

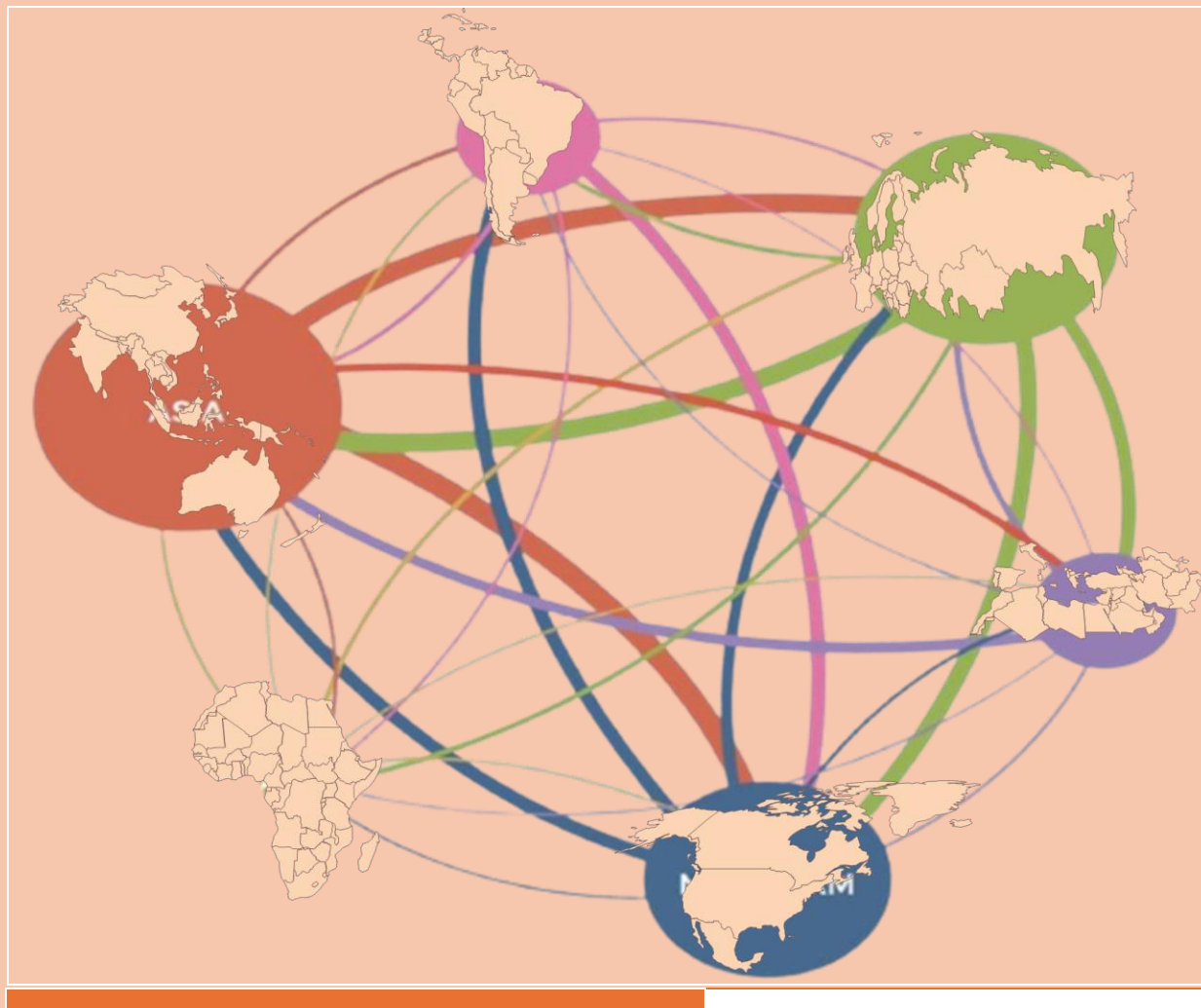


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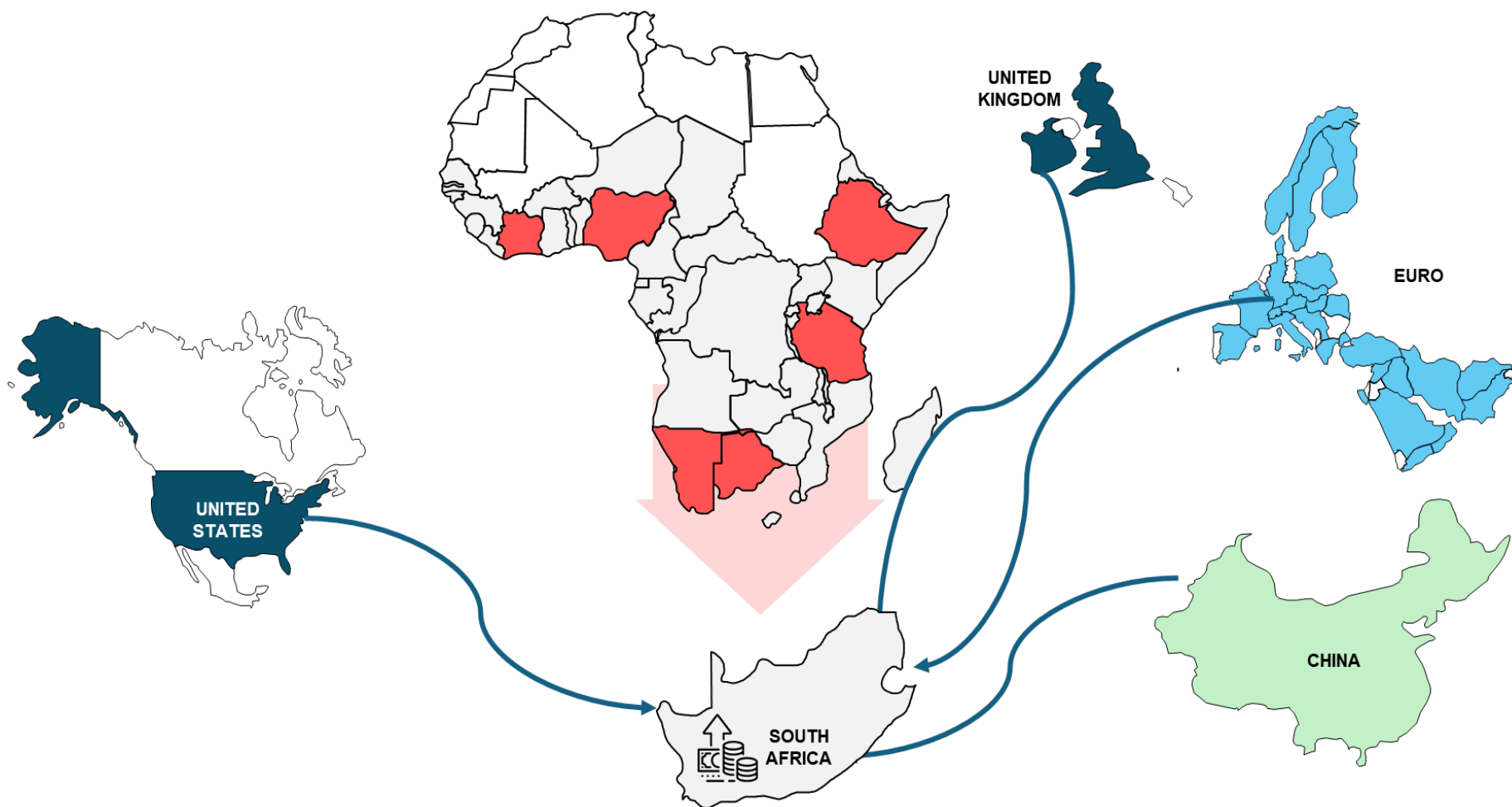
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ACCOUNTING FOR REGIONAL DYNAMICS AND GLOBAL INFLUENCES IN SOUTH AFRICA'S INFLATION PROBLEM

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GRAPHICAL ABSTRACT



External Shocks Drive Inflation:

South Africa's inflation is significantly influenced by output shocks from key global partners like the U.K., Eurozone, and China, as well as regional economies such as Ethiopia, Côte d'Ivoire, and Botswana.

Regional Price Shocks Matter More:

Price shocks from African economies—particularly Namibia, Tanzania, Nigeria, and Ethiopia—have a stronger impact on South Africa's inflation than those from most advanced economies, except the U.K.

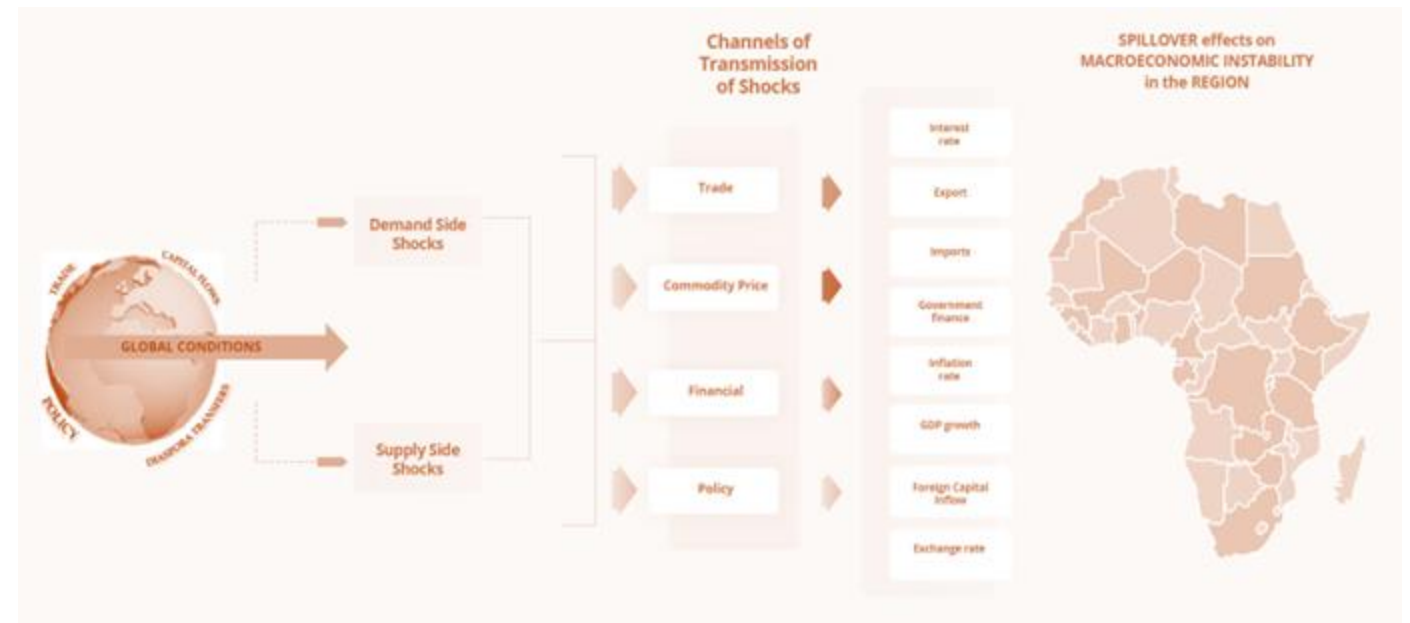
Policy Implication: South Africa's status as a non-oil, resource-rich economy highlights the need to diversify its economic structure to reduce vulnerability to external inflationary shocks.

OUTLINE OF CONTENTS



Background

- **Now, prices are high across the globe.**
 - ❖ The culprit is the monetary stimulus and expansive fiscal policies to stimulus to mitigate recent global disruptions (Abaidoo & Agyapong, 2022).
- **South Africa is facing an inflation problem induced by:**
 - ❖ Effects of these global disruptions
 - ❖ Spillover of effects of these crises on key trading partners





Background

South Africa's inflation is highly vulnerable to external Shocks.

As an open and import-reliant economy, South Africa experiences significant inflationary pressures from global disruptions, particularly in food, energy, and manufactured goods.

Global integration amplifies spillover effects.

The country's deep integration into global trade and financial systems makes it sensitive to fluctuations in international commodity prices, exchange rates, and macroeconomic shocks from major economies.

South Africa's economic structure shapes its exposure

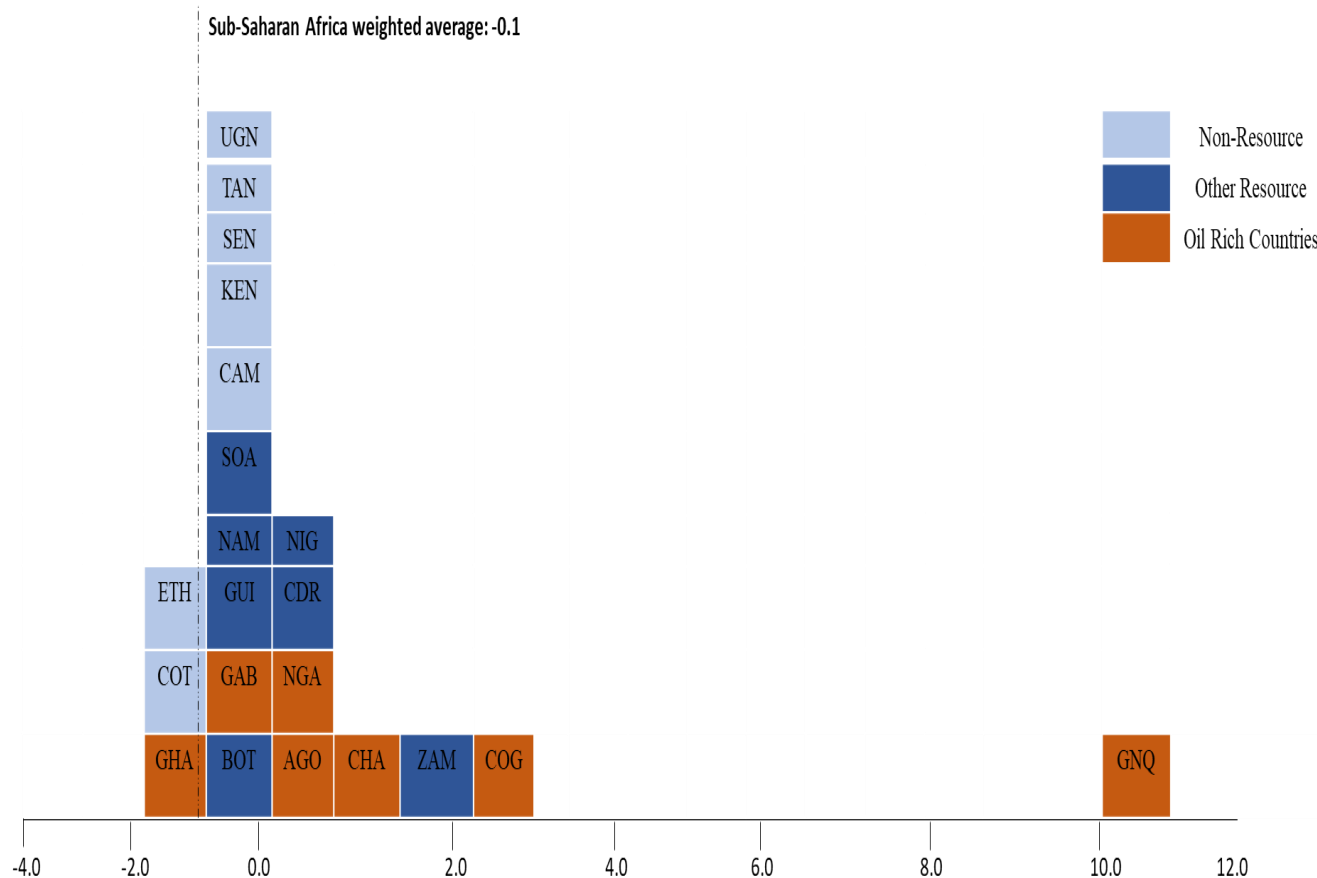
The country's resource-dependent economy increases its susceptibility to global inflationary shocks, but its relatively diverse trade portfolio helps cushion against some impacts, particularly from U.S. inflation.

Policy implication—need for strategic inflation management

Understanding these international inflation spillovers is essential for designing effective policies that stabilise inflation and protect economic recovery, making advanced modeling tools like the GVAR crucial for policy analysis.

Impact of Russia-Ukraine on GDP Growth of SSA Countries (Percentage Points)

(Estimates are the difference between WEO January and October 2022 Forecast)



- Broad generalisation of spillover studies on the region.
 - ❑ There is are gaps in understanding factors shaping inflationary trend in South Africa (Backé et al, 2014; Gurara & Ncube, 2013).
- Recently, few studies are considering the economic in documenting macroeconomic fluctuations in the region.
 - ❑ This study offer more in-depth analysis of contribution of external shocks (productivity and price) to South Africa's inflation problem.

Literature Review

- Trade specialisation enables two-way transmission of economic shocks between nations (Heertje, 1970; Krugman & Obstfeld, 2003).
- Real Business Cycle (RBC) theories add channels like technology, finance, and investment to explain how external shocks drive macroeconomic fluctuations technology (Lucas, 1977; Kose & Riezman, 2013; Bormotov, 2009).

BUSINESS CYCLE THEORIES: CLASSICAL & NEO-CLASSICAL

- Ricardo's Comparative Advantage Theory;
- The Real Business Cycle (RBC) Theory;
- The International Real Business Cycle (IRBC) Theories.

Literature Review

Ben & Jörg, 2021

Changes in global demand or commodity price volatility, significantly impact South Africa's economic growth and fiscal health.

Mackowiak (2017)

Trade and financial linkages significantly affect South Africa's economic fluctuations, aligning with broader findings on Sub-Saharan Africa (SSA).

Mekonnen (2020)

Monetary policy shifts from these regions impact key variables like exchange rates and interest rates in South Africa.

Tumala et al. (2021)

U.S. and Chinese economic adjustments significantly influence inflation and exchange rate stability across SSA, including South Africa.

Methodology – Theoretical Framework

THE INTERNATIONAL REAL BUSINESS CYCLE (IRBC) THEORY

Open economy model which allows for analysis of domestic price fluctuations in South Africa due to external shocks (Finn & Weward, 1982 & Others.

The market-clearing condition is as follows:

$$Y_{i,t} = A_{i,t} K_{i,t}^{\alpha} L_{i,t}^{1-\alpha} \dots \dots \dots (1)$$

$$Y_{j,t} = A_{j,t} K_{j,t}^{\alpha} L_{j,t}^{1-\alpha} \dots \dots \dots (2)$$

$Y_{i,t}$, $Y_{j,t}$ are outputs in countries i and j., $A_{i,t}$, $A_{j,t}$ are stochastic productivity shocks., $K_{i,t}$, $K_{j,t}$ are capital stocks, $L_{i,t}$, $L_{j,t}$ are labour inputs and α is the capital share of outputs.

Shocks originating in country i are propagated internationally through changes in productivity shocks A_i results in changes in output among others.

This change leads to changes in trade and disruption of production in trading partners like country j as highlighted below.

$$\alpha_A^g = \sum_i \delta_i^g \sigma_i^g + \sum_i \sum_{j \neq i} \phi_i \varphi_j \sigma_{ij} \dots \dots \dots (3)$$

ϕ_i represents the variance in domestic demand, φ_j is sectoral output growth, and σ_{ij} is the covariance between sectoral outputs, reflecting how trade, financial flows and technological transfers impact South Africa's economy.

Global Vector Autoregressive (GVAR) Model

Step 1:

Constructing Country-Specific VAR Models

Each country in the analysis is initially modelled using a standard VAR model, incorporating key domestic macroeconomic variables as follows:

$$y_{it} = \ln(GDP_{it}/CPI_{it}),$$

$$p_{it} = \ln(CPI_{it}),$$

$$q_{it} = \ln(EQ_{it}/CPI_{it})$$

$$e_{it} = \ln(E_{it})$$

$$y_{it} = GDP = \text{Gross Domestic Product}, p_{it} =$$

$$(CPI_{it}) = \text{Consumer Price Index}, q_{it} =$$

$$\text{Interest rate}, e_{it} = \ln(E_{it}) = \text{Exchange rate}.$$

These domestic variables serve as core indicators of economic activity.

Step 2:

Establishing the VARX Model

To account for international interactions, each country-specific model is expanded into a VARX (Vector Autoregressive model with Exogenous variables) structure:

$$x_{it} = a_{t0} + a_{t1}t + \psi_{t1}x_{t,t-1} + \psi_{t2}x_{t,t-2} + A_{t0}x_{it}^* + A_{t1}x_{i,t-1}^* + A_{t2}x_{i,t-2}^* + U_{it}$$

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 U_{it} is a serially uncorrelated and cross-sectionally weakly dependent process.

This structural set-up allows us to comprehensively analyse how the domestic economy reacts to macroeconomic fluctuations from foreign economies.

Step 3:

Building the Global VAR (GVAR) Model

By linking individual VARX models, a global VAR (GVAR) model is formulated. The GVAR model is expressed as:

$$G_0x_t = a_{t0} + a_{t1}t + G_1x_{t-1} + G_2x_{t-2} + U_t$$

Where G_0 , G_1 and G_2 capture the international linkages among countries and the dynamics of global variables, and U_{it} is the global shocks.

The reduced form of the model is written as:

$$x_{it} = \beta_0 + \beta_1 + Y_1x_{t-1} + Y_2x_{t-2} + e_t$$

Here, Y_1 and Y_2 reflect the autoregressive components, while e_t captures the innovation terms.

This framework enables the detection of (1) contemporaneous dependence of domestic variables on foreign counterparts, (2) influence of global variables, and (3) cross-country shock transmission.

List of countries considered in this study

Step 1: Countries and Macroeconomic Variable Selection



Quarterly cross-sectional data from South Africa and 20 other Sub-Saharan African (SSA) countries with four advanced economies (U.S., U.K., China & Euro)

To implement the GVAR model and capture general interdependencies among countries,

- Real economy component (real GDP and inflation)
- Policy variable (short-term interest rate)
- Macro-financial linkage variable (official exchange rate per dollar).
- Global variables such as oil price (gop), gold price (gdpr), and the global commodity price index (gbpng)

Inter-Country Linkages from the GVAR Model Between Countries and South Africa

Step 2: Weighting Procedure



It is constructed based on trade flows (exports and imports) between the domestic and selected foreign countries to analyse the influence of foreign variables on South Africa's inflation rate.

Aside from the E.U. as a region which has the highest weight of trade direction with South Africa (0.45), China is the single country with the most intense trade relationship with South Africa. This result aligns with recent data on trade growth and flow patterns observed in South Africa (Observatory of Economic Complexity, 2023; Trade Data Monitor, 2023).

Step 3: Shock Selection

To achieve the main objective of this study, shock selection is also limited to the following:

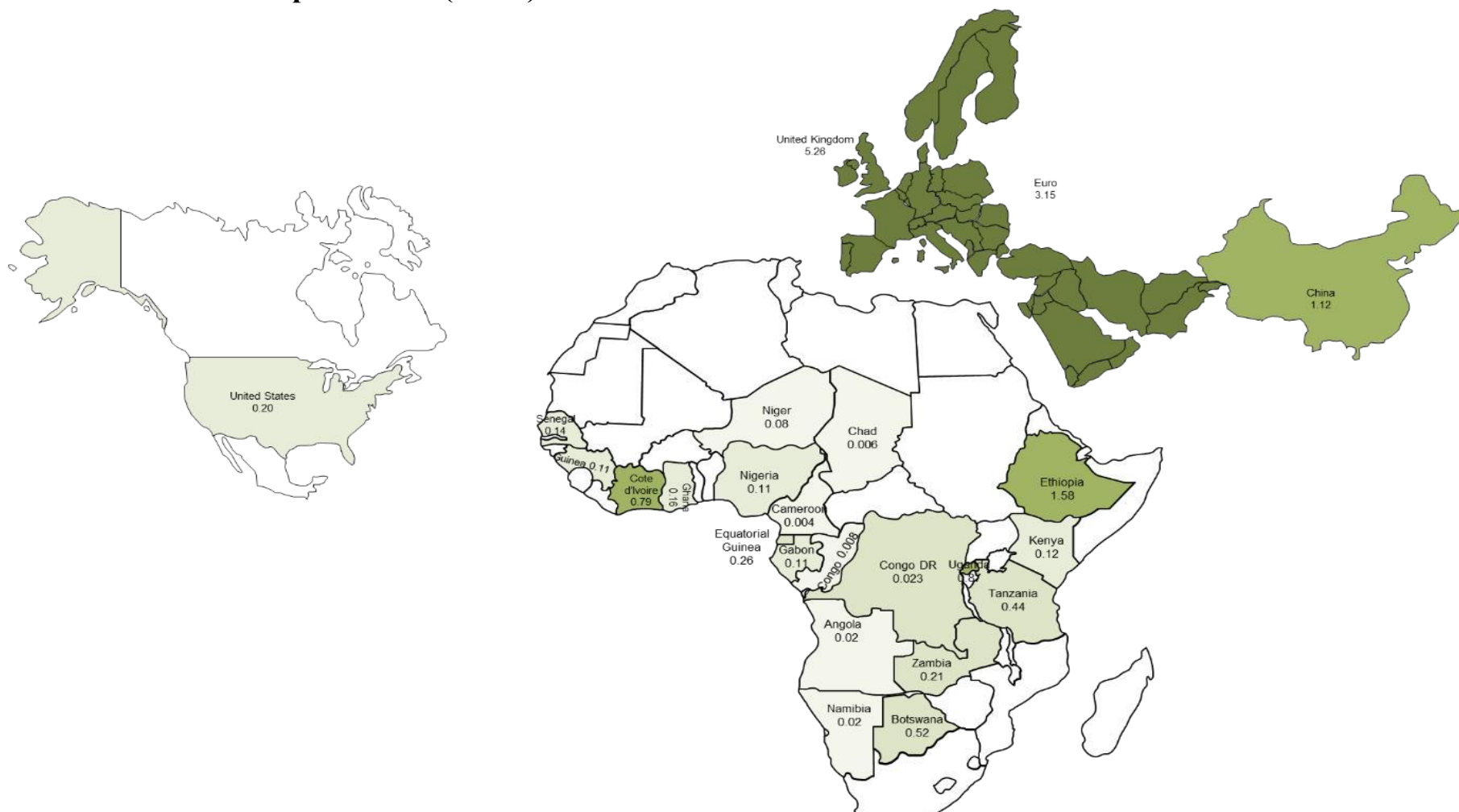
- A positive "inflation shock" from other countries, including SSA
- A negative “GDP shock” from other countries, including SSA

Focusing on the output and inflationary shocks is due to how economic downturns resulting from these shocks can trigger further economic spillovers to SSA countries. The study estimates the effects of these external shocks across key macroeconomic variables in South Africa, but only the effects on inflation in South Africa were reported

Empirical Results

Contribution of Output Shocks (rGDP) to South Africa's Inflation – Immediate Period

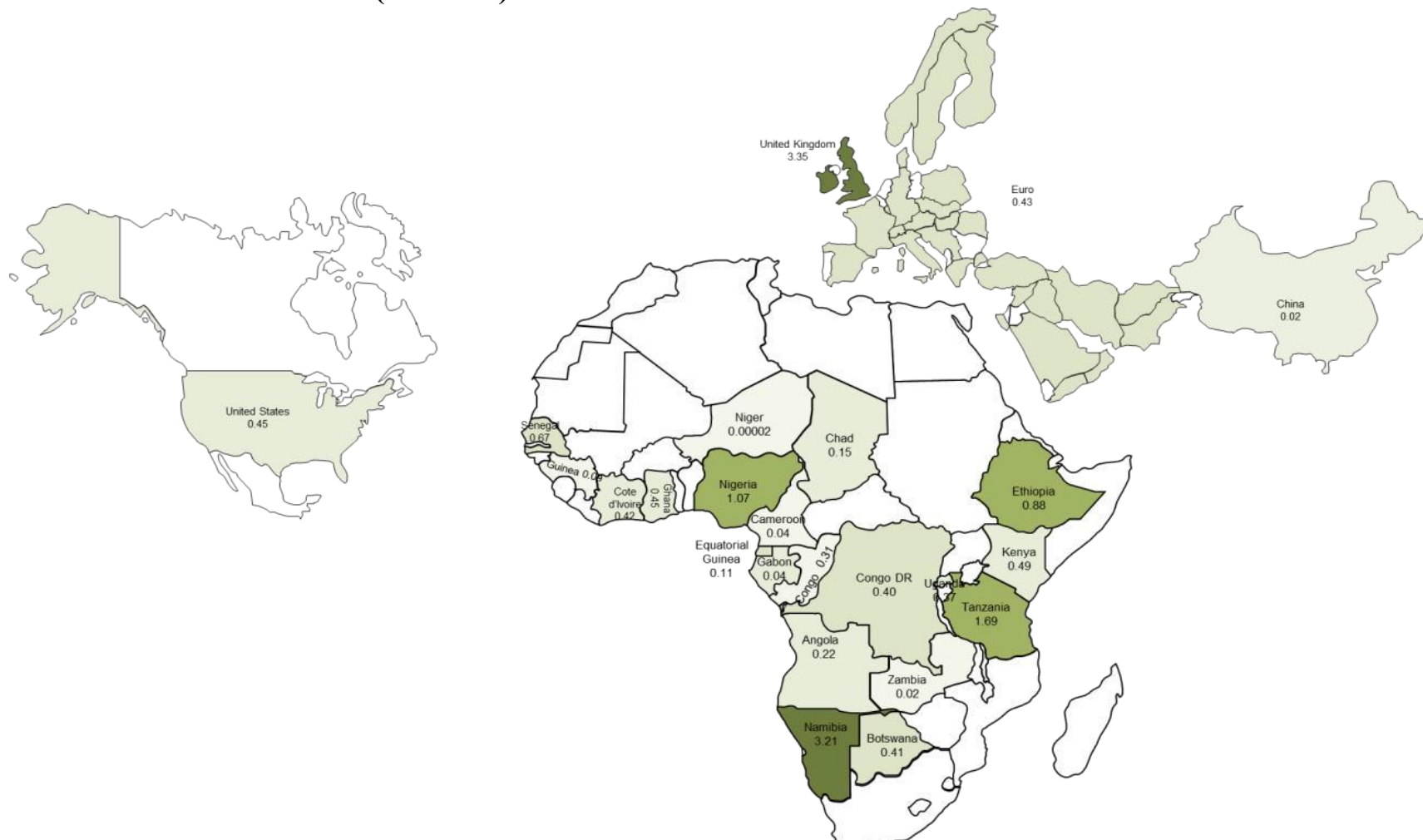
The relatively significant role of output shocks, especially from key trading partners of the SSA region and leading global countries, highlighted the major drift on external sources to change in inflationary pressure in the country.



Empirical Results

Contribution of Price Shocks (Inflation) to South Africa's Inflation – Immediate Period

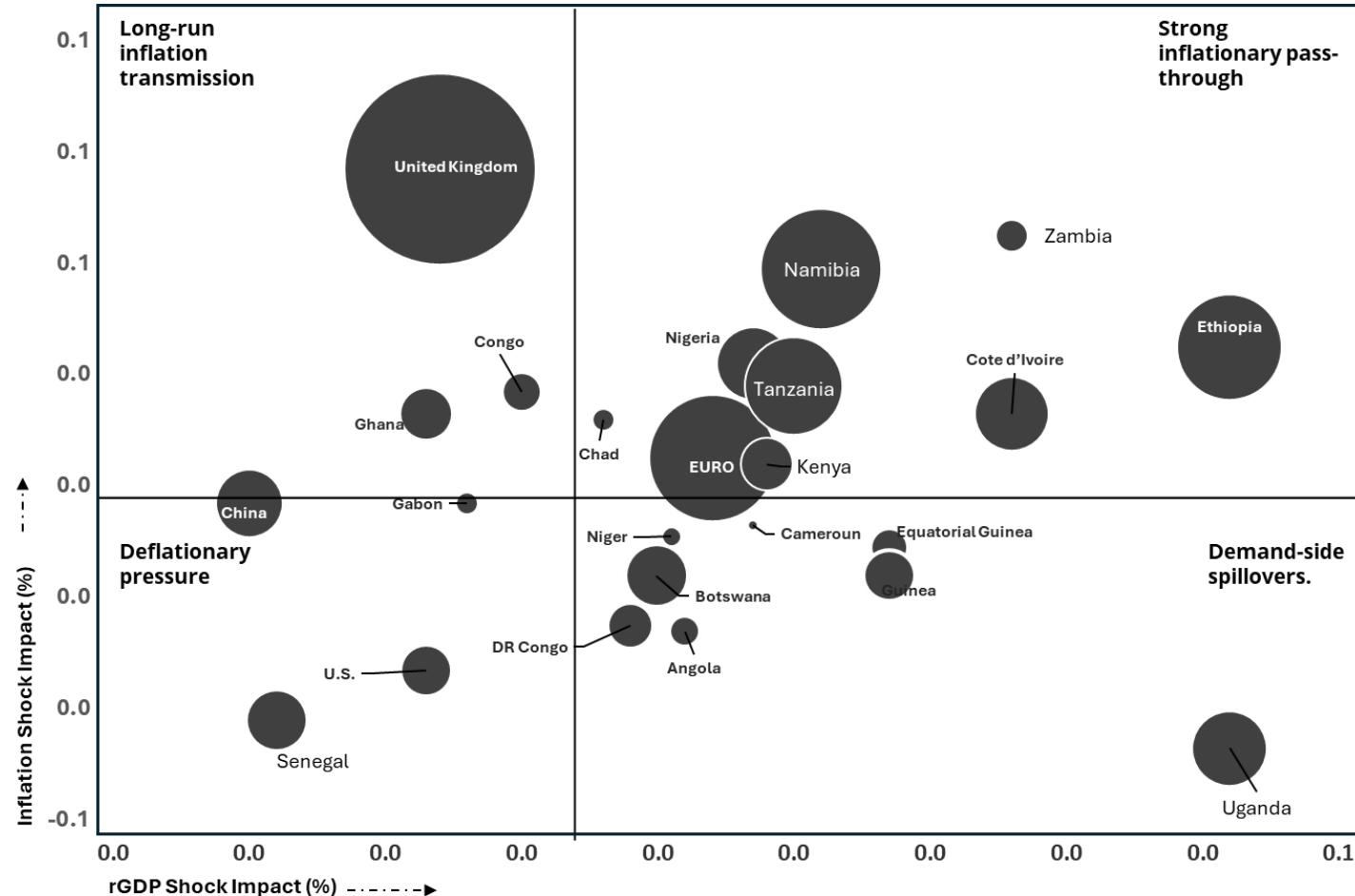
The relatively significant role of output shocks, especially from key trading partners of the SSA region and leading global countries, highlighted the major drift on external sources to change in inflationary pressure in the country.



Empirical Results

Impact of Output and Price Shocks on South Africa's Inflation (Immediate)

Bubble Size = Contribution of both shocks to S.A. inflation



The relatively significant role of output shocks, especially from key trading partners of the SSA region and leading global countries, highlighted the major drift on external sources to change in inflationary pressure in the country.

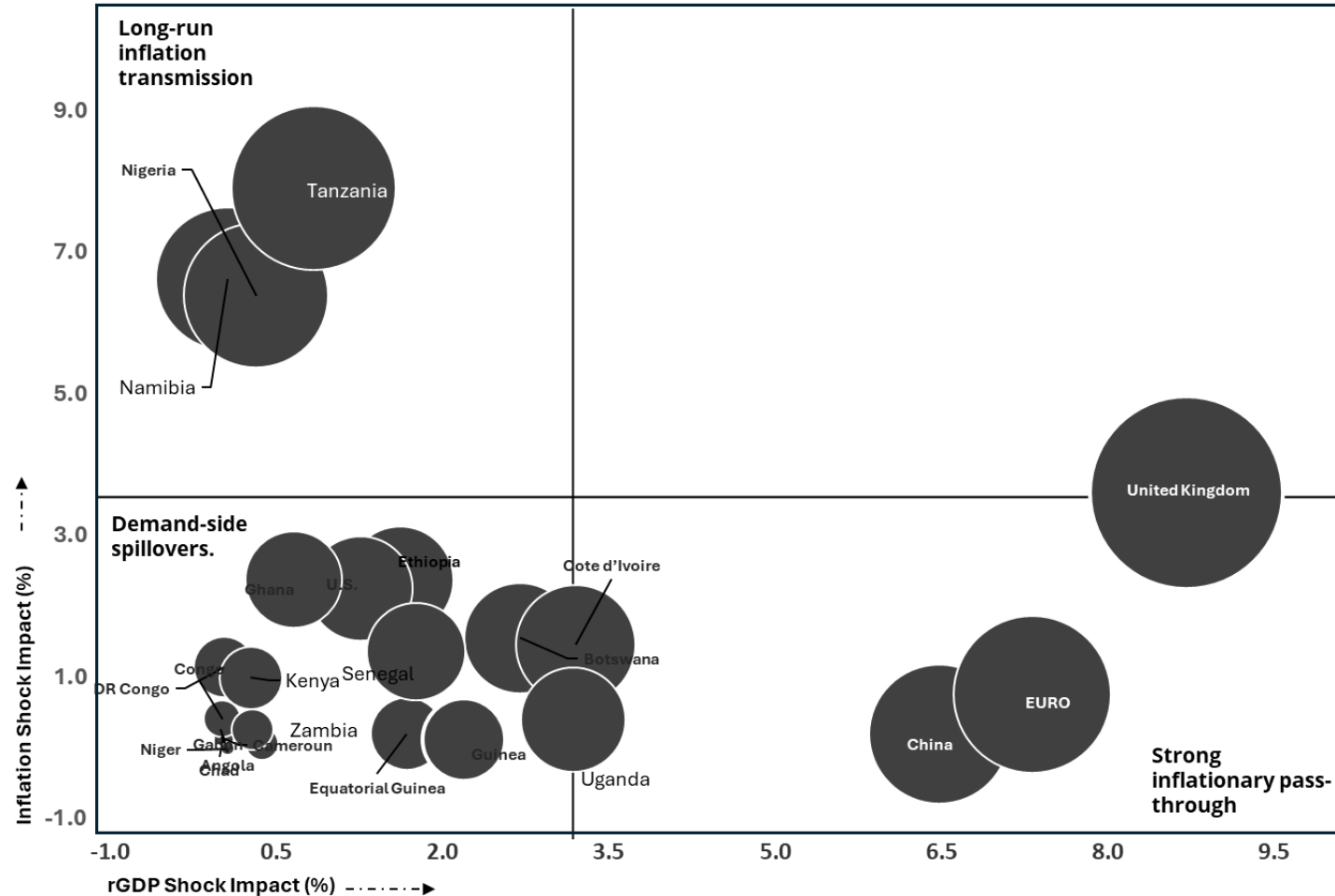
Intra-African Transmission: Closer Ties, Stronger Pass-Through

Country	rGDP (Immediate, 4Q)	Inflation (Immediate, 4Q)	Notable Insights
Ethiopia	0.042, 0.355	0.035, 0.268	Strong inflationary pass-through both short and long term.
Zambia	0.026, 0.218	0.055, 0.534	Very high long-run inflation transmission.
Namibia	0.012, 0.049	0.049, 0.302	Significant inflationary effects due to close economic integration.
Tanzania	0.010, 0.054	0.028, 0.385	Increasing inflationary pressure over time.
Cote d'Ivoire	0.026, 0.135	0.023, 0.286	Long-run inflation effect is noteworthy.
Uganda	0.042, 0.128	-0.037, -0.331	Negative price shock impact – dampens inflation.
Senegal	-0.028, -0.107	-0.032, -0.138	Deflationary pressures—possibly demand-side spillovers.
Nigeria	0.007, -0.047	0.032, 0.217	Long-term inflation transmission is relevant.

Empirical Results

Impact of Output and Price Shocks on South Africa's Inflation (After 4 Quarters)

Bubble Size = Contribution of both shocks to S.A. inflation



The relatively significant role of output shocks, especially from key trading partners of the SSA region and leading global countries, highlighted the major drift on external sources to change in inflationary pressure in the country.

Discussion of Findings

- **External Shocks Significantly Drive Inflation:** Output and price shocks from global and regional trading partners account for a significant share of inflation in South Africa—up to **43.14%** and **41.26%**, respectively, indicating substantial vulnerability to external macroeconomic fluctuations.
- **Major Global Partners Have Strong Influence:** The **UK, EU, China**, and to a lesser extent the **US**, are dominant transmitters of inflation and output shocks to South Africa, with effects transmitted mainly through **import prices, production linkages, and capital flows**.
- **Regional Integration Intensifies Spillovers:** Inflationary linkages with regional African countries—**Ethiopia, Namibia, Nigeria, Tanzania, and Zambia**—are deepening due to **expanding intra-African trade** and frameworks like the **AfCFTA**, amplifying cost-push inflation in South Africa.

Discussion of Findings

- **Output Shocks from Global Giants Matter More:** Output shocks from China, the EU, and the UK cause **stronger long-term inflationary pressure**, partly due to their role in global supply chains and their importance in South Africa's import basket (e.g., machinery, electronics, and vehicles).
- **Delayed Transmission of Global Output Shocks:** Initially, output shocks (e.g., from China and the US) **suppress inflation** in the short term due to global price effects, but **transition into inflationary pressures** over time via **increased global demand** and import costs.
- **Intra-SSA Trade is Limited but Growing:** While output shocks from **Nigeria and Kenya** remain low due to **weak intra-regional trade**, countries like **Botswana and Zambia** show more impactful spillovers, reflecting **regional trade concentration**.

Discussion of Findings

- **Structural Dependence Elevates Vulnerability:** South Africa's **resource dependence** and reliance on **intermediate imports** from inflation-prone countries make it more susceptible to imported inflation and cost escalation in production.
- **Spillovers Are Not Just About Trade Volumes:** Structural issues—**exchange rate volatility, logistics costs, and policy unpredictability**—also magnify the transmission of inflation shocks from regional partners to South Africa.
- **Varied Inflation Dynamics Among African Partners:** While **Zambia and Ethiopia** exhibit strong inflationary spillovers, countries like **Uganda and Senegal** display **deflationary effects**, underlining the **heterogeneity in trade intensity and macroeconomic stability** across the continent.

Policy Recommendations

Productivity & inflationary shocks from trading partners

Mitigating economic shocks from trading partners emphasises the need for coordinated macroeconomic policies to manage inflationary pressure.

Excessive use of monetary tools to manage inflation should be minimise or relatively muted. This study and others have shown that non-monetary drivers of South Africa's inflation are significant in recent time.

Diversification of economy & export basket

South Africa must diversify and strengthen the economy, focusing on non-resource sectors and value-added exports.

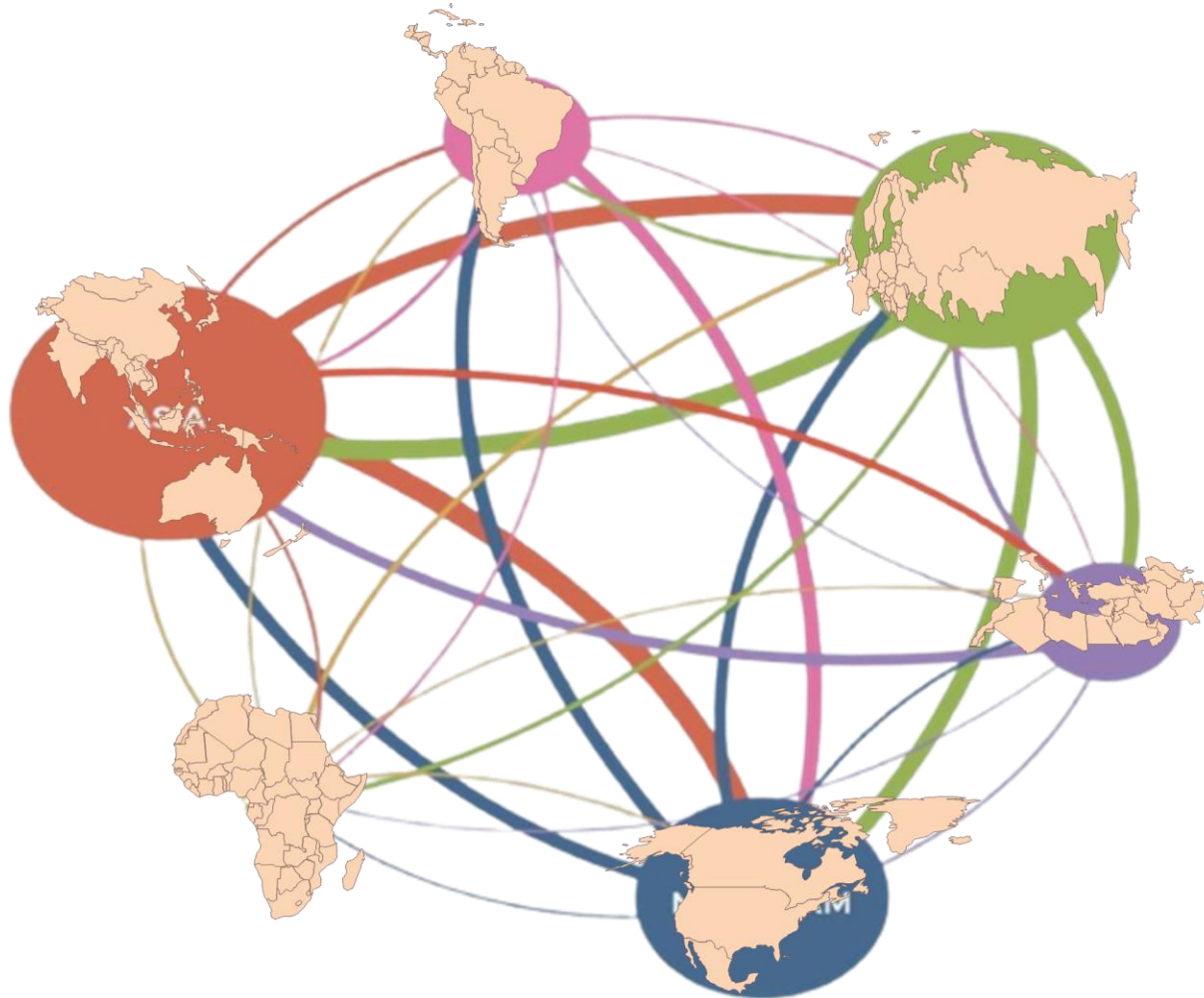
Focus on domestic economic development by boosting light manufacturing and value addition to exports, to enhance economic resilience.

Bolster domestic economies by increasing fiscal and economic buffers

Industrial development in light manufacturing and value addition is key.

Focus on attracting FDI in services, infrastructure, transport, telecom, and healthcare for growth and diversification.

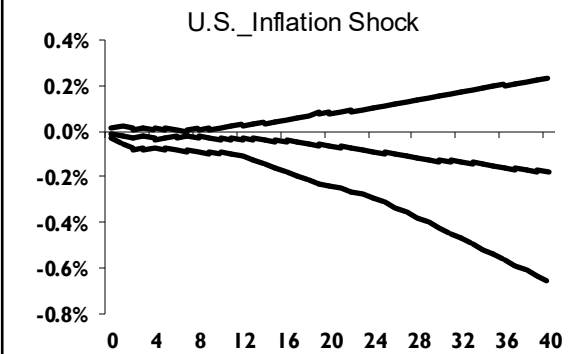
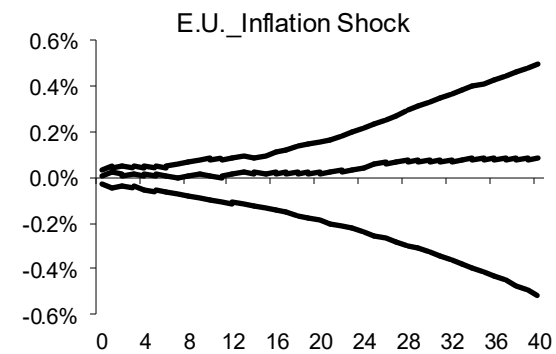
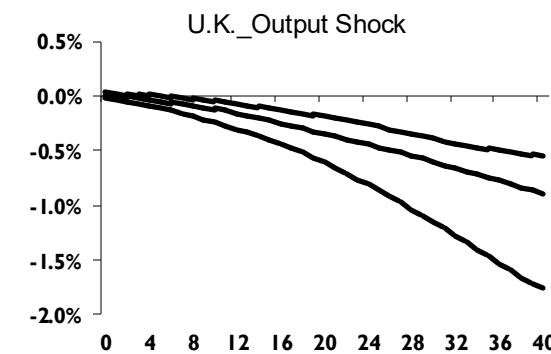
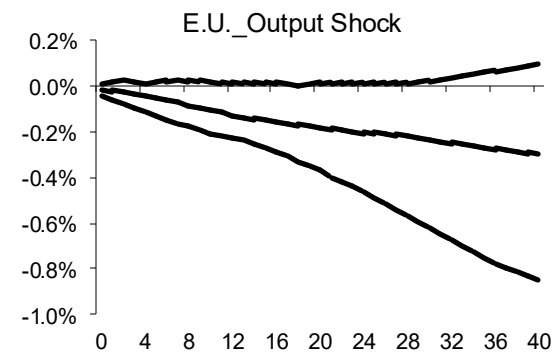
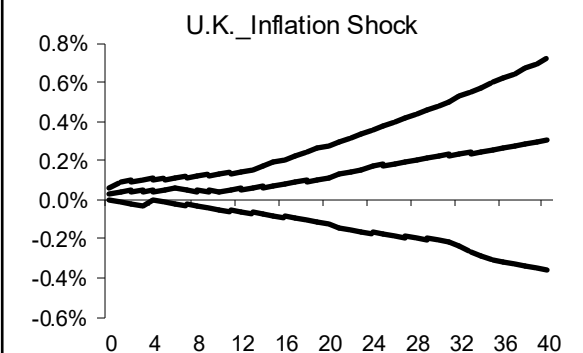
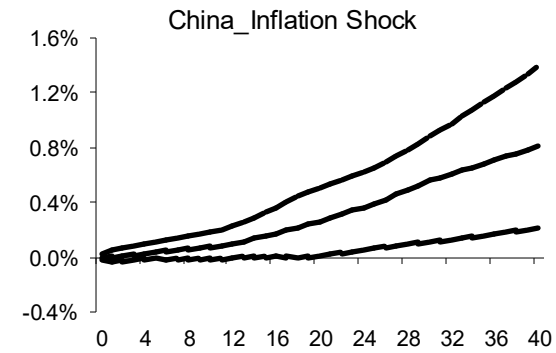
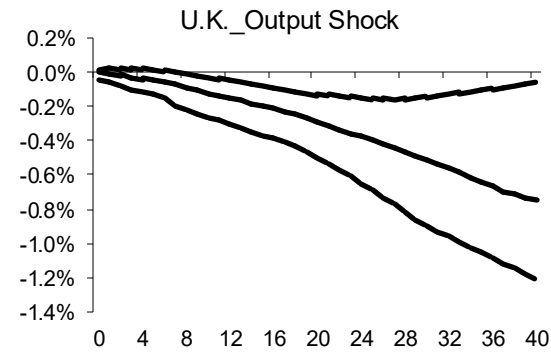
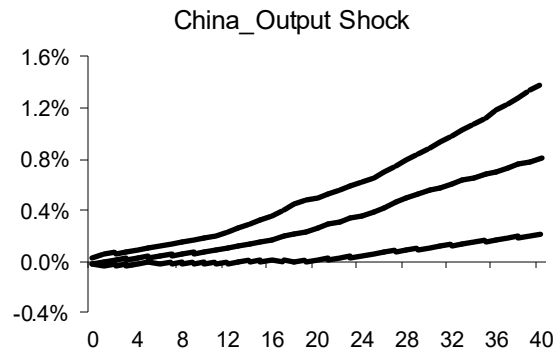
- **Inflationary Pressures in South Africa Have Global and Domestic Roots**
 - South Africa is experiencing inflationary pressures driven by both domestic factors and global events.
- **Spillover Effects of Global Shocks Are Significant**
 - Findings reveal that inflation and output shocks from South Africa's key trading partners significantly influence its inflation dynamics.
- **Economic Structure Matters in Shock Transmission**
 - The study highlights that the impacts of global shocks vary by economic structure, with resource-rich countries like South Africa being especially susceptible to external inflationary and output shocks, echoing earlier findings such as those by the IMF (2010).



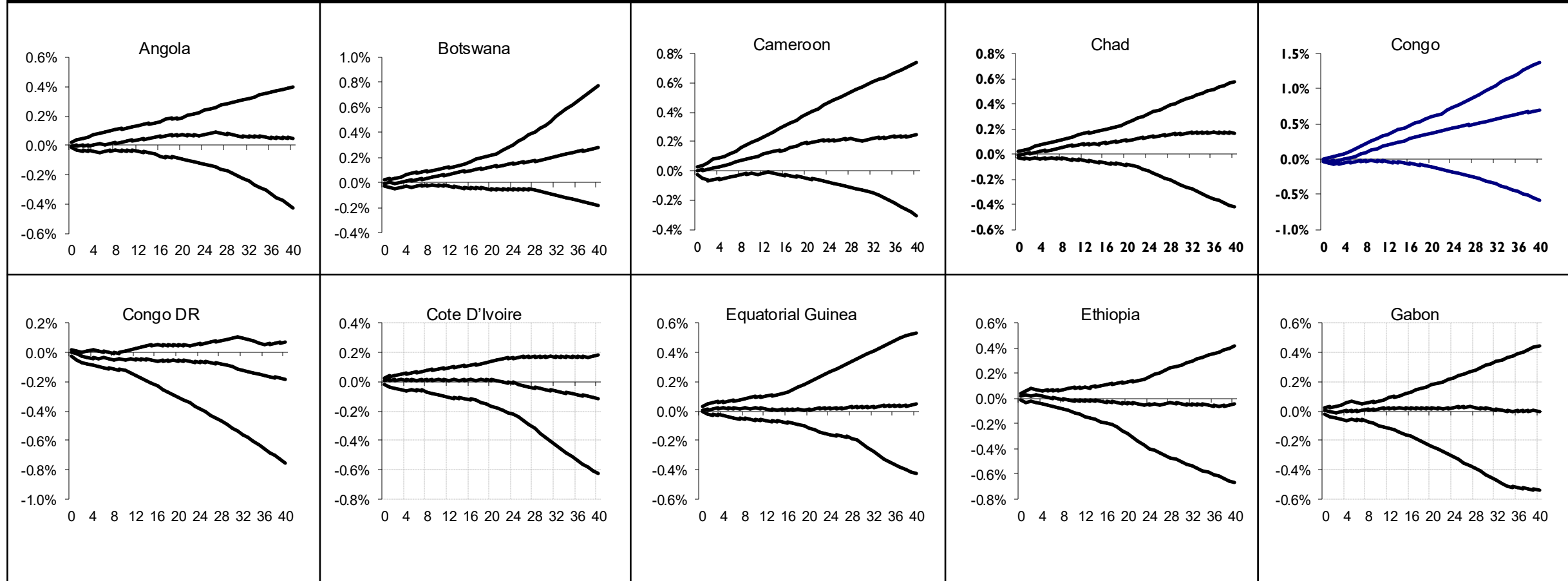
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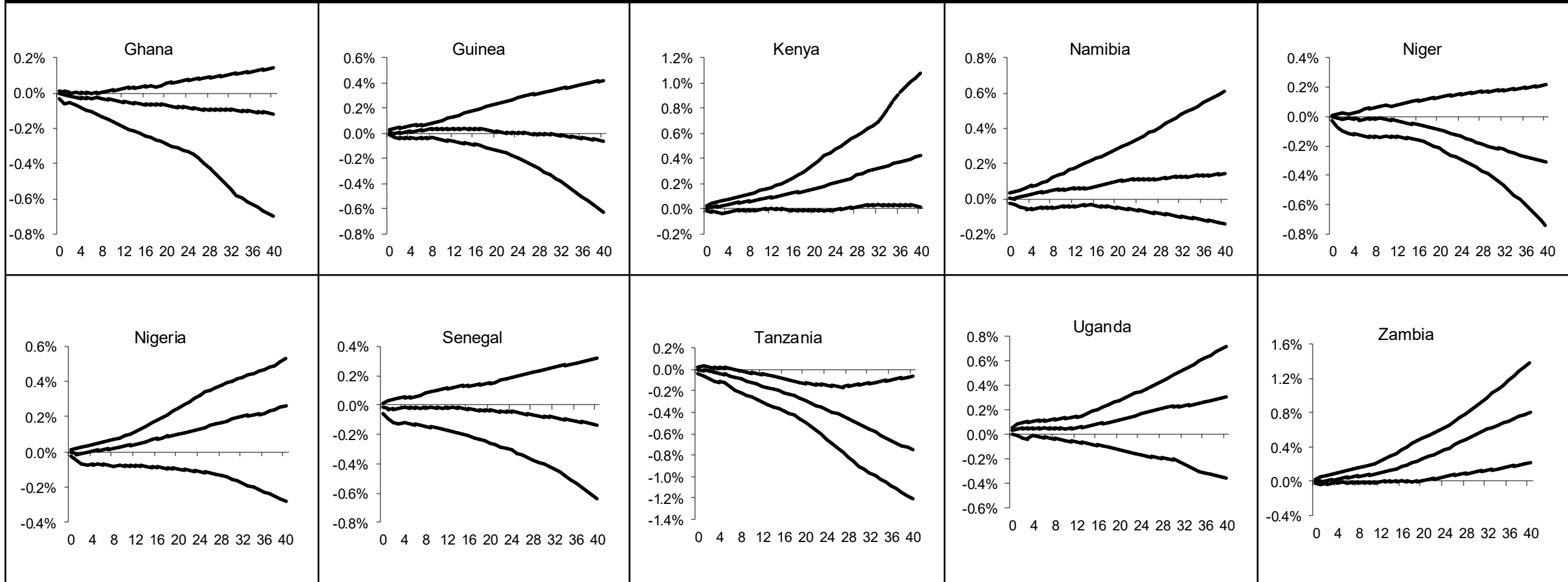
INFLATION SHOCK



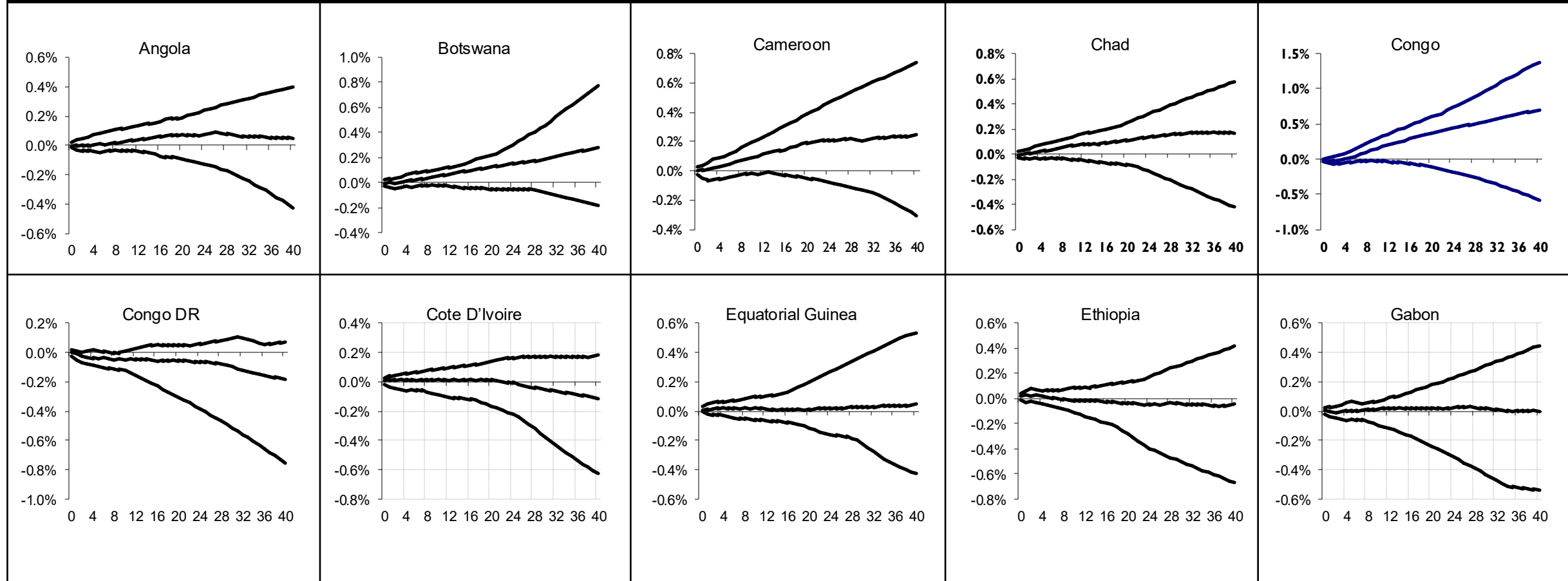
OUTPUT SHOCK – REGIONAL PARTNERS



OUTPUT SHOCK – REGIONAL PARTNERS



INFLATION SHOCK – REGIONAL PARTNERS



INFLATION SHOCK – REGIONAL PARTNERS

