Figure 2. Response of inflation to positive domestic real exchange rate shocks.

of the TVGC test. Finally, Figure 10 presents the RE time-varying Granger causality test between inflation and local and global factors, namely interest rate, exchange rate, and oil prices.

4.1. The role of local factors on inflation

The impact of positive exchange rate shocks on domestic inflation is presented in Figure 2. The results presented in Figure 2 show that the exchange rate is the most influential factor surging inflation in emerging economies, particularly in Brazil and Türkiye. In these countries, exchange rate-driven inflation appears to be quietly higher and more persistent. In Indonesia, on the other hand, the effect is positive and significant over four quarters after that becomes insignificant. Our results are in line with the literature, as many studies have shown that domestic factors are the main drivers of exchange rate fluctuations (Ha, Stocker, and Yilmazkuday 2020) and that the exchange rate can lead to an increase in domestic inflation in emerging economies through cost-push shocks,

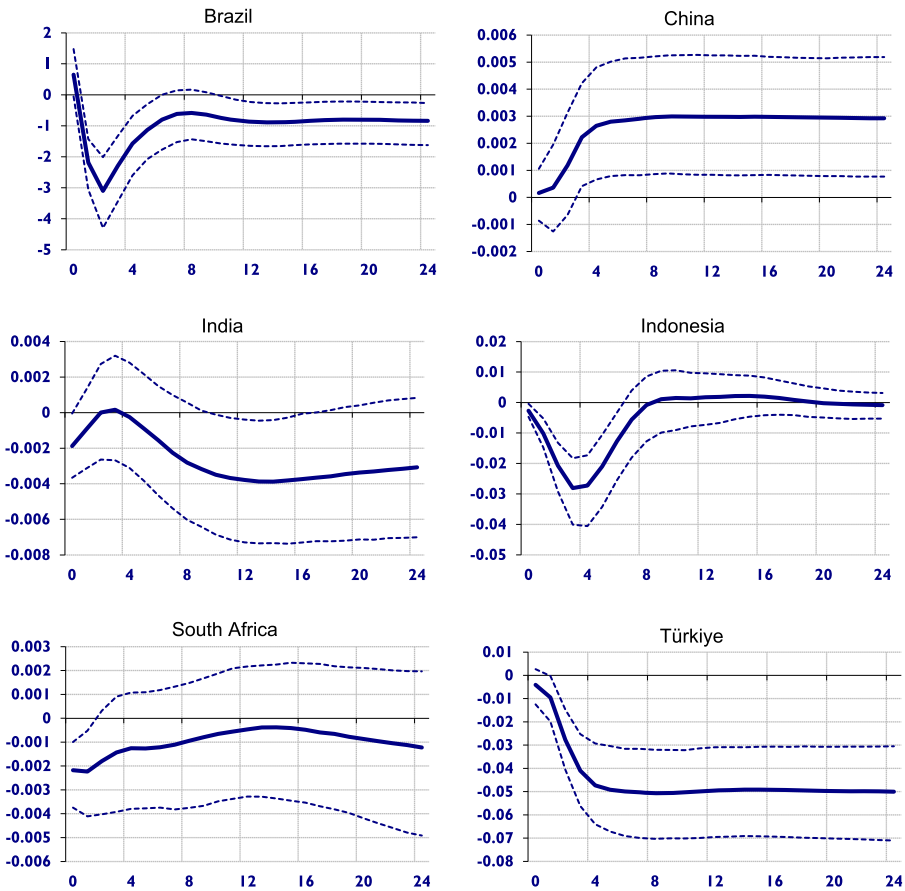


Figure 3. Response of inflation to negative domestic interest rate shocks.

expectations, and indexation channels (de Souza, Maciel, and Pizzinga 2013; Kara et al. 2007; Kara and Ögünç 2008).

As shown in Figure 3, negative interest rate shocks have a significant but different magnitude impact on inflation in emerging economies. It is thought that the use of finance in production processes constitutes an important cost factor depending on the level of interest rates (Chowdhury, Hoffmann, and Schabert 2006). Our results prove that high nominal interest rates have an inflationary effect in Brazil, Indonesia, and Türkiye. For instance, the negative interest rate shock has long-lasting negative and significant impacts on Brazil and Turkish inflation. The effect, however, is short-lived in South Africa and Indonesia, and the shock becomes insignificant after the second and seventh quarters, respectively. The initial response of inflation to China's negative interest rate shock seems insignificant. This is because they directly increase the cost of working capital, reducing the inflationary response to an interest rate shock. Therefore, whether inflation is cost-push or demand-pull, the interest rate, as a strong domestic dynamic, contributes to the disinflation process when used appropriately.

Figure 4 shows that a positive domestic output gap causes inflation in China and Türkiye and, to a lesser extent, Brazil, India, and Indonesia, suggesting that the output

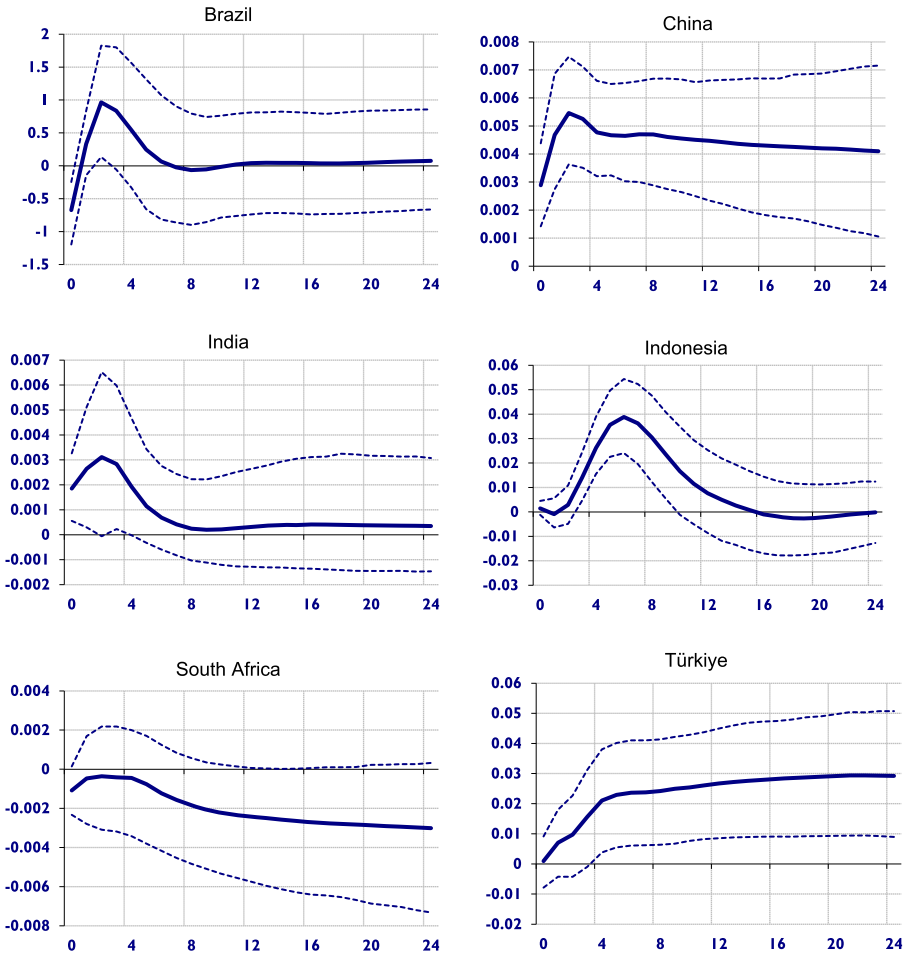


Figure 4. Response of inflation to positive domestic output gap shocks.

gap is an essential driver of inflation in these countries. It is clear that positive shocks to the domestic output gap, although of varying duration and magnitude, lead to domestic inflation in all countries except South Africa. This effect, observed only in the first year in Brazil and India, persists throughout the entire period in China and Türkiye. Indonesia and Türkiye exhibit a similar pattern regarding the inflationary pressure of the domestic output gap after the first year. The results for these countries are consistent with the fact that inflation is a general equilibrium phenomenon as much as a monetary issue (Engel 2013). In other words, the convergence of aggregate supply to its potential level in these countries contributes to a fall in the general price levels. Thus, our results support the idea that inflation is mainly driven by domestic factors (Förster and Tillmann 2014) and that the domestic output gap is the main driver of inflation (Gao, Abbas, and Lan 2024). Our findings are also consistent with Harding, Lindé, and Trabandt (2023), who found a positive relationship between inflation and the output gap. However, some studies, such as IMF (2006), Pain, Koske, and Sollie (2006), and Sbordone (2007), find different results that are not in line with our findings.

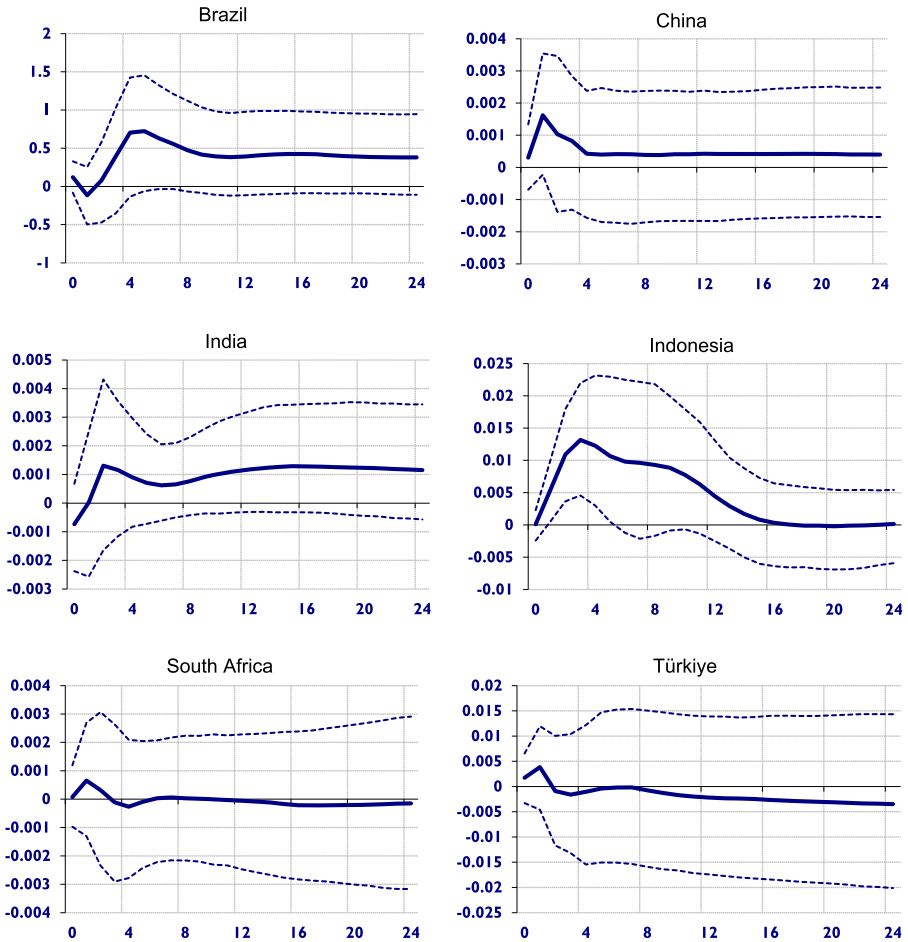


Figure 5. Response of inflation to positive domestic uncertainty shocks.

Domestic policy uncertainty leads to a rise in inflation only in Indonesia for a very short period of time, suggesting that this factor does not have a strong explanatory power on domestic inflation (Figure 5). We also find that positive global policy uncertainty shocks do not significantly impact inflation in these countries (Figure 9). Therefore, we consider that the joint action and strong communication strategies of the central banks of countries such as the US, the EU, and the UK reduce global policy uncertainty, reducing the impact of policy uncertainty on inflation in emerging economies.

4.2. The role of global factors on inflation

In light of the existing literature, this section will analyze how global developments, such as positive global interest rates, positive global output gaps, and positive global inflation shocks, affect domestic inflation. The results are represented in Figures 6–9. Firstly, Figure 6 shows the impact of a positive global interest rate shock on domestic inflation. The shock has a positive and significant long-lasting effect on inflation in Brazil. The

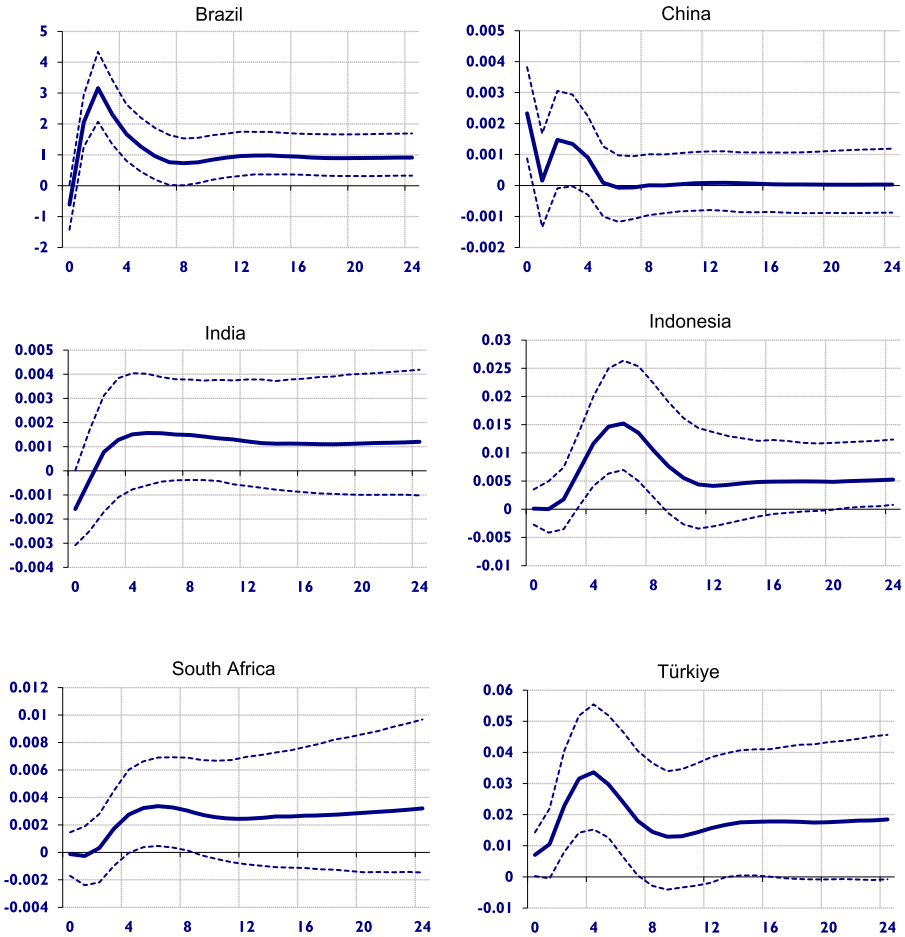


Figure 6. Response of inflation to positive global interest rate shock.

inflation rates of China, South Africa, Indonesia, and Türkiye react positively to this shock, although the impact of the shock on these economies is relatively short-lived. In this regard, it could be said that positive global interest rate shocks are inflationary in these economies.

As illustrated in Figure 7, a positive shock to the global output gap is associated with increased domestic inflation in all countries except India. While this effect is relatively short-lived in Brazil and Indonesia, it appears to have a long-lasting impact on inflation in Türkiye, South Africa, and China. In this respect, our results contradict the findings of Abbas (2018), who argues that the global output gap leads to short-lived and small inflation in China and India. We can argue that economic integration meets the increase in demand through imports and allows for the free movement of factors. In contrast, economic integration makes domestic inflation more sensitive to global shocks. In this context, the disinflationary effect of globalization – in the absence of disruptions in supply chains or supply shocks – cannot be ignored as it encourages competitiveness innovation and lowers factor prices (IMF 2006; Nagy and Tengely 2018; Sbordone 2007).

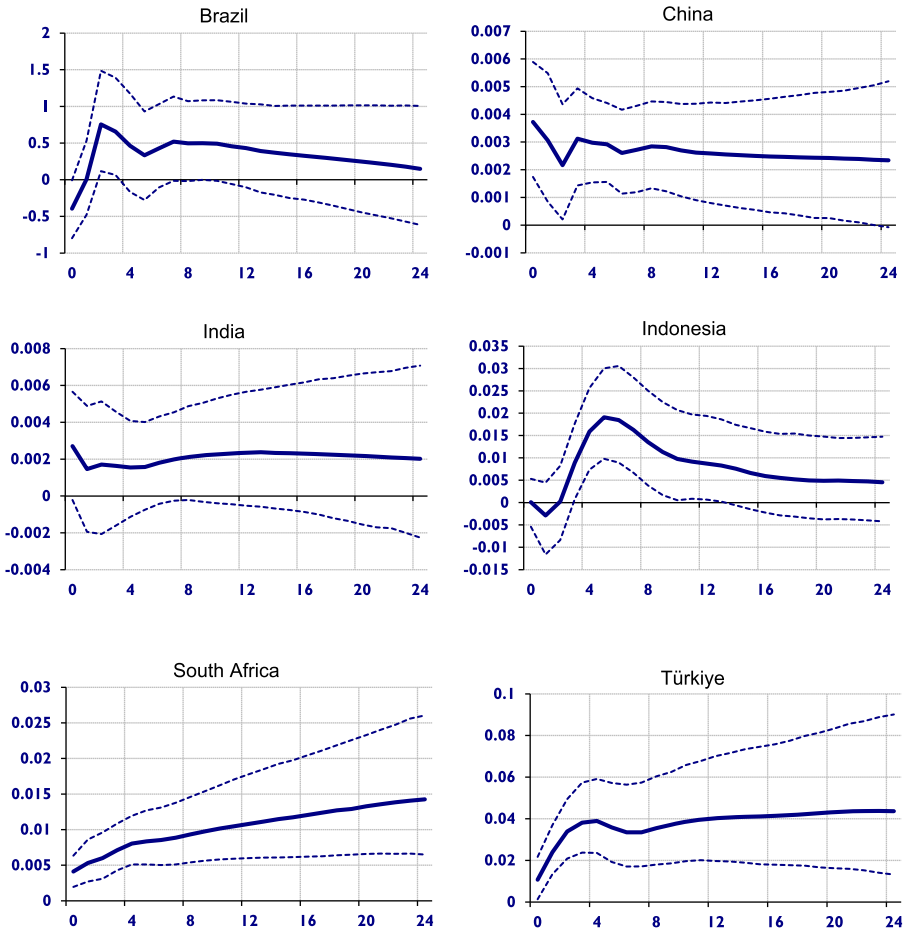


Figure 7. Response of inflation to positive global output gap shock.

These results also show the importance of supply chains and that financial/economic integration can become inflationary in the face of a supply shock. These results are in line with the findings of Auer, Borio, and Filardo (2017), Istiak et al. (2021), and Bańbura, Bobeica, and Hernández (2023); however, they provide exemplary results that Parker's (2018) global inflation hypothesis does not hold in emerging countries.

Global slowdown may also be inflationary in some countries by disrupting the external balance. The slowdown in foreign demand reduces the inflow of foreign currency into the country, causing the national currency to depreciate. It is known that this effect is inflationary through the expectation and the cost channels. This phenomenon normalizes over time with the J-curve effect depending on whether the volume or price effect is greater. In summary, the global slowdown may cause cost effects by putting pressure on the exchange market, resulting in inflation. The widening of the global output gap may lead to imports of price increases in goods and services markets. The exchange rate and oil price pass-through effects, fostered by the inflationary environment, come into play as factors that increase the magnitude of this effect. Therefore, we can argue that

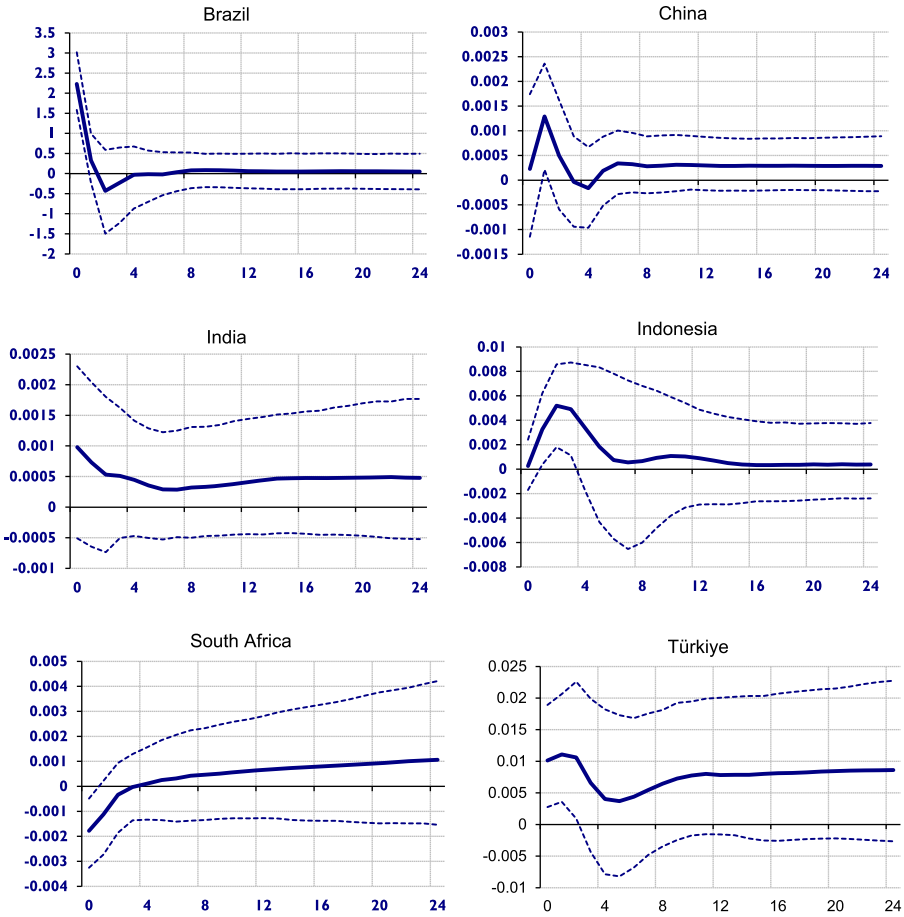


Figure 8. Response of inflation to positive global inflation shock.

a country with high imports of intermediate goods would have high inflation due to a fall in global output caused by the supply side and foreign demand not being adequately met. We can conclude that the increase in the global output gap is causing inflation in emerging economies.

Figure 8 shows that a positive global inflation shock has a positive and significant impact on inflation in Brazil, Indonesia, and Türkiye. At impact, Brazil’s inflation increased by 2% while Türkiye’s inflation increased by 0.01%. The effect is short-lived in both countries as the shock becomes insignificant after the third quarter. Similarly, Indonesian inflation responded positively to this shock, although the impact was only significant in the first to fourth quarters. The response of South African inflation to this shock is short-lived, but the impact is negative and significant.

Given that an increase in global inflation raises domestic inflation in Brazil, China, Indonesia, and Turkey, it can be argued that globalization and trade openness contribute to the spread of inflation in emerging economies. However, considering that 26 percent of inflation is explained by global shocks and 4 percent by oil prices, it should not be ignored that inflation in emerging countries is more sensitive to domestic factors (Ha

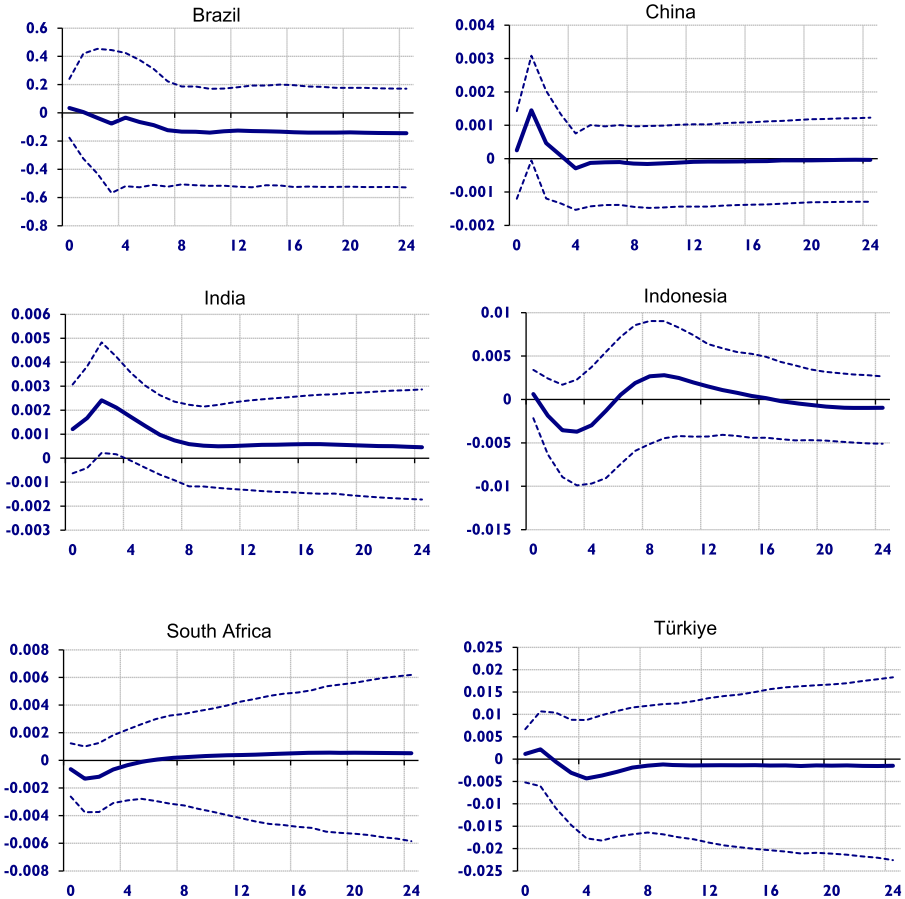


Figure 9. Response of inflation to positive global uncertainty shock.

et al. 2023). Moreover, according to Neely and Rapach (2011), 49 percent of inflation is attributed to domestic dynamics, which is consistent with our results. Although external shocks are essential for domestic inflation, local factors are the primary determinant of inflation in the long run. Therefore, as Woodford (2007) and Kamber and Wong (2020) argue, the effects of inflation targeting cannot be ignored despite greater globalization.

4.3. Time-varying granger causality results

We report the results of TVGC in two ways. First, we present the full sample results in Table 4. The findings from FE, RO, and RE algorithms provide strong evidence of causality between exchange rates, interest rates, oil prices, and inflation. This full sample with Wald statistics shows that causality runs from exchange rates, interest rates, and oil prices to inflation at the 1% level in all economies. In other words, our findings suggest that interest rates and exchange rates are the Granger causes of domestic inflation in Türkiye, Brazil, and South Africa, interest rates in China, and interest rates and oil prices in India.

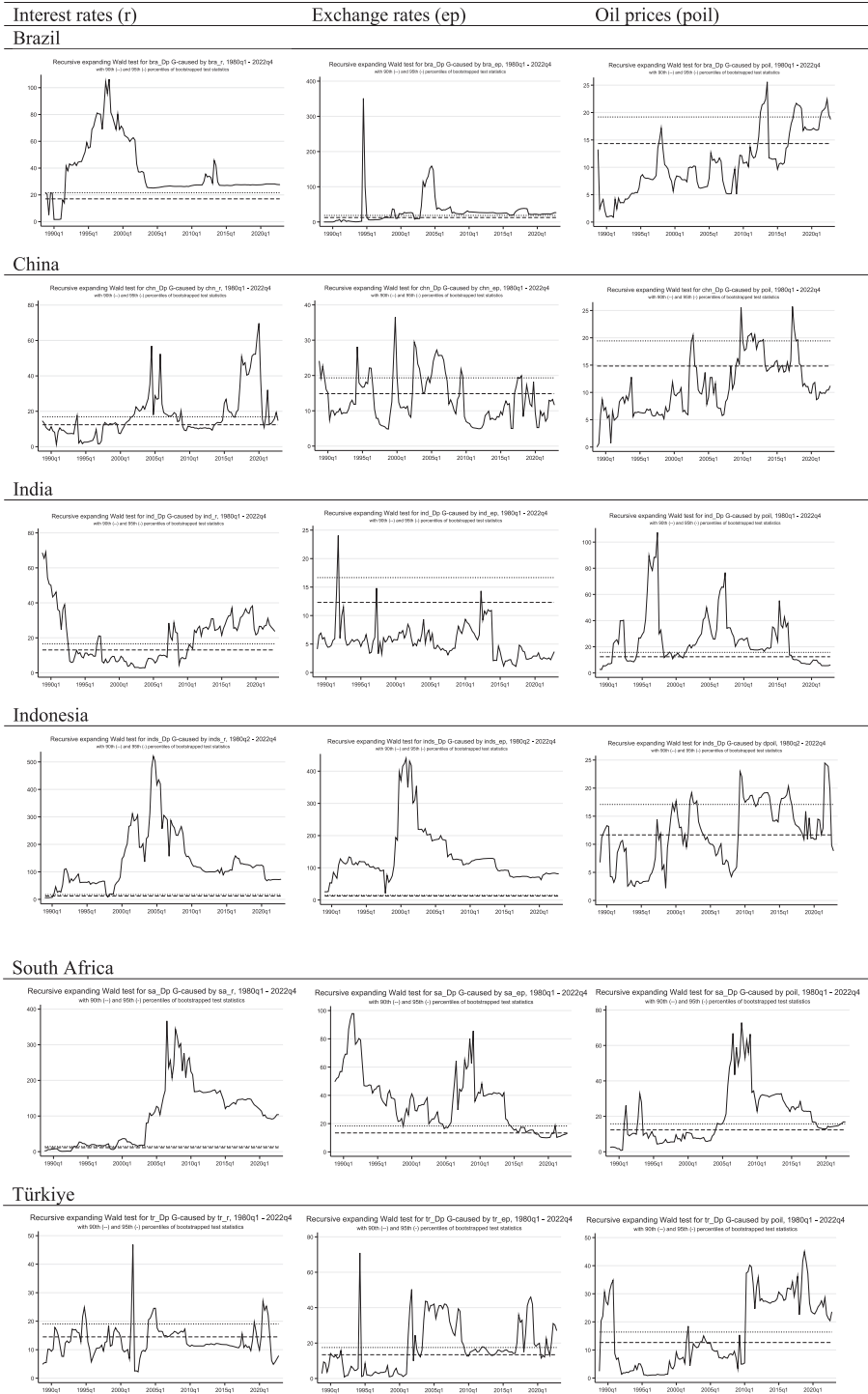


Figure 10. Time-varying Granger causality tests. Note: Time-varying Granger causality tests from interest rate(r) and exchange rate (ep), and oil prices (poil) to the inflation rate (Dp). The VAR model is estimated with $p = 2$, $d = 1$ and a trend over 1980q1–2022q4. The minimum window size is set at 36 observations. The 95th and 99th percentiles of the bootstrap critical values (lower – and upper–horizontal lines, respectively) are based on 499 replications.

Table 4. Wald tests of Granger causality.

Country	Direction of Causality	Max Wald FE	Max Wald RO	Max Wald RE
Brazil	Dp G-caused by Ep	333.705 (14.385)	185.587 (13.765)	351.050 (14.562)
	Dp G-caused by r	54.924 (29.462)	106.351 (27.007)	106.351 (29.462)
	Dp G-caused by poil	13.197 (19.016)	18.158 (18.130)	25.598 (19.086)
China	Dp G-caused by Ep	24.035 (17.076)	36.489 (16.382)	36.489 (18.266)
	Dp G-caused by r	14.470 (15.105)	69.710 (18.054)	69.710 (18.054)
	Dp G-caused by poil	8.629 (20.304)	25.725 (20.358)	25.725 (21.237)
India	Dp G-caused by Ep	22.812 (16.207)	14.242 (17.136)	24.055 (17.136)
	Dp G-caused by r	69.071 (12.574)	68.483 (12.239)	69.071 (12.981)
	Dp G-caused by poil	25.401 (16.273)	89.442 (16.735)	107.361 (17.496)
Indonesia	Dp G-caused by Ep	169.215 (17.397)	360.820 (17.397)	439.753 (17.397)
	Dp G-caused by r	11.035 (23.932)	477.121 (22.004)	520.822 (23.975)
	Dp G-caused by poil	13.324 (17.964)	24.464 (17.700)	24.464 (18.128)
South Africa	Dp G-caused by Ep	72.605 (14.616)	93.621 (14.573)	97.834 (16.110)
	Dp G-caused by r	5.827 (14.917)	366.945 (15.626)	366.945 (15.626)
	Dp G-caused by poil	10.592 (16.696)	59.017 (16.361)	72.890 (16.748)
Türkiye	Dp G-caused by Ep	36.490 (16.470)	70.588 (14.833)	70.920 (16.470)
	Dp G-caused by r	10.304 (19.611)	46.872 (18.269)	46.872 (19.611)
	Dp G-caused by poil	8.747 (16.537)	37.372 (16.309)	44.994 (16.537)

Note: Wald tests are calculated using a VAR model with $d = 1, p = 2$, minimum window size 36, and the number of bootstrap experiments 499. The 95th percentiles of the bootstrap statistics are in parentheses.

Secondly, we present a time-varying Granger causality relationship between domestic and global factors and inflation in emerging economies in Figure 10. We only plot the RE algorithm results to save space.⁸ These results show essential features of inflation dynamics in emerging economies. The results obtained from the RE algorithm are significant at the 95% level. The first one is that the interest rate appears to have more persistent predictive power for inflation in Brazil, Indonesia, and South Africa than in other countries. While the causality from interest rates to inflation is short-lived in Türkiye (only in 2001 and 2020), it is long-lived in Brazil (from 1990 to 2022), South Africa (from 2005 through 2022), and India (especially from 2010 to 2022). On the other hand, the results from RE show causality between interest rate and inflation in China from 2001 through 2008 and 2015 through 2020.

As expected, the results show Granger causality from exchange rate to inflation in all countries. Granger causality appears to be the case in Türkiye, especially during crises such as 1994 and 2001. Moreover, the stability created by the free-floating exchange rate regime and the inflation targeting strategy, which started to be implemented in the 2000s,

on the exchange rate pass-through is also observed. Similarly, the causality from the exchange rate to inflation reached its highest level in Brazil in 1994. It was seen to be effective in South Africa in 2005, in India between 2010 and 2016, and in China between 2000 and 2010. According to the results, oil prices have been causally associated with inflation in Türkiye in the early 90s and continuously after 2010, in Brazil periodically after 2008, in China in the early 2000s and between 2010 and 2020, in India continuously until 2016, and in South Africa continuously after 2005.

These results suggest that the local and global factors Granger causes on inflation. However, the causality varies across countries and over time. As the causality coefficients for the interest and exchange rates are more significant than for the oil price, we can conclude that local dynamics are stronger than global ones in explaining inflation in these countries.

5. Conclusion

Increasing globalization and economic integration bring essential advantages to countries, such as the cost-cutting effects of international competition, innovation, free movement of production, and capital factors. Thus, globalization is believed to prevent domestic prices from rising excessively by meeting sudden increases in domestic demand through imports. This phenomenon is summarized by two conceptualizations in the literature: the reduced sensitivity of inflation to the domestic output gap and the flattening of the Philips curve. However, in addition to these positive contributions of globalization, it also brings various problems, especially for small open economies, making them vulnerable to external shocks. For this reason, a growing body of recent research argues that global factors are essential in the emergence of domestic inflation and that the reduced sensitivity of inflation to the domestic output gap and flattening of the Philips curve are invalid for all countries. In other words, local factors still powerfully drive domestic inflation.

Consequently, it is becoming increasingly important to model the simultaneous impact of local and global factors on domestic inflation. In this context, the recently developed global vector autoregressive (GVAR) model, which has been used in many studies, has emerged as a powerful tool that enables simultaneous and global assessment of how local and global factors impact domestic inflation. In this study, we used a multi-country model containing 33 countries from different regions and a large dataset to assess whether inflation dynamics are locally or globally determined in Brazil, China, India, Indonesia, South Africa, and Türkiye over 1980q1-2022q4. Furthermore, considering that the effects of shocks on inflation may vary over time, we also explored the possibility of causality between exchange rates, interest rates, oil prices, and domestic inflation using the time-varying Granger causality (TVGC) test.

The results reveal that domestic and global factors contribute to domestic inflation in different magnitudes. For example, local dynamics, such as positive exchange rates and output gap shocks, lead to higher domestic inflation. In contrast, global dynamics, such as positive global interest rates and global output gap shocks, affect inflation less. Positive shocks to the domestic output gap have a more persistent effect on domestic inflation in China and Türkiye compared to other countries. Similarly, the effect of the exchange rate on inflation is relatively high and persistent in Brazil, Indonesia, and Türkiye. Furthermore, our findings suggest that domestic policy uncertainty is not a strong explanatory factor.

On the other hand, inflation is linked to positive shocks to the global output gap in almost all countries. Additionally, five out of six countries experience domestic inflation in response to a positive global interest rate shock, albeit for varying lengths of time. It is also important to consider that a supply shock affecting the global economy could result in inflationary pressures in countries through globalization and economic integration.

The TVGC test results indicate that interest rates and exchange rates Granger cause inflation in all countries while oil prices in some countries. The causality coefficients for interest and exchange rates are more significant than those for oil prices. This also suggests that local dynamics are stronger than global ones in explaining inflation in these countries and that there may be differences across countries and over time. In sum, economic integration, and hence globalization, seen as a tool to suppress inflation, can turn into an inflationary factor in the face of supply shocks. However, given the effects of local and global shocks on inflation, we suggest that domestic dynamics are as important as global factors in explaining inflation in emerging economies.

Notes

1. GVAR Toolbox 2.0, available at <https://sites.google.com/site/gvarmodelling/gvar-toolbox>.
2. The dataset is provided in the GVAR toolbox and is available at <https://www.econ.cam.ac.uk/people-files/emeritus/mhp1/GVAR/GVAR.html>
3. The eight countries in the euro area, namely Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain, are grouped and treated as a single economy as they started to use a common monetary policy in 1999.
4. Output gap ($Y-Y^*$) refers to the difference between a country's actual output (Y) and potential output (Y^*).
5. In a similar vein, Dees et al. (2007) used the same specification, yet we have extend the models by incorporating updated data and incorporating output gap and uncertainty index variables into the models.
6. Trade weights are based on IMF Direction of Trade Statistics and taken from the GVAR toolbox.
7. The complete trade share matrix is available on request.
8. The FE and RO results are available on request.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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