Dissecting International Monetary Policy Spillovers in Africa: A Time-Varying Analysis

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Abstract

While the international spillovers of monetary policy from advanced economies are well-documented for Asia and Latin America, Africa remains a critical but understudied region. This paper investigates the primary channels through which international monetary policy shocks transmit to the macroeconomic performance of ten major African economies. Using a time-varying vector autoregression (TVP-VAR) for spillover measurement and a time-varying panel model (TVPLM) to assess transmission channels from 2006Q1 to 2023Q4, we find that financial linkages are the dominant transmission mechanism. Specifically, foreign direct investment (FDI) and personal remittances are more influential in driving spillovers to output and inflation than traditional trade channels or global commodity prices. Our results also reveal significant heterogeneity: spillovers are most pronounced in commodity-dependent economies (South Africa, Algeria, Nigeria) and in countries with de facto currency pegs (Morocco, Cameroon). By providing the first comprehensive analysis of these transmission channels for a diverse set of African countries, our findings offer crucial insights for policymakers on mitigating external shocks and enhancing monetary policy independence.

Keywords: Monetary policy spillovers, static and dynamic spillovers, time-varying parameters vector autoregressions, time-varying panel with fixed effects.

JEL Classification: E52; E58; F01; F33; F42; F62.

1 Introduction

The 2007-2008 global financial crisis (GFC) and subsequent periods of economic turmoil, including the Eurozone sovereign debt crisis and the COVID-19 pandemic, have underscored the profound interconnectedness of the global economy. In response to these shocks, advanced economies implemented sweeping conventional and unconventional monetary policies. Major central banks, including the Federal Reserve (FED), the European Central Bank (ECB), and the Bank of England (BOE), adopted measures such as quantitative easing (QE) that propagated across national borders. More specifically, many African countries experienced substantial capital inflows because of the near-zero interest rates in advanced economies. For example, countries like Nigeria and Ghana attracted significant foreign direct investment (FDI) and portfolio investment in the oil and gas sectors, while South Africa saw investments in telecommunications, financial services, infrastructure, and manufacturing. These capital inflows bolstered economic growth on the continent, even as advanced economies faced slow growth. Furthermore, quantitative easing in advanced economies stimulated financial market transactions, enabling countries like South Africa to raise substantial funds from international debt markets. Given these dynamics, African policymakers must remain vigilant to international monetary policies, as they can impose new conditions on trade and financial relationships and significantly impact commodity markets.

The main objective of this paper is to identify and quantify the primary channels through which international monetary policy shocks transmit to the macroeconomic performance of major African economies. To achieve this, the paper pursues three specific aims: (i) to measure the magnitude and time-varying intensity of international monetary policy spillovers on output, policy rates, and inflation; (ii) to identify the dominant transmission channels between trade linkages, financial linkages and global factors; (iii) to assess the heterogeneity of these spillovers across African countries. To guide our investigation, we test three central hypotheses: (i) spillovers are stronger in African countries with greater financial integration; (ii) spillovers are more pronounced in countries with strong trade linkages to the source economies; and (iii) the transmission of shocks is asymmetric, with commodity-dependent economies experiencing larger output spillovers and countries with fixed exchange rates experiencing stronger spillovers to policy rates and inflation.

The ten African nations central to this study—Algeria, Botswana, Cameroon, Côte d'Ivoire, Egypt, Ghana, Morocco, Nigeria, South Africa, and Tunisia—were selected to provide a representative and diverse cross-section of the continent's economic landscape. Collectively representing approximately more than a half of Africa's Gross Domestic Product (GDP), this sample includes the continent's largest economies (Nigeria, South Africa, Egypt), countries with diverse resource endowments (e.g., oil, gas, diamonds), and varying levels of industrialization. Crucially, the inclusion of countries with different exchange rate regimes—from the CFA franc zone's peg to the euro to more flexible regimes—is essential for testing our heterogeneity hypothesis and ensuring our findings are not skewed by a single policy framework.

Our analysis focuses on monetary policy spillovers from advanced economies, excluding major emerging markets like China and Russia. This exclusion is a pragmatic choice driven by methodological challenges, data limitations, and the distinct nature of their economic linkages with Africa. A key reason for this exclusion is the unique and less conventional monetary policy frameworks and economic structures of China and Russia. China, for instance, operates with a regulated domestic financial market, a relatively rigid exchange rate, and limited capital market openness Cho and Kim (2021), which complicates the clear identification of monetary policy shocks and their transmission mechanisms. Standard spillover models, designed for Western market dynamics, may not be applicable without substantial adjustments. Furthermore, although the trade relationship between Africa and China is significant and growing, it is heavily concentrated in commodities and infrastructure financing Odjo and Traoré (2024). Spillover analysis often prioritizes financial market channels, which are less developed or operate differently between Africa and China/Russia compared to their linkages with Western financial markets. Finally, the historical depth of trade and financial ties with Europe and North America provides a richer, longer dataset for robust econometric analysis. While Europe's share of Africa's trade has declined, it was a dominant partner for a much longer period than China, for whom intensified links are more recent Odjo and Traoré (2024). This lack of sufficiently long and detailed time-series data for Africa's relations with China and Russia currently limits the feasibility of a comprehensive spillover study.

To address our research objectives and test our hypotheses, we employ a two-step methodological framework using a dataset spanning from 2006Q1 to 2023Q4. This approach provides a clear linkage between our methods and our specific research questions. First, we use a time-varying parameter vector autoregression (TVP-VAR) model to measure the magnitude and evolution of international monetary policy spillovers on each African country's output, interest rates, and inflation. By generating country-specific spillover indices, this step directly allows us to test our third hypothesis on asymmetric transmission. It enables a direct comparison of the spillover intensity between commodity-dependent economies (like Nigeria and South Africa) and those with fixed exchange rate regimes (like Cameroon and Morocco). Second, we use the dynamic spillover series generated in the first step as the dependent variable in a time-varying panel model (TVPLM). This second stage is designed to identify the primary transmission channels and directly test our first and second hypotheses. By including variables for financial integration (FDI, remittances) and trade linkages as explanatory variables, the TVPLM allows us to statistically determine their role and significance in driving the measured spillovers.

Our central finding is that financial linkages—specifically foreign direct investment (FDI) and personal remittances—are the dominant channels through which international monetary policy shocks affect output and inflation in Africa, proving more influential than traditional trade channels or global commodity prices. Empirical results display significant heterogeneity in responses across the continent. For instance, external monetary policy shocks account for over 55 percent of output variation in the financially integrated, commodity-dependent economy of South Africa, while policy rates in countries with de facto currency pegs like Morocco are also highly sensitive, with external factors explaining

53 percent of their variation. Furthermore, inflation spillovers are most pronounced in import-reliant nations like Tunisia, where international monetary policy drives more than 74% of inflation dynamics. These varied responses offer crucial insights for policymakers on mitigating external shocks and enhancing monetary policy independence.

This paper makes several novel contributions. To our knowledge, it is the first to systematically investigate and quantify the transmission channels of international monetary policy spillovers across such a diverse panel of African countries. We extend existing work by employing a TVP-VAR methodology, which allows us to capture the dynamic and evolving nature of these effects. This is particularly crucial for analyzing how spillovers evolved during distinct crisis episodes, including the GFC, the Eurozone sovereign debt crisis, and the COVID-19 pandemic. By examining spillovers to output and inflation, we broaden the scope beyond the policy rate focus of recent studies and highlight the significant heterogeneity in responses across the continent, offering nuanced insights for tailored policymaking.

The remainder of the paper is structured as follows. Section 2 provides a review of the relevant theoretical and empirical literature. Section 3 details the methodological approach and data. Section 4 presents the empirical results, and Section 5 concludes with a discussion of the policy implications.

2 A Brief Literature Review

The international transmission of monetary policy is a significant area of interest within international economics. This section synthesizes the vast literature, first by touching on the theoretical foundations and the extensive empirical work on major economies, then by identifying the key transmission channels, and finally by highlighting the critical research gap concerning African economies, which motivates this study. Theoretical groundwork for monetary policy spillovers is well-established, originating from the Mundell-Fleming-Dornbusch framework and evolving with New Open Economy Macroeconomics (NOEM) models Dooley and Isard (1980) and Dooley and Isard (1983). A vast empirical literature has since tested these theories, primarily focusing on the transmission of shocks from advanced economies—particularly the United States (US) and the Euro Area (EA)—to other developed nations and major emerging markets in Asia and Latin America Kim (2001); Canova (2005);Mumtaz and Surico (2009); Anaya et al. (2017) and Camara et al. (2025).

These studies have employed a wide array of econometric methods, including various vector autoregressive (VAR) models, factor models, and Global VAR (GVAR) models. A significant portion of this research explores bilateral and regional spillovers. For instance, Holman and Neumann (2002) documented robust transmission between the U.S. and Canada, while Canova (2005) found that U.S. monetary policy shocks had significant effects in Latin America. In Asia, Maćkowiak (2006) identified transmission from Japan and China to East Asian countries. A parallel body of literature has focused on spillovers within currency unions, most notably the Eurozone Peersman (2004) and Georgiadis (2015).

A key insight from this broad literature is the lack of consensus on the sign, magnitude, and dominant channels of monetary policy spillovers. For example, Georgiadis (2016) and Maćkowiak (2007) showed that U.S. monetary policy shocks can generate significant, and sometimes larger, output spillovers abroad. Others, like Kim (2001) and Canova (2005), found that tight U.S. monetary policy tends to negatively affect output in emerging markets, challenging some theoretical predictions.

The literature has converged on several key channels through which these spillovers operate, though their relative importance is debated. The first is the traditional trade and competitiveness channel, where a monetary tightening in an anchor country appreciates its currency, altering trade balances and affecting output in partner countries. A second, often dominant, mechanism is the interest rate and financial channel Kim (2001); Ehrmann and Fratzscher (2009). This channel posits that a rise in an anchor country's interest rates leads to capital outflows from emerging markets, tightening their financial conditions and depressing output. Finally, a more recent branch of empirical work, using bank-level data, documents the bank-lending channel PEYDRÓ (2019);Buch et al. (2019). Through this mechanism, contractionary policy in an advanced economy raises funding costs for parent banks, forcing them to reduce lending to their foreign subsidiaries Schnabl (2012).

The literature also documents time-variant effects of international monetary policy transmission Ciccarelli and Rebucci (2001), Kazi et al. (2013), Liu et al. (2014) and Barbosa et al. (2018). For instance, Ciccarelli and Rebucci (2001) observed increasing spillover effects of monetary policy among Euro Area countries in the late 1990s. Kazi et al. (2013) found that the impact of U.S. monetary policy on share prices in OECD countries was more pronounced during the 2008-2009 financial crisis. Conversely, Barbosa et al. (2018) reported that financial frictions from the European debt crisis did not significantly influence monetary policy spillovers from the U.S. and U.K. to bank lending in Ireland and Portugal. Similarly, Tillmann et al. (2019) found no significant increase in U.S. monetary policy spillovers after the global financial crisis.

Despite this extensive literature, Africa remains a critically understudied region. This is a significant gap, as African economies possess a unique confluence of structural factors that make them acutely susceptible to external monetary policy spillovers. These vulnerabilities include a heavy dependence on USD-priced commodity exports, a reliance on international debt markets for public financing, a strong foreign bank presence creating a potent bank-lending channel, and widespread financial dollarization that exposes domestic balance sheets to exchange rate shocks. These structural factors underscore the urgent need to understand monetary policy spillovers in a specifically African context. While a few recent studies have begun to explore this issue Tumala et al. (2021); Sikiru and Salisu (2024); Moyo and Phiri (2024), a systematic, empirical analysis of the specific transmission channels across a diverse set of African economies is still missing. This paper aims to fill that gap by not only measuring the time-varying nature of these spillovers but by explicitly identifying the relative importance of the trade, financial, and global factor channels.

3 Econometric Framework

To investigate the transmission of international monetary policy spillovers to African economies, we employ a two-stage econometric approach. This framework is explicitly designed to link our research objectives to our empirical models. In the first stage, we address our objective of measuring the magnitude and time-varying intensity of spillovers. We use a Time-Varying Parameter Vector Autoregression (TVP-VAR) model for the panel selected African countries to quantify the dynamic spillovers from advanced economies' monetary policy shocks to each country's output, policy rate, and inflation. In the second stage, we address our objectives of identifying the dominant transmission channels and assessing their importance over time. We use the dynamic spillover series generated in Stage 1 as the dependent variable in a Time-Varying Parameter Panel Model with fixed effects (TVPLM). This allows us to statistically test our hypotheses regarding the roles of trade linkages, financial linkages, and global factors.

3.1 Measuring Monetary Policy Spillovers with a TVP-VAR model

To capture the dynamic nature of international monetary policy transmission, we adopt the TVP-VAR methodology. This approach is superior to the traditional rolling-window VAR framework for several reasons: (i) it does not require the arbitrary selection of a rolling-window size, which can significantly affect the results; (ii) it avoids the loss of observations inherent in rolling-window analysis; and (iii) it is less sensitive to outliers, providing more robust estimates of dynamic connectedness Antonakakis et al. (2020).

3.1.1 The TVP-VAR Specification

The TVP-VAR(p) model is specified as follows:

$$Y_t = \beta_t Y_{t-1} + \varepsilon_t \tag{1}$$

$$vec(\beta_t) = vec(\beta_{t-1}) + v_t \tag{2}$$

with $\varepsilon_t | F_{t-1} \sim N(0, S_t)$ and $v_t | F_{t-1} \sim N(0, R_t)$. where Y_t is an $(n, 1)$ vector of endogenous variables at time t. In our system, this vector includes the monetary policy uncertainty measures of the advanced economies and the output, policy rate, and inflation of a specific African country. Y_{t-1} is the corresponding $(np, 1)$ vector of lagged endogenous variables. β_t is the (n, np) time-varying coefficient matrix that captures the evolving relationships between the variables. F_{t-1} represents all available information up to time $t-1$. The error term t$\varepsilon t$is an $(n, 1)$ vector of stochastic shocks with a time-varying variance-covariance matrix S_t.

Equation 2 specifies that the coefficients in β_t follow a random walk process, where $vec(.)$ is the vectorization operator. The innovation to the coefficients, v_t, is a vector of shocks with a time-varying variance-covariance matrix R_t. This specification allows the parameters of the model to adapt to

structural changes in the economy, making it particularly well-suited for analyzing periods of crisis and policy shifts.

3.1.2 Deriving the Spillover Index

The core of the spillover analysis relies on the Generalized Forecast Error Variance Decomposition (GFEVD), which measures the proportion of the forecast error variance of one variable that can be attributed to shocks in another variable, independent of the ordering of the variables in the VAR system. This is derived from the time-varying moving average (MA) representation of the TVP-VAR model:

$$Y_t = \sum_{j=0}^{\infty} \alpha_{jt} \varepsilon_{t-j} \tag{3}$$

where, $\alpha_{0t} = 1$, α_{jt} is an (n, n) dimensional matrix of MA coefficients. The Generalized Impulse Response Functions (GIRFs) denoted $\Psi_{j \longrightarrow i,t}(H)$, represent the response of variable i following a shock in variable j at horizon H, calculated as follows:

$$\Psi_{j \longrightarrow i,t}(H) = S_{JJ,t}^{\frac{1}{2}} \alpha_{H,t} S_t \varepsilon_{it} \tag{4}$$

Afterwards, we compute the Generalized Forecast Error Variance Decomposition (GFEVD) that can be interpreted as the variance share one variable has on others at the H-step-ahead forecast horizon. These variance shares are normalized, so that each row sums up to one, meaning that all variables together explain 100 percent of variable's i forecast error variance Denoting GFEVD by $\varphi_{ij}(H)$, this is calculated as follows:

$$\varphi_{ij,t}(H) = \frac{\sum_{t=1}^{H-1} \Psi_{j \longrightarrow i,t}^2}{\sum_{j=1}^{n} \sum_{t=1}^{H-1} \Psi_{j \longrightarrow i,t}^2} \tag{5}$$

with $\sum_{j=1}^{p} \varphi_{ij,t}(H) = 1$ and $\sum_{i,j=1}^{p} \varphi_{ij,t}(H) = p$. The denominator represents the cumulative effect of all the shocks, while the numerator measures the cumulative effect of a shock in variable j. Using the GFEVD, it is possible to build the total spillover index as follows:

$$C_t(H) = \frac{\sum_{i,j=1, i \neq j}^{p} \varphi_{ij,t}(H)}{\sum_{i,j=1}^{p} \varphi_{ij,t}(H)} \times 100 = \frac{\sum_{i,j=1, i \neq j}^{p} \varphi_{ij,t}(H)}{p} \times 100 \tag{6}$$

This approach assesses how a shock in one variable spills over to other variables at different stages. First, we examine the case where variable j transmits its shock to all other variables i, called total directional spillovers to others and defines as:

$$C_{ij,t}(H) = \frac{\sum_{i,j=1, i \neq j}^{p} \varphi_{ij,t}(H)}{\sum_{i}^{p} \varphi_{ij,t}(H)} \tag{7}$$

Second, we calculate the directional spillovers variable i received from variables j, called total directional spillovers from others and defined as:

$$C_{ij,t}(H) = \frac{\sum_{i,j=1, i \neq j}^{p} \varphi_{ij,t}(H)}{\sum_{i}^{p} \varphi_{ij,t}(H)} \tag{8}$$

Gabauer and Gupta (2018) have introduced a connectedness decomposition methodology which allows to investigate how much of spillovers is transmitted within the country and how much is transmitted from one country to another. The decomposition of k countries is given as follows:

$$\Big[\varphi(H) = \varphi_{ij,t}(H)\Big] = \begin{bmatrix} C_{11} & ..... & C_{1k} \\ . & . & . \\ . & . & . \\ C_{k1} & ..... & C_{kk} \end{bmatrix}$$

where C_{ii} comprises the internal spillovers of country i and C_{ij} represents the spillovers of country j to country i. Gabauer and Gupta (2018) set $diagC_{ii} = 0$ to compute the internal and external spillovers to obtain external directional spillovers TO (TO_{ij}) and FROM ($FROM_{ij}$) as follows:

$$TO_{ij} = \sum_{n=1}^{k} C_{ij,nm} \tag{9}$$

$$FROM_{ij} = \sum_{n=1}^{k} C_{ij,nm} \tag{10}$$

In our results section, we refer to two types of spillovers based on this GFEVD. Static spillovers refer to the average value of the GFEVD over the entire sample period (2006Q1-2023Q4). This provides a single-number summary of the average connectedness. Dynamic spillovers refer to the time-series plots of the spillover indices, which illustrate how the intensity and direction of spillovers evolve over time, particularly in response to major economic events.

3.2 Identifying Transmission Channels with a Time-Varying Panel Model (TVPLM)

After quantifying the dynamic spillovers, we investigate their underlying drivers using a time-varying coefficient panel data model with fixed effects Atak et al. (2025). This model is superior to a standard fixed-effects panel model as it allows us to test how the importance of various transmission channels may have changed over time, rather than assuming their influence is constant. The model is specified as:

$$Y_{it} = \alpha_i + X_{it}^{'}\beta(\tau_t) + \mu_{it} \tag{11}$$

where Y_{it} is the vector of external inward spillovers for country i at time t calculated in stage 1. We run separate regressions where Y_{it} represents the spillovers to output, policy rate, and CPI inflation, respectively. X_{it} is a vector of variables representing the potential transmission channels for country i at time t. Following the literature, we consider three main channels: (i) trade Channel: measured by trade openness (exports plus imports as a percentage of GDP), (ii) financial channel: measured by foreign direct investment (FDI) inflows, personal remittances, and the stock of external debt, all as a percentage of GDP, and (iii) global factors channel: measured by global energy and non-energy commodity price indices.

The individual fixed effects, α_i, account for unobserved time-invariant heterogeneity across the African countries in our sample with variance σ_α^2. $\beta(\tau_t)$ is the vector of time-varying coefficients corresponding to each channel variable in $X_{it}^{'}$. These coefficients are modeled as a smooth function of τ_t, which represents a normalized time trend. Thus, $\beta(\tau_t) = \big(\beta_0(\tau_t), \beta_1(\tau_t).....\beta_d(\tau_t)\big)^{'}$ vary over time. The economic meaning of $\beta(\tau_t)$ is that it allows us to estimate the changing importance of each transmission channel over our sample period. For example, it allows us to see if the financial channel (e.g., the coefficient on FDI) became more or less important in transmitting spillovers after the 2008 financial crisis.

The error term μ_{it} is the vector of idiosyncratic errors at time t which is not serially correlated, $E(\mu_t, \mu_s) = 0$, $\vee s \neq t$ with mean zero and a constant variance σ_μ^2. $\sum$ is the covariance matrix and $\sigma_v^2 = \sigma_\mu^2 + \sigma_\alpha^2$. By estimating the $\beta(\tau_t)$ coefficients, this second stage allows us to directly test our hypotheses and identify which channels are the most significant, and how their relevance has evolved from 2006 to 2023.

By estimating the $\beta(\tau_t)$ coefficients, this second stage allows us to directly test our hypotheses and identify which channels are the most significant, and how their relevance has evolved from 2006 to 2023.

3.3 Data and variables

The dataset for this study covers the ten African economies listed in the introduction: Algeria, Botswana, Cameroon, Côte d'Ivoire, Egypt, Ghana, Morocco, Nigeria, South Africa, and Tunisia. The data spans the period from 2006Q1 to 2023Q4. The variables are organized into three categories for our two-stage analysis.

3.3.1 Domestic and external variables for measuring spillovers

For each of the ten African countries, we collect three key quarterly macroeconomic variables : policy rates, inflation, and output. For policy rates, we use each country's central bank monetary policy rate (e.g., repo rate, prime lending rate). This represents the key short-term interest rate targeted by monetary authorities. Inflation is calculated as the quarter-on-quarter log-difference of the Consumer Price Index (CPI). This is a standard, non-debatable method for measuring quarterly inflation rates. A key challenge in this multi-country study is the lack of consistent quarterly GDP data for the entire sample. To maintain a broad and structurally diverse panel, which is essential for our analysis, we employ a pragmatic approach. We use quarterly Gross Domestic Product (GDP) for Botswana, Egypt, Ghana, Morocco, Nigeria, and South Africa. For Algeria, Cameroon, Côte d'Ivoire, and Tunisia, we use the Industrial Production Index (IPI) as a proxy for quarterly economic activity. We explicitly acknowledge that this inconsistency in output measures limits the direct quantitative comparison of spillover magnitudes to output across the two sub-groups. However, our primary objective is to analyze the dynamic evolution of these spillovers (i.e., the timing of shocks) and the relative importance of the transmission channels, for which this approach remains robust.

To capture the stance of international monetary policy, we use the Shadow Short Rates (SSR) developed by Krippner (2016). This measure is superior to standard policy rates because it is not bounded by the zero lower bound (ZLB). It therefore effectively captures the stance of both conventional and unconventional (e.g., quantitative easing) monetary policies, which is crucial for our post-2008 sample period. We include the SSRs for eight major advanced economies: the United States (US), Euro Area (EA), Japan, United Kingdom (UK), Switzerland, Canada, Australia, and New Zealand.

3.3.2 Transmission channel variables

The analysis of transmission channels of monetary policy is based on annualized inward spillover results. A balanced panel dataset is used, ensuring the same number of data points for each African country from 2006 to 2022. For this second-stage panel analysis, we collect data for the following variables, which are categorized according to trade, financial, and global factors channels. Trade channel is measured by trade openness (the sum of exports and imports as a percentage of GDP). Financial channel is measured by three variables: foreign firect investment (FDI) net inflows (% of GDP), personal remittances received (% of GDP), and external debt stocks (% of GDP). Global factors channel is measured by global energy commodity price index and non-energy commodity price index.

3.3.3 Data sources

Domestic macroeconomic data (Output, CPI, Policy Rates) are sourced from the international financial statistics (IFS) of the international monetary fund and the respective national central banks and statistics offices[1]. The Shadow Short Rates are obtained from the public data repositories of the measure's developers. All transmission channel variables (Trade, FDI, Remittances, External Debt) are sourced from the World Development Indicators (WDI), and the global commodity price indices are from the World Bank Commodity Price Data.

4 Empirical Estimates and Discussions

This section presents the empirical findings from our two-stage econometric approach. We first discuss the results of the stage 1 TVP-VAR analysis, presenting the static (average) and dynamic (time-varying) measurement of monetary policy spillovers. We then present the stage 2 TVPLM results, which identify the primary transmission channels driving these spillovers.

[1]Consumer prices data are sourced from the International Financial Statistics (IFS), with the concept of Prices, Consumer Price Index, all items, Index. Monetary policy rates are obtained from central banks. The industrial production index data for Algeria come from IFS (Concept: Economic Activity, Industrial Production, Index), for Tunisia from the National Institute of Statistics (Concept: Industrial Production Index, 2010 = 100), for Cameroon from the National Institute of Statistics (Concept: Economic Activity, Industrial Production, Index, 2011 = 100), and for Côte d'Ivoire from the West African Central Bank (Industrial Production, BCEAO Index). Quarterly GDP data were extracted from IFS for Botswana, Morocco, and South Africa (Concept: Gross Domestic Product, National Currency), from the Ministry of Planning and Economic Development for Egypt (Concept: Total GDP, Total Gross Value Added, Million EGP), and from the Nigeria Statistics Office (GDP at current basic prices, N=Million). Inflation is measured as the first log-difference of the Consumer Price Index (CPI).

4.1 Static Spillover Analysis

Tables 4.1 and 4.1 presents the static spillover estimates from the TVP-VAR model, averaged over the full sample period. A key finding is that external spillovers from advanced economies' monetary policy account for a larger share of the forecast error variance in African macroeconomic variables than internal country-specific shocks. This underscores the vulnerability of these economies to external monetary policy shifts. The transmission is most pronounced for consumer price inflation, with the Euro Area, Australia, and New Zealand identified as the primary sources of these spillovers.

Table 1 Static Spillovers of international monetary policy uncertainty (1)

	US	NZ	EA	Japa	UK	Swit	Cana	Aust	MPU	Outp	IR	CPI Infl	In spi	FROM
Algeria														
Output	1,98	6,44	15,34	1,15	16,00	2,32	1,76	10,03	55,02	41,27	1,36	2,33	3,69	58,73
Interest rate	8,07	4,89	0,83	7,81	7,62	0,70	8,59	3,30	41,81	3,37	49,37	5,46	8,83	50,63
CPI Inflation	2,30	9,63	14,89	1,54	10,06	15,82	3,77	8,68	66,69	2,73	1,72	28,88	4,45	71,12
Egypt														
Output	1,44	8,15	8,13	5,56	1,98	2,47	1,86	10,13	39,72	53,89	2,02	4,37	6,39	46,11
Interest rate	3,16	4,58	2,32	2,41	1,96	5,18	5,43	8,63	33,67	0,77	31,19	34,36	35,13	68,81
CPI Inflation	0,99	15,52	12,32	1,20	2,75	7,00	2,20	10,63	52,61	3,20	1,48	42,70	4,68	57,30
Morocco														
Output	1,95	11,45	4,25	1,92	7,10	3,45	1,41	13,06	44,59	32,95	7,54	14,91	22,45	67,05
Interest rate	0,75	9,13	15,20	0,73	3,46	7,20	1,57	14,93	52,97	6,05	29,76	11,22	17,27	70,24
CPI Inflation	2,25	6,50	6,00	2,00	10,54	5,87	2,72	7,29	43,17	17,40	5,00	34,44	22,40	65,56
Tunisia														
Output	1,12	27,02	6,31	1,94	2,23	2,36	2,19	10,48	53,65	39,19	1,12	6,05	7,17	60,81
Interest rate	0,18	11,76	2,72	0,57	3,55	0,72	6,30	9,40	35,20	0,84	62,69	1,26	2,10	37,31
CPI Inflation	1,91	11,23	18,46	2,73	7,86	14,72	3,73	13,57	74,21	5,56	2,27	17,97	7,83	82,03
CIV														
Output	2,52	11,22	5,38	3,95	2,99	1,57	4,20	17,49	49,32	44,55	2,06	4,07	6,13	55,45
Interest rate	2,68	8,05	2,32	4,12	1,14	0,41	1,08	11,38	31,18	1,42	66,38	1,02	2,44	33,62
CPI Inflation	2,30	6,89	17,43	2,24	4,81	8,98	5,14	13,29	61,08	6,17	4,04	28,72	10,21	71,28
Ghana														
Output	13,00	6,32	8,81	4,63	2,67	4,97	3,80	4,71	48,91	24,47	2,88	23,74	26,62	75,53
Interest rate	12,84	1,26	0,37	9,69	0,24	3,09	1,50	2,41	31,40	7,56	27,15	33,89	41,45	72,85
CPI Inflation	21,76	5,86	2,28	13,76	0,57	3,59	3,22	2,01	53,05	5,36	3,45	38,15	8,81	61,85
Nigeria														
Output	0,94	5,93	12,03	1,48	4,76	3,37	3,19	5,06	36,76	24,07	3,47	35,72	39,19	75,93
Interest rate	3,83	2,36	15,91	3,38	3,98	2,94	2,66	4,38	39,44	4,61	15,97	39,98	44,59	84,03
CPI Inflation	2,69	5,66	16,19	1,68	3,88	3,8	2,62	5,96	42,48	12,83	5,64	39,06	18,47	60,94

note : US=US SSR, NZ=NZ SSR, EA=EA SSR, japa=Japan SSR, UK=UK SSR, Swit=Switzerland SSR, Cana=Canada SSR, Aust=Australia SSR, PMU=MPU spillovers, Outp=Output, IR=Interest rate, CPI Infl=CPI Inflation, In spi =Internal spillovers.

Output Spillovers

Table 2 Static Spillovers of international monetary policy uncertainty (2)

	US	NZ	EA	Japa	UK	Swit	Cana	Aust	MPU	Outp	IR	CPI Infl	In spi	FROM
Cameroon														
Output	1,69	8,68	11,47	4,72	2,48	12,75	1,70	4,23	47,72	29,41	2,48	20,37	22,85	70,59
Interest rate	0,25	1,97	10,58	0,12	0,86	9,79	7,62	13,09	44,28	1,03	49,12	5,58	6,61	50,88
CPI Inflation	2,06	6,36	12,87	3,92	2,78	18,60	2,93	5,02	54,54	4,25	3,77	37,44	8,02	62,56
Botswana														
Output	1,71	5,94	6,43	4,91	1,39	4,70	1,98	5,37	32,43	54,95	1,19	11,43	12,62	45,05
Interest rate	1,74	4,12	3,47	2,22	1,81	2,23	7,70	2,20	25,49	1,94	39,51	33,05	34,99	60,49
CPI Inflation	4,42	7,66	9,50	1,41	1,85	4,17	4,06	6,27	39,34	2,90	1,76	56,00	4,66	44,00
South Africa														
Output	10,84	10,89	4,50	5,10	1,24	2,85	3,72	16,25	55,39	23,12	5,55	15,94	21,49	76,88
Interest rate	2,36	8,12	1,46	1,66	0,24	1,06	7,32	20,20	42,42	11,39	34,43	11,75	23,14	65,57
CPI Inflation	12,39	5,99	6,02	5,47	1,04	7,88	6,12	12,12	57,03	7,11	2,86	33,00	9,97	67,00

note : US=US SSR, NZ=NZ SSR, EA=EA SSR, japa=Japan SSR, UK=UK SSR, Swit=Switzerland SSR, Cana=Canada SSR, Aust=Australia SSR, PMU=MPU spillovers, Outp=Output, IR=Interest rate, CPI Infl=CPI Inflation, In spi =Internal spillovers.

The impact on output is most pronounced in highly globalized and commodity-dependent economies. South Africa is the most affected country in our sample, with 55.39 percent of its output variation explained by external monetary policy shocks. This high level of exposure is likely linked to its deep integration into global financial markets and its dependence on commodity exports, which makes it sensitive to shifts in global demand and risk sentiment. Algeria and Tunisia also exhibit significant vulnerability, with external spillovers accounting for over 50 percent of their output forecast variance. The high level of exposure Algeria is attributable to its economic dependency on global commodity markets. As a result, uncertainty in major economies can lead to volatility in commodity prices, affecting export revenues, trade balances, and overall economic activity. Furthermore, international monetary policy uncertainties can cause exchange rate volatility, impacting export revenues. In contrast, Botswana appears more insulated, with external spillovers explaining only 32 percent of its output variation.

Monetary policy in the Euro Area is a significant driver of output fluctuations in the selected African countries. Specifically, Euro Area monetary policy significantly affects output in Algeria (15.34 percent), Nigeria (12.03 percent), Cameroon (11.47 percent), and to a lesser extent in Egypt (8.15 percent). This finding aligns with the substantial trade linkages between these African nations and the Euro Area, as the Euro Area is a major destination for commodity exports from countries like Nigeria and Cameroon. Additionally, monetary policies in Australia and New Zealand contribute to notable output variation in several African countries, including Algeria, Egypt, Morocco, Tunisia, Côte d'Ivoire, and South Africa. This influence can be attributed to the similar economic structures of these countries, characterized by high commodity dependence. Given that Australia and New Zealand are major exporters of commodities such as iron ore and coal, significant changes in their monetary policies can impact global commodity prices, leading to output fluctuations in these African countries.

Policy rate spillovers

The transmission of international monetary policy shocks to African policy rates is generally weaker, a finding that contrasts with some earlier studies on other regions Kim (2001), Ehrmann and Fratzscher (2009). However, heterogeneity is significant. Morocco's policy rate is the most affected, with external shocks explaining 53 percent of its variation, likely due to its managed exchange rate regime, which incorporates a currency basket heavily weighted toward the euro. Similarly, policy rates in Algeria, Cameroon, and South Africa are also sensitive to external shocks, with over 40 percent of their variation attributed to international monetary policy. The significant impact on Cameroon's policy rate is consistent with its membership in the Central African Economic and Monetary Community (CEMAC), which maintains a peg to the euro. Monetary policy in Australia also explains a significant portion of policy rate variance in several African countries, potentially through commodity markets. As a major commodity exporter, Australia's monetary policy decisions can affect global demand and supply dynamics for these commodities, influencing economic stability and interest rate adjustments in commodity-dependent African countries.

Inflation Spillovers

CPI inflation in the selected African economies is highly sensitive to external monetary policy shocks. In Tunisia, more than 74 percent of inflation variation is driven by these spillovers, a result of the country's high import dependency, especially for food and energy. External monetary policy shocks account for over 50 percent of inflation variation in Algeria, Egypt, Côte d'Ivoire, Ghana, Cameroon, and South Africa, all of which are commodity exporters. Uncertainties in global monetary policies, especially from major economies like the US or the Eurozone, can lead to volatility in exchange rates, making imports more expensive and generating inflationary trends. The Euro Area is a particularly strong source of inflation spillovers, explaining 18.46 percent of the variation in Tunisia and 17.43 percent in Côte d'Ivoire. For Ghana and South Africa, U.S. monetary policy is a key driver, accounting for 21.76 percent and 12.39 percent of their inflation variation, respectively. The strong transmission to inflation in countries with pegged exchange rates, such as Cameroon and Côte d'Ivoire, aligns with the findings of Tervala (2018), who shows that expansionary monetary policy in an anchor economy can lead to domestic inflationary pressures.

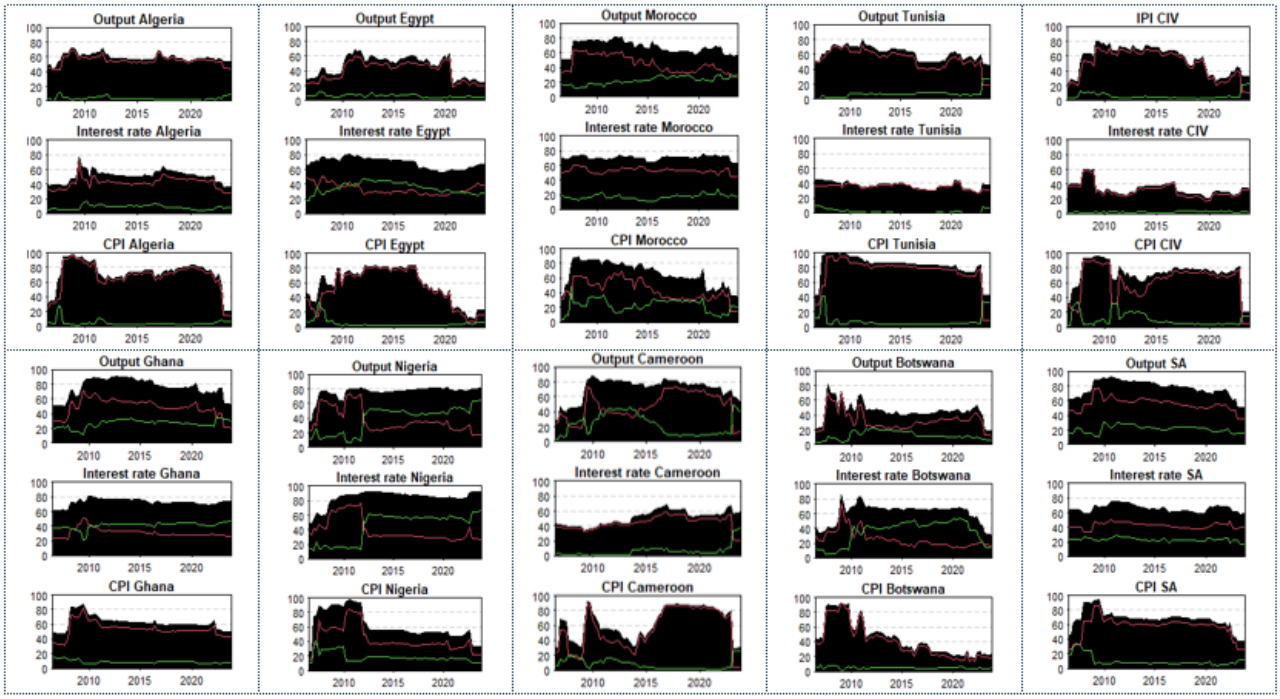
4.2 Dynamic Spillover Effects

To capture the evolving nature of these spillovers, we now turn to our dynamic analysis, which allows us to observe how the intensity of transmission has changed over time, particularly in response to major global economic events.

4.2.1 Total Directional Spillovers

Figure 1 illustrates the total directional spillovers from international monetary policy uncertainty to the output, policy rates, and inflation of the selected African economies. A clear pattern emerges: the transmission of these shocks intensified significantly during the 2008 global financial crisis (GFC), a period marked by the implementation of expansionary monetary policies in advanced economies.

Fig. 1 Total directional spillovers FROM monetary policy uncertainty to Africa



Source: Authors' Calculations Note: the red line represents external spillovers from MPU and the green line represents internal spillovers from other domestic macroeconomic variables.

This led to sharp fluctuations in global demand for African commodities, contributing to significant output volatility across the continent. In the post-GFC period, the intensity of spillovers has generally declined, although with notable exceptions. In Cameroon, for instance, spillovers remained elevated, while in Nigeria, internal shocks have become more dominant since 2012.

The stability of internal monetary policy shocks to policy rates in Africa is relatively consistent over the period considered. Internal spillovers from CPI inflation and output often exceed external spillovers from international monetary policy in countries like Egypt, Ghana, Nigeria, and Botswana. This suggests that monetary policy decisions in these nations are frequently made independently of major central banks, guided by either inflation targets or economic support objectives.

The forecast error variance of CPI inflation in Africa is predominantly driven by external spillovers. The transmission to inflation peaked between 2007 and 2009, and while it has since moderated, it remains a significant source of inflation dynamics in countries like Algeria, Tunisia, Côte d'Ivoire, Ghana, and South Africa. In contrast, external spillovers to inflation have shown a decreasing trend in Egypt, Morocco, Nigeria, and Botswana.

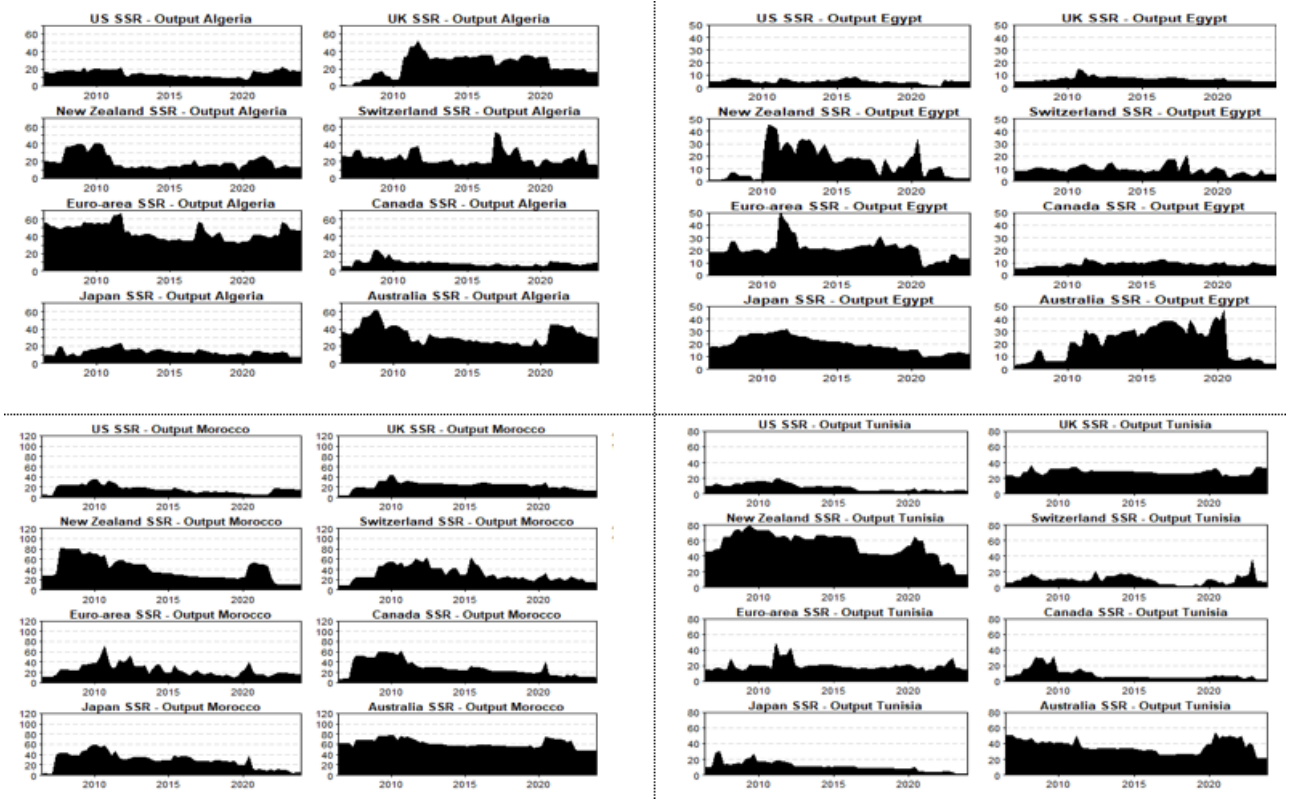
4.2.2 Pairwise Directional Spillovers

To provide a more granular view of the transmission, we now examine pairwise directional spillovers from each advanced economy to the macroeconomic variables of the African countries in our sample. The full set of pairwise spillover graphs for all ten countries is extensive.

Output Spillovers

Figures 2, 3 and 4 illustrates the results of TVP-VAR analysis regarding spillovers from international monetary policy shocks to output in the selected African economies.

Fig. 2 Pairwise Spillovers FROM international MPU to Africa output (1)



Source: Authors' Calculations

Monetary policy shocks from the Euro Area are the most significant driver of output variation in Algeria, with the impact peaking in 2012 during the European sovereign debt crisis. This crisis period also corresponds to the peak transmission of Euro Area shocks to output in several other African countries, including Egypt, Morocco, Tunisia, Côte d'Ivoire, Ghana, Nigeria, Botswana, and South Africa. Between 2006 and 2023, U.S. monetary policy had a more limited impact on the output of most African countries, with the exception of Ghana, Nigeria, and South Africa, where the effect was most pronounced during the GFC.

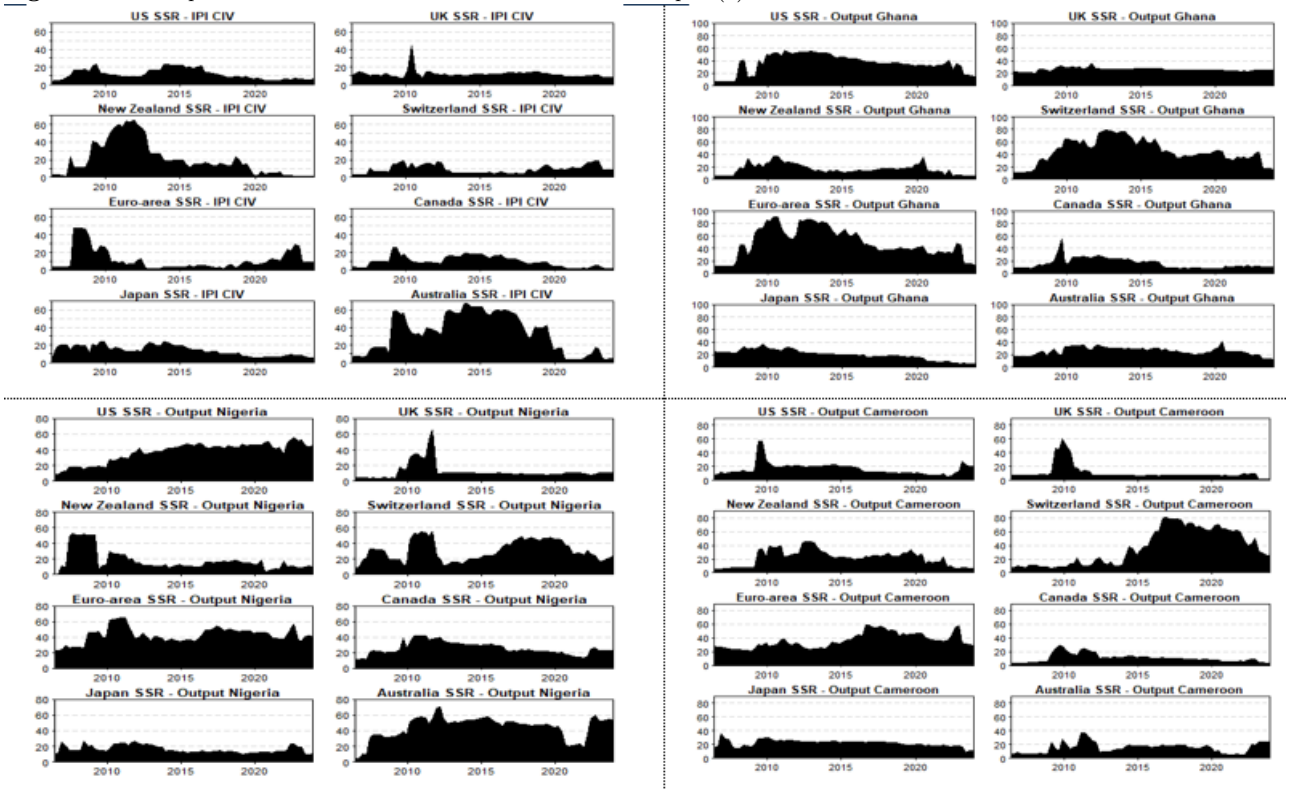
The findings also highlight the role of monetary policy shocks from Australia and New Zealand in driving output variation across several African nations, including Algeria, Egypt, Morocco, Tunisia, CIV, Nigeria, and South Africa. However, the contribution of these shocks is often volatile in Algeria, Egypt, Tunisia, CIV, and Nigeria, suggesting that their transmission may occur indirectly through global factors such as commodity prices.

Policy Rates Spillovers

Figures 5, 6 and 7 presents TVP-VAR results of spillovers from international monetary policy decisions to key rates in selected African economies.

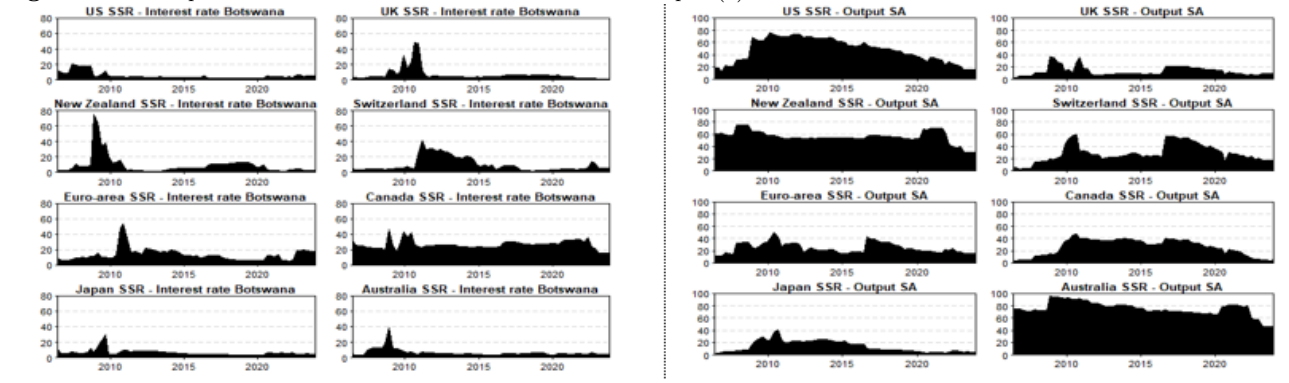
The transmission of international monetary policy shocks to African policy rates is generally weak, but with important exceptions. The policy rate in Cameroon shows a significant response

Fig. 3 Pairwise Spillovers FROM international MPU to Africa output (2)



Source: Authors' Calculations

Fig. 4 Pairwise Spillovers FROM international MPU to Africa output (3)

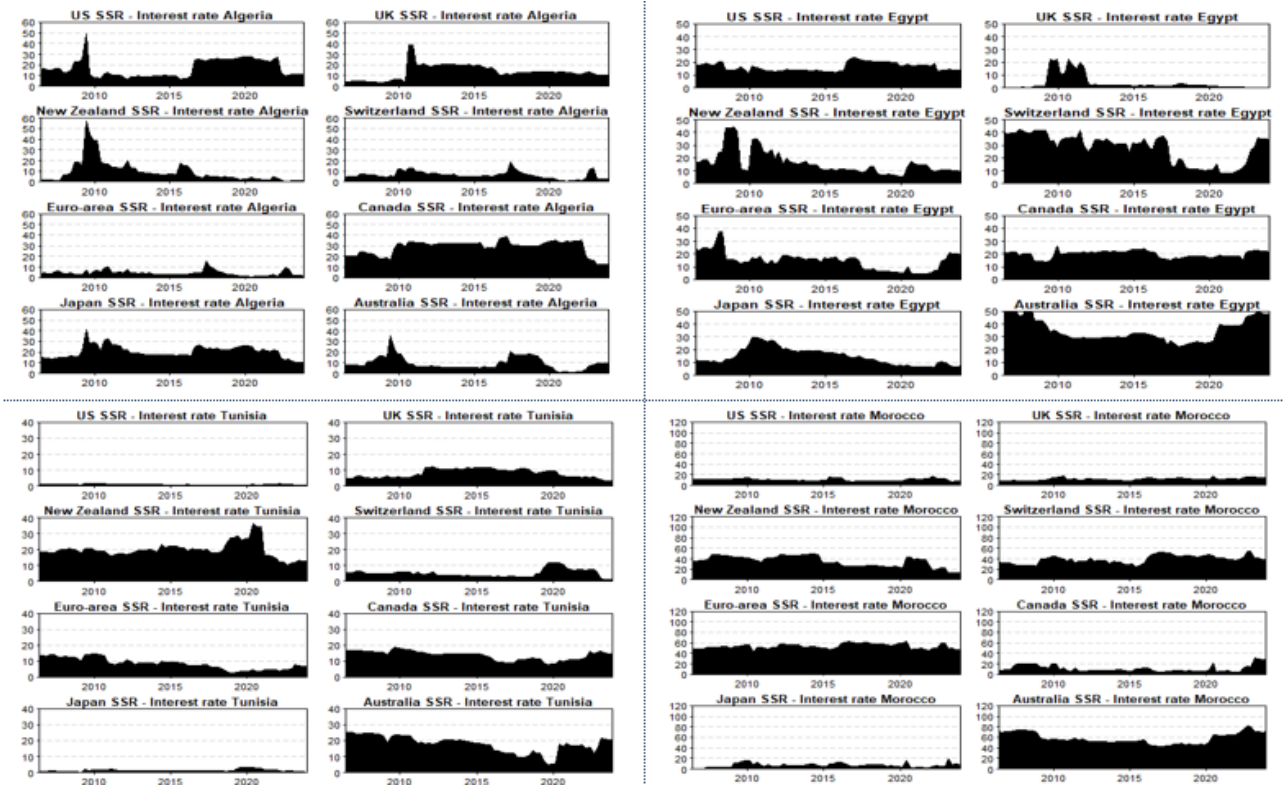


Source: Authors' Calculations

to Euro Area monetary policy, a direct consequence of its membership in the CEMAC currency union. Conversely, the pegged exchange rate regimes in Botswana (pegged to the South African Rand) and Côte d'Ivoire (pegged to the Euro) appear to have insulated their policy rates from direct spillovers from advanced economies. We can also see that Nigerian policy rates have reacted strongly to accommodative monetary decisions by the U.S. and the Euro Area during the global financial crisis. Finally, policy rates in countries with managed float exchange rate regimes, such as Algeria, Egypt (since 2016), Tunisia, and Morocco, tend to respond to monetary policy uncertainty from advanced economies.

CPI Inflation Spillovers

Fig. 5 Spillovers FROM international MPU to Africa policy rates(1)



Source: Authors' Calculations

Figures 8, 9 and 10 shows TVP-VAR results of spillovers from international monetary policy decisions to CPI inflation in selected African economies.

CPI inflation in African countries is sensitive to monetary policy decisions in all the advanced economies in our sample, a reflection of their economic openness. In Egypt, the transmission of international monetary policy shocks to CPI inflation has fluctuated significantly over time, with pronounced effects between 2011 and 2016. The political instability following the 2011 revolution and the subsequent devaluation of the Egyptian pound in November 2016 led to increased inflation of imported goods. Post-2008 global financial crisis, the transmission of monetary policy uncertainty to CPI inflation has been notably strong and persistent in Nigeria, South Africa, and Ghana, all of which have floating exchange rate regimes. Conversely, spillovers to CPI inflation have decreased in Botswana, CIV, and Cameroon, which have pegged exchange rate systems.

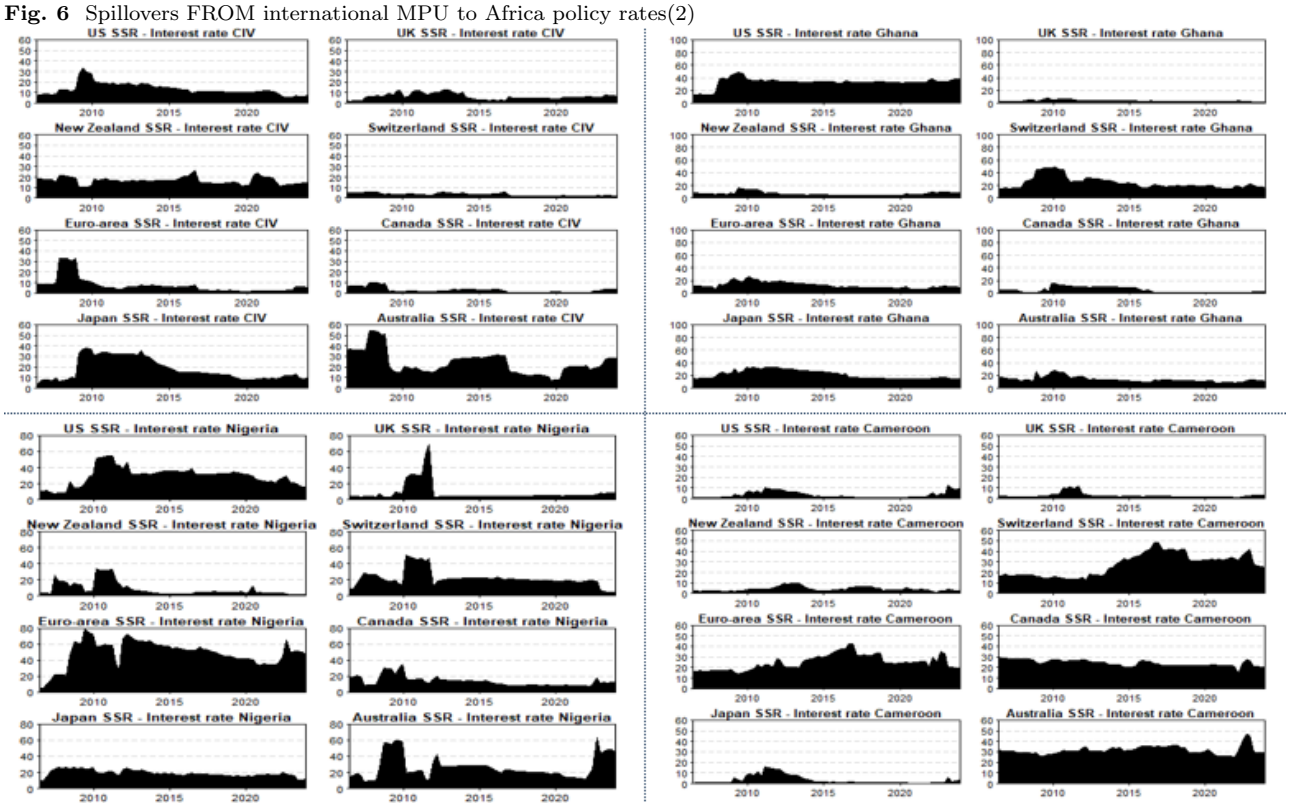
4.3 Spillover Channels

This subsection presents both static and dynamic analyses of channels through which international monetary policy shocks are transmitted to African economies.

4.3.1 Static analysis of spillover channels

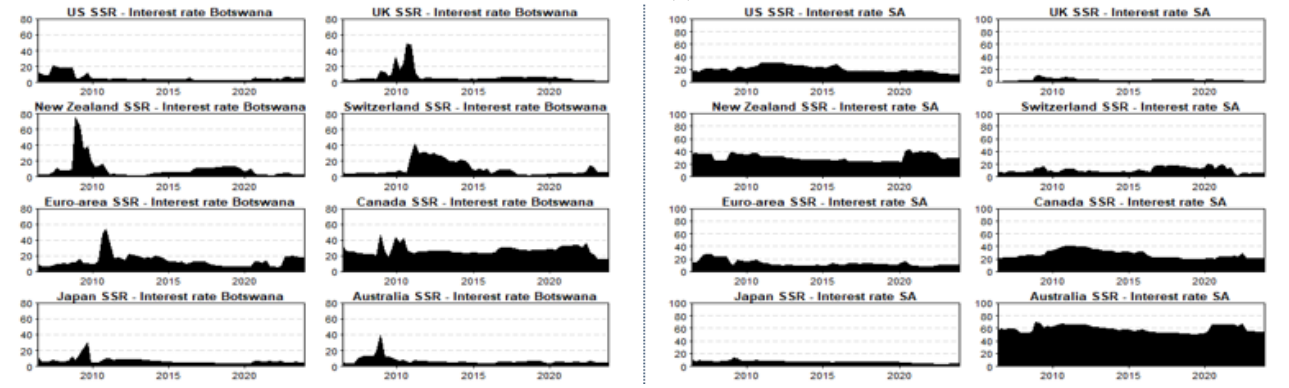
Table 4.3.1 presents the time-varying panel model estimates of the transmission channels. The results indicate that financial linkages are the primary conduit for international monetary policy spillovers to both output and inflation in Africa.

Fig. 6 Spillovers FROM international MPU to Africa policy rates(2)



Source: Authors' Calculations

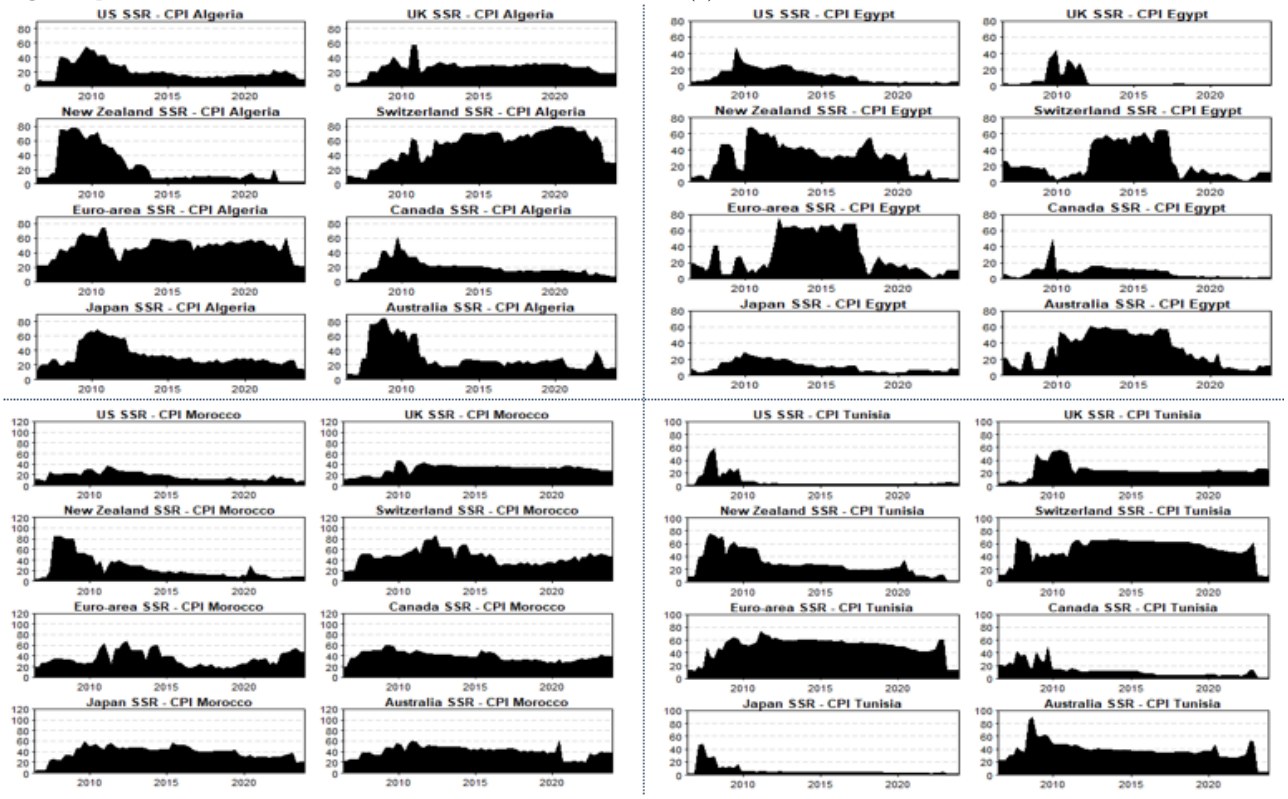
Fig. 7 Spillovers FROM international MPU to Africa policy rates(3)



Source: Authors' Calculations

This finding aligns with the economic intuition that global interest rate changes or shifts in risk perception due to monetary policy decisions can affect capital flows, impacting FDI inflows and, consequently, private investments and output. This is consistent with the view that changes in global interest rates and risk sentiment directly affect capital flows to the continent. Personal remittances are also a significant channel, with a 1 percent increase in remittances as a share of GDP associated with a 0.84 percent increase in output spillovers. Many countries in the sample, such as Egypt, Nigeria, Morocco, Ghana, Tunisia, and Algeria, receive substantial remittances. Shocks in the countries where these migrants reside can affect their ability to send money home, impacting African economies. Trade openness is a less influential channel for monetary policy spillovers to output, with a 1 percent increase in trade openness raising inward spillovers by only 0.07 percent. International monetary

Fig. 8 Spillovers FROM international MPU to Africa CPI inflation (1)

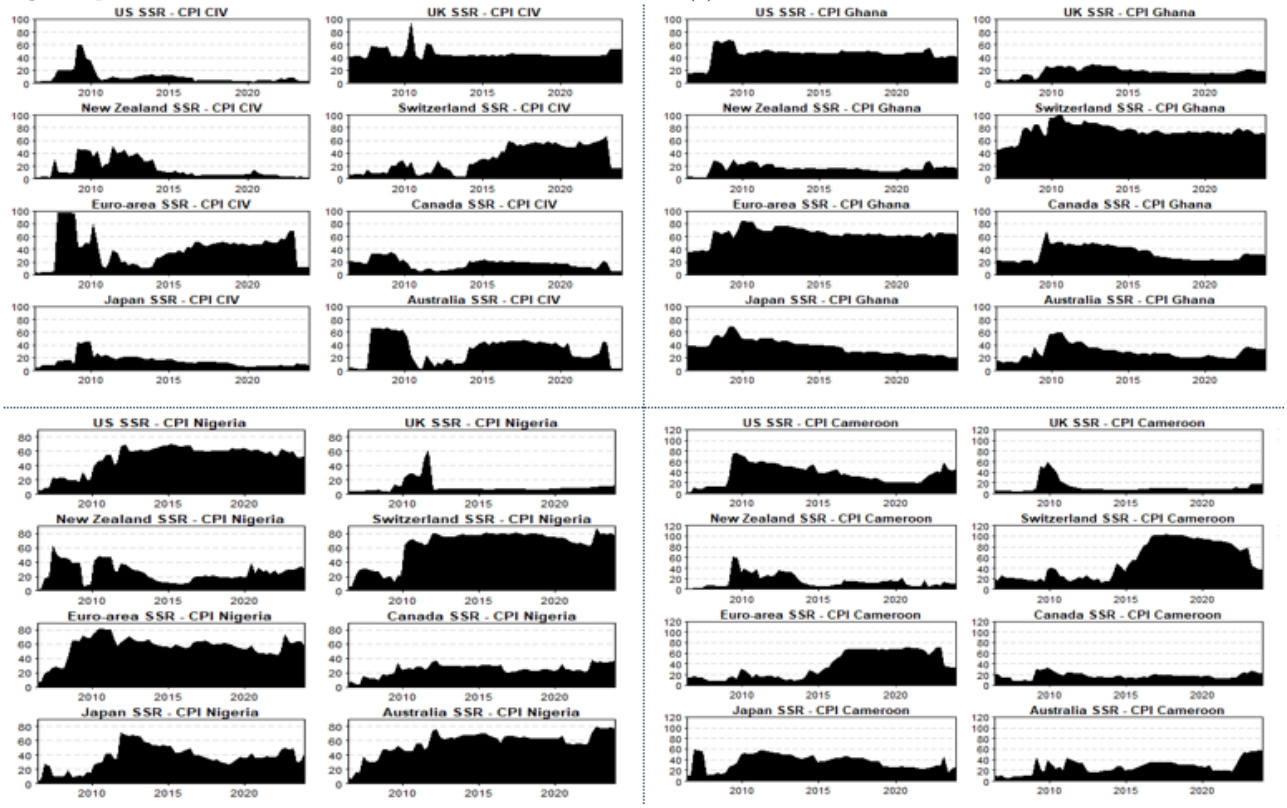


Source: Authors' Calculations

Table 3 Summary of time-varying estimated coefficients

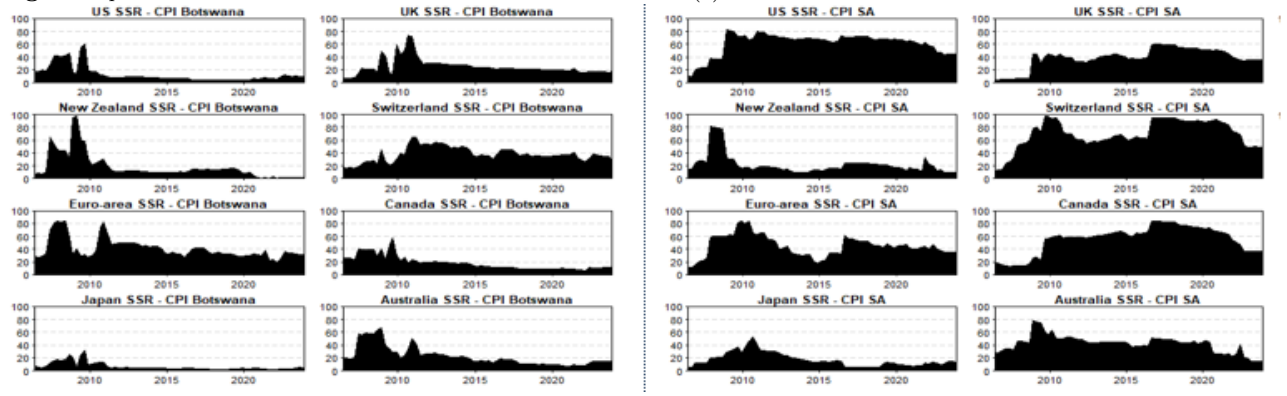
	Trade	FDI	Remittances	Debt	Energy	Non-energy
Output						
Min.	-0,392	0,359	-10,143	-0,728	-0,007	0,000
1st Qu.	-0,177	1,254	0,817	-0,106	-0,005	0,002
Median	0,046	1,434	1,810	0,032	-0,003	0,007
Mean	0,072	1,512	0,840	-0,003	-0,003	0,007
3rd Qu.	0,406	2,097	2,743	0,194	-0,001	0,011
Max.	0,509	2,330	3,636	0,453	-0,001	0,015
CPI Inflation						
Min.	-0,313	0,714	-11,959	-0,688	-0,009	0,000
1st Qu.	-0,267	1,218	-1,505	-0,205	-0,006	0,003
Median	-0,026	1,900	0,275	0,131	-0,004	0,010
Mean	0,082	2,068	-0,671	0,067	-0,004	0,009
3rd Qu.	0,425	2,638	1,720	0,254	-0,002	0,013
Max.	0,807	3,856	4,678	0,812	-0,001	0,021
Policy rate						
Min.	-0,089	0,631	-4,588	-0,143	-0,003	0,001
1st Qu.	0,045	0,672	-1,727	-0,047	-0,002	0,003
Median	0,096	0,861	-0,528	0,232	-0,002	0,005
Mean	0,135	1,196	-1,123	0,204	-0,002	0,004
3rd Qu.	0,201	1,379	0,045	0,429	-0,001	0,005
Max.	0,359	2,867	0,489	0,540	-0,001	0,007

Fig. 9 Spillovers FROM international MPU to Africa CPI inflation (2)



Source: Authors' Calculations

Fig. 10 Spillovers FROM international MPU to Africa CPI inflation(3)



Source: Authors' Calculations

policy shocks can affect global demand for goods and services, influencing the demand for African exports. However, external debt as a share of GDP and commodity prices do not significantly affect inward monetary policy spillovers to African output.

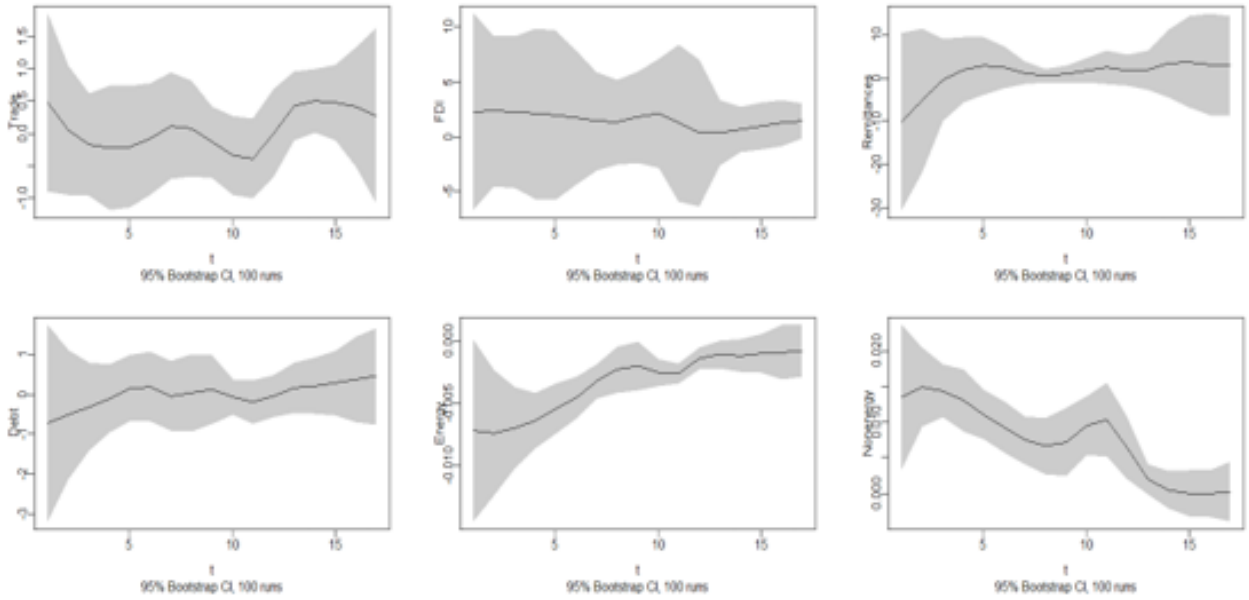
For inflation, FDI is again the dominant channel, with a 1 percent increase in FDI as a share of GDP leading to a 2.07 percent increase in inward spillovers to inflation. This likely reflects the impact of capital inflows on the exchange rate, with currency appreciation making imports cheaper. In contrast, personal remittances appear to have a dampening effect on inflation spillovers, with a 1 percent increase in remittances associated with a 0.67 percent reduction in spillovers, possibly by stabilizing the exchange rate. Trade openness is a less influential, though still significant, channel for

inflation spillovers. However, a 1 percent increase in trade openness raises the intensity of monetary policy spillovers on CPI inflation by 0.08 percent. This is due to reliance on imports, where currency depreciation from international monetary policy shocks raises import costs and inflation. External debt also influences CPI inflation, with a 1 percent increase in external debt as a share of GDP raising the impact of international monetary policy uncertainty on CPI inflation by 0.07 percent.

4.3.2 Time-Varying Analysis of Spillover Channels

The present subsubsection presents the changing effects of the drivers of the international transmission of monetary policy uncertainty to African countries. Figure 11 depicts econometric regressions showing how various channels affect output spillovers from international monetary policy in African countries with time-varying panel data and fixed effects. Results indicate that trade openness has a

Fig. 11 Plots of the coefficients estimates - Output spillovers -

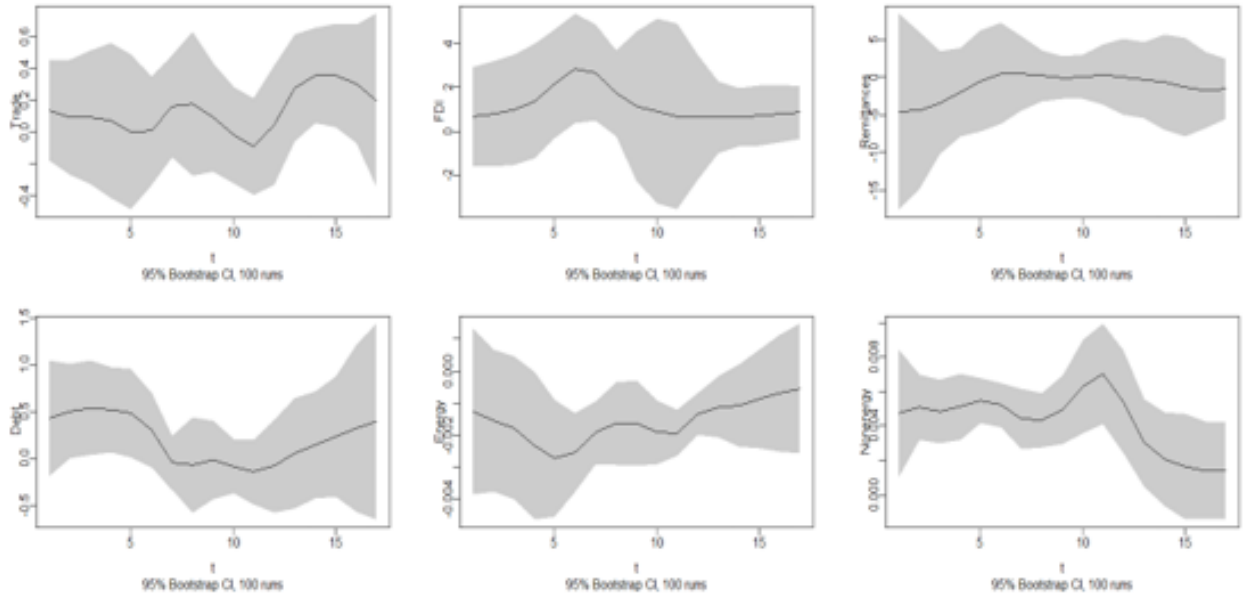


Source: Authors' calculations. Notes The time-varying estimates of coefficients are plotted with a black line within 95% confidence intervals in grey.

relatively low and stable impact on output spillovers, fluctuating between -0.51 and 0.51 percent. The role of trade channels diminished during the global financial crisis but increased post-crisis before declining again with the COVID-19 pandemic. Financial channels, particularly FDI, have a consistent impact on spillovers, although personal remittances showed a temporary reduction during the financial crisis. External debt's role is increasing, reflecting rising indebtedness of African economies. Commodity prices have minimal impact, with energy prices slightly reducing and non-energy prices slightly increasing spillovers.

Figure 12 shows econometric regressions of channels affecting policy rates due to international monetary policy uncertainty in African countries.

Fig. 12 Plots of the coefficients estimates – Policy rate spillovers –



Source: Authors' calculations. Notes The time-varying estimates of coefficients are plotted with a black line within 95% confidence intervals in grey

Trade channels influence policy rates similarly to their effect on output, with an increased role after 2015 and a decrease in 2022 due to reduced international trade connectivity. FDI's impact on policy rates was relatively stable, with notable increases between 2011 and 2012 due to shifts in capital flows. Personal remittances have helped reduce sensitivity to international monetary policy, especially during the financial crisis. External debt's impact on policy rates increased significantly during the global financial crisis but has since fluctuated. Finally, Figure 13 depicts the channels through which international monetary policy uncertainty affects CPI inflation in African countries.

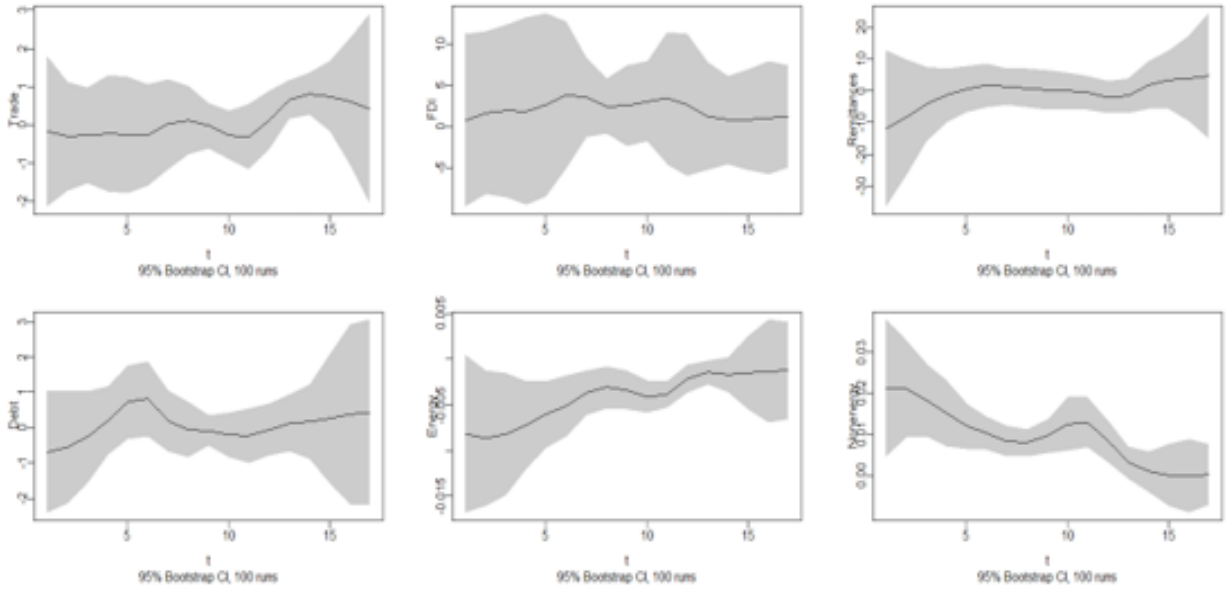
Trade openness initially reduced the impact of international monetary policy on CPI inflation from 2006 to 2015, likely due to diversification of trading partners. However, its effect increased post-2015. FDI has generally enhanced the transmission of monetary policy uncertainty to inflation, while personal remittances mitigated it. External debt's role changed over time, with an upward trend since 2012, reflecting the impact of rising external debt on currency depreciation and inflation.

5 Concluding Remarks and Policy Implications

The conclusion and policy implications of this study underscore the significance of international monetary policy on African economies, particularly through financial and commodity linkages. The 2008 global financial crisis and Eurozone debt crisis highlight the need for coordinated international economic policies, with similar relevance for African economies increasingly integrated into the global financial system.

The study's goal was to assess the spillover effects of international monetary policies on African macroeconomic performance, focusing on the transmission mechanisms. Using time-varying vector

Fig. 13 Plots of the coefficients estimates – CPI Inflation spillovers -



Source: Authors' calculations. Notes The time-varying estimates of coefficients are plotted with a black line within 95% confidence intervals in grey

autoregression (TVP-VAR) and a panel model (TVPLM), the findings reveal that monetary policy shocks from abroad significantly influence output in commodity-dependent African economies (e.g., South Africa, Nigeria, Algeria). Spillovers on African policy rates are also notable in countries with de facto currency pegs (e.g., Morocco, Cameroon, Algeria). The primary transmission channels are financial linkages, particularly foreign direct investment (FDI) and remittances, rather than commodities.

Based on these results, several policy implications are evident:

1. **Reserve Requirements for Commodity Exports:** Given that international monetary policy shocks impact output variation in commodity-dependent African countries, central banks should consider setting high reserve requirements on commodity exports. This measure would act as a prudential tool to mitigate financial risks stemming from foreign monetary policies.
2. **Coordination of Monetary Policy:** The study shows that international monetary policy shocks do not significantly affect African policy rates, suggesting a disconnect between local monetary management and global trends. To address this, it is recommended that African central banks enhance coordination with major international central banks to better align their monetary policies with global developments.
3. **Incentivizing Remittances:** Since financial linkages, particularly remittances, are key transmission channels of international monetary policy uncertainty, African countries should implement incentive mechanisms to encourage personal remittances. This would help buffer the transmission of global monetary uncertainties into the domestic economy.

These recommendations aim to strengthen the resilience of African economies in the face of international monetary fluctuations, promoting greater financial stability and economic growth.

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