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Dynamic Effects of Shock-dependent Phillips Curve on Economic Growth Rate and Exchange Rate: Evidence from some African Countries

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Abstract

This study examines how a shock-dependent Phillips Curve affects economic growth and exchange rate changes in six African nations between 1980 and 2024. Using PSVAR, CIR, and panel GLM approaches, the study shows how inflation affects economic growth and exchange rates differs by country and shock type. Key findings include the negative consequences of supply-side shocks in structurally weak countries, as well as different exchange rate reactions influenced by monetary frameworks. The paper emphasizes the importance of structural determinants and policy credibility in managing inflation and exchange rate volatility, and it recommends state-contingent monetary policies as well as improved transmission channels.

Keywords: Shock-Dependent Phillips Curve, Inflation Dynamics, Economic Growth, Exchange Rate Volatility, Economy of Africa.

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Introduction

Understanding the dynamic interaction of inflation, output, and exchange rate changes remains a major difficulty in macroeconomic policy design, especially in emerging and developing nations. Among the theoretical frameworks established to capture these interactions, the Phillips Curve remains an important tool for evaluating inflation-output trade-offs. The shock-dependent Phillips Curve has gained popularity in recent years due to its ability to account for inflation's asymmetric and nonlinear reactions to a variety of shocks, including supply-side disruptions, demand variations, and monetary policy changes.

Most undergraduate courses cover the Phillips curve trade-off between inflation and unemployment, which underpins much modern central bank policy [1-3]. In the late 1960s, the popular approach to inflation dynamics was to provide a tradeoff between inflation and unemployment along a negatively sloping Phillips Curve (PC), which policymakers might use. An expansionary demand policy could result in a lower unemployment rate at the cost of a limited and consistent amount of additional inflation. Policy considerations were based on the points of tangency between the convex PC and the concave inflation-unemployment indifference curve.

The Phillips Curve has typically shown an inverse link between inflation and unemployment [4]. This static trade-off has been called into question over time by theoretical advances and empirical findings, particularly in the presence of expectations and shocks. Friedman and Phelps contended that the association is only meaningful in the near term due to the function of adaptive or sensible expectations [5,6]. The New Keynesian Phillips Curve (NKPC) focuses on inflation expectations and marginal cost as key drivers of inflation dynamics, taking into account nominal rigidities and price stickiness [7].

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Phillips curve shocks, especially supply shocks, have a significant impact on economic growth and currency rates. A negative supply shock, such as a significant increase in oil prices, can lead the Phillips curve to shift to the right, resulting in higher inflation and possibly weaker economic development. Some models anticipate that such shocks will lead the domestic currency's value to decrease. A positive supply shock, on the other hand, has the potential to shift the Phillips curve to the left, resulting in lower inflation and possibly stronger economic growth, as well as exchange rate implications.

However, empirical research has demonstrated that the NKPC does not fully explain inflation dynamics in emerging markets or under extreme shocks [8]. This resulted in the creation of shock-dependent Phillips Curves, which allow the slope and position of the curve to change depending on whether the shock is demand- or supply-driven [9]. Phillips curve shocks, whether induced by supply, demand, or monetary policy, can have a considerable and variable impact on economic growth and exchange rates.

In recent years, macroeconomic conditions in African countries, particularly those with significant integration into the global economy, have been marked by chronic price instability, currency rate misalignments, and uneven growth rates. South Africa, Egypt, Ethiopia, Nigeria, Algeria, and Uganda are a heterogeneous group on the continent, each with their own monetary regimes, structural characteristics, and susceptibility to external shocks. These countries have undergone significant transitions, yet they continue to experience macroeconomic shocks caused by commodity price variations, geopolitical concerns, currency rate volatility, and climate-induced supply disruptions.

This study aims to investigate the dynamic implications of a shock-dependent Phillips Curve on economic growth rates and exchange rate behavior in a representative sample of African economies. By enabling the slope of the Phillips Curve to fluctuate with the type and number of economic shocks, we hope to represent the nonlinear and state-dependent aspect of inflation dynamics. This analytical approach not only improves the model's empirical relevance, but it also provides for a more comprehensive understanding of policy transmission processes in various macroeconomic situations.

Specifically, the study addresses two main questions: (1) How do different economic shocks affect the trade-off between inflation and output in these countries? (2) What are the short- and medium-term implications of these shock-induced inflation dynamics for exchange rate fluctuations and economic development paths? In doing so, we add to the expanding corpus of empirical literature on context-specific policy responses in African economies.

The conclusions of this study have significant implications for monetary policy formulation, inflation targeting frameworks, and exchange rate management. This study, which uses country-level data and a panel vector autoregression (PVAR) model tailored to capture shock-dependent dynamics, provides novel insights into how inflation-output trade-offs evolve under various macroeconomic shocks and how these influence broader economic outcomes in diverse African settings.

The remainder of the paper is organized as follows. The following section looks at the literature review. Section 3 discusses the empirical review. Section 4 describes the data collection and the estimation procedure (econometrics). Section 5 gives the estimated outcomes. Section 6 discusses the results in relation to known econometric approaches. Section 7 includes concluding thoughts and policy ideas.

Literature Review

The link between inflation, output, and exchange rates has been extensively studied in macroeconomic literature, with the Phillips Curve acting as the primary analytical framework. A.W. Phillips proposed the conventional Phillips Curve, which implied a consistent, inverse relationship between inflation and unemployment [4]. However, later advances, particularly the expectations-augmented Phillips Curve by Friedman and Phelps, included the function of adaptive and rational expectations, considerably altering the curve's policy relevance [10,6]. Recent research has focused on shock-dependent or nonlinear Phillips Curves, which account for state-contingent inflation-output trade-offs and shock transmission heterogeneity.

Recent study stresses the Phillips Curve's state-dependent aspect. For example, McLeay and Tenreyro suggest that the inflation-unemployment trade-off is determined by the type of shock—supply shocks may cause both inflation and unemployment to rise (flattening or inverting the curve), whereas demand shocks often sustain the traditional trade-off [11]. Auerbach and Gorodnichenko found that fiscal and monetary policy multipliers change across regimes, implying that Phillips Curve dynamics are nonlinear and context-sensitive [12].

In African economies, where inflation is more variable and frequently influenced by external shocks (commodity prices, exchange rates), the standard Phillips Curve framework underperforms [13]. Berg et al. found that include external shocks and monetary regimes increases the explanatory power of inflation-output models in emerging markets [14].

A growing amount of study connects the Phillips Curve paradigm to macroeconomic outcomes other than inflation, specifically growth and currency rates. For example, exchange rate pass-through is stronger in economies with lower monetary credibility, and this feedback loop frequently interacts with the inflation-output trade-off [15,16]. Mishra and Montiel and Izquierdo et al. found that exchange rate volatility worsens inflation persistence and slows growth throughout global tightening cycles in the BRICS economies [17,18].

Empirical Review

According to empirical studies by Ball, Mankiw, and Romer and Blanchard and Galí, the Phillips Curve's slope varies based on the form and size of the shock, including supply-side disruptions and monetary policy shocks [19,20]. Dupraz, Nakamura, and Steinsson found empirical support for a nonlinear, shock-dependent Phillips Curve, demonstrating that inflation responds more strongly to negative demand shocks than positive ones [21]. Similarly, Forbes et al. discovered that external shocks, notably currency rate pass-through, can dramatically affect the slope of the Phillips Curve in open economies [22].

Several studies have used Phillips Curve variants to examine African countries, with inconsistent results due to differences in institutional quality, monetary regimes, and structural factors. Kumo and Bonga, Hove, and Nyoni investigated the inflation-unemployment trade-off in Sub-Saharan Africa and found weak or unstable Phillips Curve correlations in countries with substantial supply-side limitations or informal labor markets [23,24]. Similarly, Kedir and Mouratidis used a time-varying Phillips Curve model to Ethiopia and Kenya, revealing nonlinearity and asymmetric inflation responses to shocks [25].

In developing and emerging economies, Mishra and Montiel underline that structural rigidities, inadequate monetary transmission mechanisms, and exposure to external shocks make the inflation-output connection more volatile and dependent on prevailing economic conditions [17]. Burger and Marinkov found support in South Africa for a steady short-run Phillips Curve, although Aron and Muellbauer underlined the role of expectations and exogenous shocks on inflation dynamics [26,27]. In Nigeria and Egypt, studies such as Olubusoye and Oyaromade and Omisakin and Adeniyi imply that monetary policy shocks and currency rate volatility are important determinants of inflation-output trade-offs [28,29].

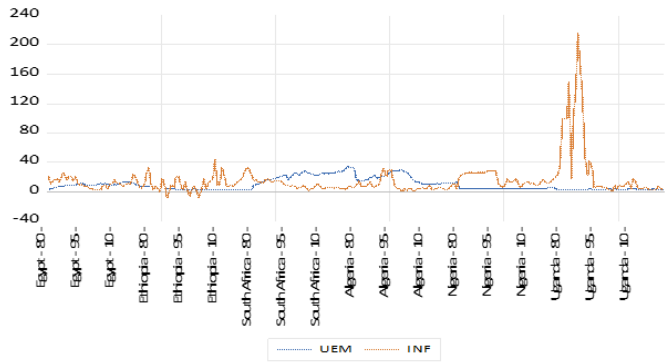
Céspedes, Chang, and Velasco suggested that monetary policy reacting nonlinearly to shocks can either increase or decrease exchange rate volatility, depending on inflation targeting regimes and credibility [30]. Rabanal demonstrates that in developing nations, taking into account shock asymmetry in inflation-output dynamics offers a more comprehensive explanation of macroeconomic volatility and exchange rate fluctuations [31]. Shock-dependent Phillips Curves have recently been extended to examine their implications for exchange rates and growth.

Although nonlinear and shock-dependent Phillips Curves have been the subject of an increasing amount of research, there are still few empirical applications of this theory in African nations, particularly when using a multi-country comparative approach. Cross-country variations in macroeconomic regimes, institutional capability, and sensitivity to global shocks are frequently overlooked in favor of single-country analysis in the majority of studies. Furthermore, few have directly connected exchange rate behavior and the results of economic expansion in Africa to shock-dependent inflation dynamics.

By using a shock-dependent Phillips Curve framework to six distinct African economies—South Africa, Egypt, Ethiopia, Nigeria, Algeria, and Uganda—this study adds to the body of literature. examining the asymmetric impacts of various shocks on output, inflation, and currency rates (such as supply against demand); capturing short- and medium-term macroeconomic responses across nations with different structural features through the use of a dynamic panel empirical technique.
The study intends to close this empirical gap and offer more specialized and fact-based insights for macroeconomic stabilization measures in the African setting. Research by Aron and Muellbauer and Bonga-Bonga shows the constraints of inflation-targeting regimes in the face of foreign volatility, particularly when domestic structural rigidities and fiscal imbalances constrain policy responses [27,32].

Data and Econometric Methodology

The annual macroeconomic panel data used in this analysis covers the years 1980–2024 for six African nations: South Africa, Egypt, Ethiopia, Nigeria, Algeria, and Uganda. These nations were chosen due to their disparate monetary and exchange rate policy frameworks, economic size, regional diversity, and data accessibility.



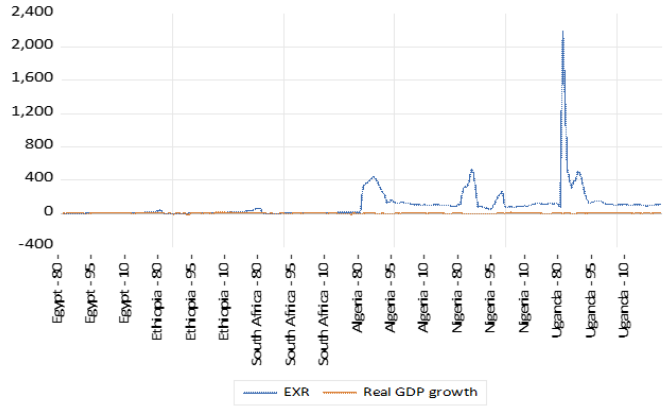
Source: Data were processing with E-views[13]

Figure 1: Co-movement between unemployment rate and inflation rate in all countries

Figure 1 shows the co-movement of the unemployment rate and the inflation rate. Note: The author's construction is based on data collected from the World Bank. The blue hue reflects the unemployment rate, while the brown tint depicts the inflation rate.

Data

Our analysis used data on inflation rates (INF), unemployment rates (UEM) in percent, exchange rates (EXR), and real GDP (economic growth). The World Bank's International Financial Statistics [IFS] database was used to obtain data on inflation, exchange rates, and real GDP (economic growth), while the World Bank's World Development Indicator was used to extract data on unemployment. We explore six African countries from 1980 to 2024.



Source: Data were processing with E-views13

Figure 2: Co-movement between the exchange rate and real (GDP) growth in all countries

Figure 2. shows high volatility in EXR but low volatility in GDP growth shows that exchange rate shocks are not reflected in corresponding short-term GDP growth swings, presumably due to price rigidities and lagged pass-through effects. Structural considerations in African economies cushion or delay macroeconomic repercussions. Spikes in EXR are most likely due to currency crises, regime transitions, or structural adjustment plans in the individual countries. This dataset is most certainly non-stationary for EXR (due to the presence of trends and spikes), but it may be stable or nearly stationary for GDP growth.4-2 Econometric Methodology

Shock-Dependent Phillips Curve

The main innovation in this study is the estimation of the slope of the Phillips curve in response to various shocks. Following studies such as Gali and Gambetti and Barnichon and Mesters who estimated the slope of the Phillips curve by using the ratio of (CIR) cumulative impulse response functions between inflation and unemployment, and the shock-dependent slope of the Phillips curve is estimated by the following expression [9,33,34].

$$\textbf{Shock-Dependent Slope} = \frac{(CIR)INFs}{(CIR)UEMs}$$

where: ((CIR)INFs), CIR of Inflation to a Specific Shock, and ((CIR)UEMs), CIR of Unemployment to a Specific Shock. It is independent of the scale of the variables/shocks investigated, and it may be approximated for demand and supply shocks over different time horizons. This estimation methodology is similar to previous research by Shambaugh, Forbes, Hjortsoe, and Nenova, Ha, Stocker, and Yilmazkuday and Yilmazkuday, which yielded continuous pass-through measures throughout time [8,22,35,36].

Panel Generalized Linear Models (GLM)

Panel Generalized Linear Models (GLMs) are statistical models for analyzing panel data (data containing several entities observed over multiple time periods) when the response variable is not normally distributed. These models combine the flexibility of GLMs, which can handle data distributions other than the normal, with the ability to account for the data's panel layout. Panel model estimation for glm-like models, such as binomial models (logit and probit), count models (poisson and negbin), and ordered models (logit and probit), is discussed in Baltagi, Hsiao, and Croissant and Millo [37-39].

This section presents the generalized linear model (GLM) developed by Nelder and Wedderburn a more comprehensive treatment may be found in the classic work by McCullagh and Nelder [40,41]. The GLM framework generalizes linear models in the following way. Linear model theory provides a framework for selecting suitable linear combinations of explanatory factors to predict a response.

Panel Structural Vector Autoregressive Models (PSVAR)

Panel SVARs have been used to solve a wide range of policy and applied economic concerns. Panel SVARs are particularly useful for studying the transmission of idiosyncratic shocks across units, time, and nations. For example, Canova et al. investigated how US interest rate shocks spread to ten European economies, seven in the Eurozone and three outside of it, as well as how German shocks spread to the remaining nine economies [42].

To investigate the dynamic link between inflation (via a shock-dependent Phillips Curve), GDP growth, and exchange rate movements in African BRICS nations under various shock scenarios (supply and demand shocks).

This study uses a Panel Vector Autoregression (PVAR) model to examine macroeconomic dynamics across countries and over time:

$$Y_{i,t} = A_1 Y_{i,t-1} + A_2 Y_{i,t-2} + \ldots + A_\rho Y_{i,t-\rho} + \mu_i + \lambda_t + \mathcal{E}_{i,t}$$

Where:

($Y_{i,t}$): Vector of endogenous variables (inflation, output gap, GDP growth, exchange rate).
(μ_i): Country fixed effects
(λ_t): Time fixed effects
($\mathcal{E}_{i,t}$): Error term

Estimation Results

Table 1 provides descriptive statistics for the variables. As shown in the table, the mean values of all variables are positive. Economic growth emissions have the lowest average, but the exchange rate is the highest. Furthermore, unemployment has the lowest volatility, whereas the exchange rate has the highest unpredictability. Regarding the link between the variables, the correlation matrix shows that, (-0.326): A negative link exists, consistent with Okun's Law: higher unemployment is associated with slower economic growth. (0.526): There is a positive link between inflation and exchange rate depreciation, which could indicate pass-through effects or macroeconomic instability. (-0.215): Mild negative relationship—can be regarded as compatible with the Phillips Curve, but connection is weak. (-0.159): Weak negative association – currency rate volatility or depreciation may have a negative impact on growth, possibly through higher import costs or uncertainty.

Table 1: Summary information on the variables.

Descriptive Statistics				
	UEM	**INF**	**EXR**	**GROWTH**
Mean	10.053	15.774	101.721	3.994
Median	5.742	9.300	63.907	3.9
Std. Dev.	8.533	24.971	195.142	3.807
Skewness	1.071	4.843	6.702	-0.048
Kurtosis	2.921	30.349	64.230	3.491
Correlation Matrix				
	UEM	**INF**	**EXR**	**GROWTH**
UEM	1			
INF	-0.215	1		
EXR	-0.131	0.526	1	
GROWTH	-0.326	-0.049	-0.159	1

Source: Data were processing with E-views[13]

Unit Root Test

The first stage in investigating short- and long-term relationships among variables is to assess their degree of integration or

stationarity. Specifically, the Levin-Lin test. We will also use the Im, Pesaran, and Shin (IPS) test, which is based on the Dickey-Fuller (DF) approach. Individual stationarity tests for each series within the panel can be performed separately using the IPS test, which improves the accuracy of the results across multiple variables. Before moving on to further econometric research, ensure that the stationarity findings are robust.

Table 2: Unit root test results.

	Levin, Lin & Chu t		Im, Pesaran and Shin W-stat		Co-integration
	Level	1st Difference	Level	1st Difference	
UEM	-1.959**	-5.631***	-2.695**	-7.031***	I(0)
INF	-1.358*	-8.399***	-1.993**	-11.575***	I(0)
EXR	1.031	-20.991***	-0.807	-13.731***	I(1)
GROWTH	-4.119***	-10.070***	-6.081***	-15.076***	I(0)

Source: Data were processing with E-views[13]

The symbols *, **, and * represent significance levels of 1%, 5%, and 10%, respectively.**

A unit root test was performed on all variables in the study, and the results are described in Table 2. The findings show that unemployment, inflation, and growth variables are stationary at their respective levels, while the exchange rate achieves stationarity only after being differentiated. In other words, all variables, save the exchange rate variable, reach stationarity at the first difference. As a result, the variables have different orders of integration, with some being stationary at I(0) and others at I(1).

Slope of the (Shock-dependent Phillips Curve) and its Effect on Growth and Exchange Rates

Table 3 shows how the shock-dependent Phillips curve affects economic growth, and exchange rates in South Africa, Egypt, Nigeria, Algeria, Ethiopia, and Uganda. We find that the shock-dependent Phillips curve has a negative and statistically significant impact on economic growth rates in South Africa (-0.241*), Nigeria (-0.157*), Algeria (-0.026*), and Egypt (-0.033*) at the 5% level. Meanwhile, for Ethiopia and Uganda, there is no impact, as the sign is positive (0.063) and Uganda (0.001), and is not statistically significant. As for the impact of the Phillips curve based on shocks on exchange rates in these countries, it is clear that there is an impact on each of South Africa (0.353*), Nigeria (0.325*), and Algeria (0.114*), and no impact on Egypt (0.182), Ethiopia (0.074), and Uganda (0.003).

Table 3: The slope of the shock-dependent Phillips curve and its effect on growth and exchange rates

Countries	Real (GDP) growth Shocks	Exchange rate Shocks
South Africa	-0.241*	0.353*
Egypt	-0.033*	0.182
Nigeria	-0.157*	0.325*
Algeria	-0.026*	0.114*
Ethiopia	0.063	0.074
Uganda	0.001	0.003

Source: Data were processing with E-views[13]

Panel Generalized Linear Models Results

The exchange rate has a positive but statistically insignificant effect on the shock-dependent Phillips curve ratio. A one-unit increase in EXR causes a 0.0019-unit increase in the shock-dependent Phillips curve, but since ($p > 0.05$), this effect is not statistically significant. REAL_GDP_GROWTH: Statistically significant at 5%, with a positive effect. A one-percentage-point rise in GDP growth boosts the shock-dependent Phillips curve by approximately 0.192 units. This is rather surprising, as economic theory predicts that stronger growth will cut unemployment and possibly enhance inflation, lowering the shock-dependent Phillips curve ratio. This implies that either inflation is not rising adequately during periods of high growth, or unemployment is rising disproportionately—both outcomes may reflect structural inefficiencies or stagflation-like processes. (See Table 4.).

Table 4: Panel Generalized Linear Models results

Dependent Variable: UEM/INF
Method: Generalized Linear Model (Newton-Raphson / Marquardt steps)
Date: 08/03/25 Time: 20:24
Sample: 1980 2024
Included observations: 263
Family: Normal
Link: Identity
Dispersion computed using Pearson Chi-Square
Convergence achieved after 0 iterations
Coefficient covariance computed using observed Hessian

Variable	Coefficient	Std. Error	z-Statistic	Prob.
EXR	0.001916	0.001931	0.992264	0.3211
REAL_GDP_GROWTH	0.191807	0.076954	2.492491	0.0127

Mean dependent var	1.972673	S.D. dependent var	6.489202
Sum squared resid	11659.74	Root MSE	6.658350
Log likelihood	-871.7989	Akaike info criterion	6.644859
Schwarz criterion	6.672023	Hannan-Quinn criter.	6.655776
Deviance	11659.74	Deviance statistic	44.67335
Pearson SSR	11659.74	Pearson statistic	44.67335
Dispersion	44.67335		

Source: Data were processing with E-views[13]

Insignificant effect of EXR

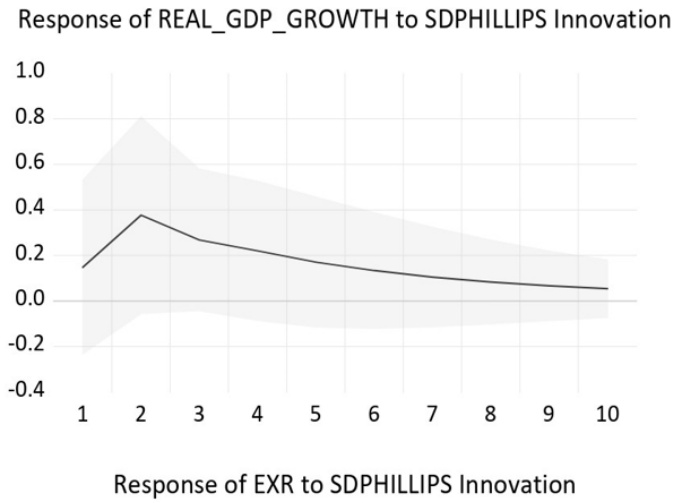
In this scenario, the exchange rate may not have a direct influence on the shock-dependent Phillips curve ratio. It could be due to lag effects, or the shock-dependent Phillips curve ratio is an inadequate aim for influencing exchange rate policy.

Positive and Significant Effect of GDP Growth

This may indicate that growth is not translating into lower unemployment or controlled inflation. Potential structural difficulties include unemployment growth, sectoral mismatches, and supply-side inflation.

The GLM results indicate that real GDP growth has a statistically substantial and unexpectedly beneficial impact on the shock-dependent Phillips curve ratio, whereas exchange rate fluctuations have no meaningful effect. However, the model has poor fit and significant dispersion, implying that further model improvement, maybe with other functional forms or variable transformations, is required to derive more policy-relevant conclusions.

Panel Structural Vector Autoregressive Models Results



Source: Data were processing with E-views[13]

Figure 3: Impulse Response Function (IRF) of the REAL_GDP_GROWTH to a shock-dependent Phillips curve

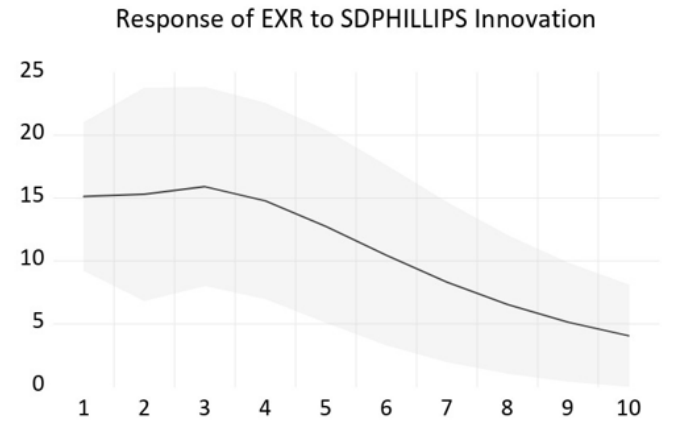
From Figure 3. we can read, Dynamic effects of shock-dependent Phillips curve on economic growth.

Initial Response (Period 1-2)
Real GDP growth responds positively and statistically significantly to the shock-dependent Phillips curve in the short term. The peak occurs around period 2, with a value slightly above 0.3, showing that positive shock-dependent Phillips curve innovation (presumably connected to domestic Phillips curve dynamics, such as inflationary pressure or wage-cost shocks) increases real economic activity at first.

Medium-Term Dynamics (Period 3-6)
The reaction gradually drops but remains positive and generally within the confidence ranges, implying that the effect endures moderately but fades with time.

Long-Term Response (Period 7-10)
The response approaches zero, showing that the innovation's effect on GDP growth fades completely by period 10. Importantly, the confidence interval reduces, reflecting higher precision in longer-term estimates.

Stability and Significance
The absence of a reversal (negative reaction) shows that shock-dependent Phillips curve has no major negative effects on GDP growth in the medium to long term. Because the confidence bands do not contain zero in the early periods, the initial response is statistically significant.



Source: Data were processing with E-views13

Figure 4: Impulse Response Function (IRF) of the Exchange Rate (EXR) to a shock-dependent Phillips curve

From Figure 4. we can read, Dynamic effects of shock-dependent Phillips curve on exchange rate

A positive shock-dependent Phillips curve innovation, which may reflect demand-pull inflation or rising wage pressures, initially increases economic growth—possibly through more consumer spending or reduced real interest rates. However, if inflationary pressures rise or monetary policy responds, the growth effect weakens. This pattern is consistent with New Keynesian models, which show that inflation shocks can boost short-run output due to sticky prices or delayed policy responses while remaining neutral in the long run.

Initial Impact (Periods 1-3)
The exchange rate (EXR) initially rises somewhat before peaking around period 3. This implies that a positive shock to the shock-dependent Phillips curve induces a slight appreciation (or depreciation, depending on EXR coding) of the exchange rate in the short term. The confidence interval (shaded region) is broad, but it does not cover zero in the early periods, implying a potentially significant short-term influence.

Medium- to Long-Term Response (Periods 4-10)
Following the peak at period 3, EXR steadily diminishes across the horizon. By period 10, the effect appears to be decreasing but still positive, indicating a progressive adjustment in exchange rate behavior over time. The decreasing trend suggests that the initial shock has faded, possibly due to mean reversion or monetary policy adjustment.

A shock to the shock-dependent Phillips curve could indicate higher inflationary pressures or inflation expectations. EXR's early positive response could imply capital inflows or interest rate adjustments if central banks hike rates in response to inflation predictions. The ensuing fall could be attributed to a deterioration in trade competitiveness, monetary tightening effects, or lagging inflation passthrough. In the short term, the exchange rate responds positively but moderately to the shock-dependent Phillips curve, then gradually declines. The response is only temporary, implying that such shocks have no long-term consequences. Policymakers in these nations should be

cognizant of EXR's short-term volatility in response to inflation shocks, as well as its long-term corrective path.

Discussion of Results

This study's empirical findings shed light on how shock-dependent inflation dynamics, as reflected by a modified Phillips Curve framework, interact with economic growth and exchange rate behavior in a number of African economies. The application of dynamic panel approaches, such as Panel SVAR and Generalized Linear Models, allows for a more thorough examination of the heterogeneous and state-dependent impacts across countries.

Growth Effects of Shock-Dependent Phillips Curve

The shock-dependent Phillips Curve slope had a negative and statistically significant influence on GDP growth in South Africa, Nigeria, Egypt, and Algeria, highlighting the uneven burden of inflation shocks in structurally rigid countries. In these countries, supply-driven inflation shocks are likely to dominate, resulting in stagflationary dynamics in which inflation rises while output decreases. This is consistent with other findings in the literature, such as Barnichon and Mesters and Rabanal which indicate that inflation is not neutral under supply restrictions [9,31]. In contrast, the lack of significant effects in Ethiopia and Uganda may reflect a mismatch between inflationary pressures and output responses, either due to weak monetary transmission mechanisms or higher degrees of informality in labor markets.

Exchange Rate Responses to Inflation Shocks

The findings also show that exchange rates respond to Phillips Curve shocks, albeit in a highly country-specific manner. South Africa, Nigeria, and Algeria had substantial exchange rate responses, whereas Egypt, Ethiopia, and Uganda did not. These disparities could be ascribed to discrepancies in exchange rate regimes, capital account openness, and central bank confidence. For example, Nigeria's relatively tight currency policy and reliance on oil exports may exacerbate the transmission of inflationary shocks to the exchange rate, consistent with the findings of Forbes et al. and Shambaugh [22, 35].

The Panel SVAR results demonstrate that positive shocks to the Phillips Curve (interpreted as greater inflationary pressure relative to unemployment) result in a short-term increase in real GDP growth. This finding is consistent with the New Keynesian concept that inflation shocks can temporarily boost output via real interest rate effects, particularly underprice stickiness. However, the decreasing influence over time suggests that these benefits will not last and may be reversed if inflation expectations alter or policy measures stabilize the macroeconomic climate [43].

Structural Implications from GLM Results

The GLM results show that real GDP growth has a positive and significant effect on the shock-dependent Phillips Curve slope, which is an unexpected finding that could suggest underlying structural concerns. It implies that periods of economic expansion in these countries may not be accompanied by proportional reductions in unemployment or manageable inflation. This could reflect structural labor market mismatches, productivity deficits, or supply-side barriers that impede inflation control even during expansion periods. Meanwhile, the exchange rate's statistically modest effect on the Phillips Curve ratio demonstrates the limited direct significance of currency changes in determining inflation-unemployment dynamics, at least in the short term [44-47].

Concluding Remarks and Policy Suggestions

Concluding Remarks

This study evaluated the dynamic interplay of inflation, output, and exchange rates in six African economies using a shock-dependent Phillips Curve approach. By allowing the Phillips Curve slope to fluctuate depending on the kind and number of economic shocks, the research caught nonlinear and asymmetric macroeconomic responses that typical linear models frequently miss. The findings show that the inflation-output trade-off is extremely shock-sensitive and context-dependent. Supply-side shocks tend to place greater limitations on economic growth, especially in nations with weak structural foundations or rigid policy frameworks. Furthermore, inflation shocks do not have the same impact on exchange rate dynamics across the area, highlighting the variability of monetary policy regimes and institutional effectiveness. The modest long-term output gains from inflation-induced dynamics emphasize the transient character of any stimulus effect, underscoring the idea that inflation is not a sustainable instrument for growth promotion.

Policy Suggestions

Adopt State-Contingent Monetary Policy Frameworks

Policymakers should realize that the inflation-output link is not linear and tailor policy responses to the underlying type of shock. For example, in environments with poor labor markets or limited production capacity, demand-driven inflation may necessitate a different reaction than supply-driven inflation.

Enhance Supply-Side Capacity to Mitigate Stagflation Risks

In economies whose price rises do not match output growth (e.g., Nigeria, Egypt), structural reforms aiming at increasing productivity, resolving labor market inefficiencies, and enhancing infrastructure are critical to minimizing the inflation-growth trade-off.

Strengthen Monetary Transmission Mechanisms

In countries like Ethiopia and Uganda, where inflation dynamics look isolated from GDP and currency fluctuations, enhancing financial inclusion, broadening capital markets, and increasing central bank credibility might help monetary policy work more effectively.

Implement Exchange Rate Buffering Tools

Given the differing currency rate reactions to inflation shocks, nations with open capital accounts should consider increasing the use of macroprudential measures and reserve management to cushion against volatility and limit external risks.

Improve Inflation Forecasting and Communication

Central banks should invest in high-frequency data systems and convey inflation expectations clearly in order to lead the private sector and anchor inflation in a credible way, particularly when inflation responds asymmetrically to global and domestic shocks.

Promote Regional Cooperation in Macroeconomic Management

Shared vulnerabilities, like as commodity price shocks and climate risks, highlight the importance of collaborative monetary and fiscal frameworks in regional blocs like ECOWAS or COMESA, especially for smaller or more open economies.

Declarations Statement

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Ethics Approval

• This study relies solely on publicly available secondary macroeconomic and sectoral data. There were no human participants or animals involved, so official ethics approval was not necessary.

Conflict of Interest

A. Financial Disclosure

• The author has no financial interests or ties that could have influenced the research.

B. Personal Conflicts of Interest

• The author declares no personal relationships that may have influenced the work.

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• The author has no competing academic or intellectual interests in this study.

D. Institutional Conflicts of Interest

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Authorship and Contribution

• This article was written by a single author. The author designed the study, created the econometric methodology, carried out the empirical analysis, analyzed the findings, and wrote the entire manuscript.

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