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Trade shocks and macroeconomic performance in non-UEMOA countries[1]

Forthcoming: Transnational Corporations Review

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[1] This an improved version of a University of South Africa thesis project that is in the public domain. The first author of the article is the author of the thesis while the second and third authors are the corresponding PhD supervisors.

Abstract

This present study examines how commodity terms of trade (CTOT) influence economic performance in the proposed West African Monetary Zone (WAMZ) or non-UEMOA countries using data from 2000 to 2021. To make the assessment, PVAR, Granger causality and impulse-response functions analyses are employed. The analyses are tailored such that economic performance is viewed in terms of unemployment, inflation, and real output. The following main findings are established. CTOT negatively affect inflation though the effect is not very significant. CTOT shocks positively and negatively affect real output and unemployment, respectively. Policy implications are discussed.

Keywords: terms of trade; economic performance; non-UEMOA
JEL Classification: E51; E52; E58; E59; O55

1.Introduction

The present study which is positioned on assessing how trade shocks influence macroeconomic performance in non-UEMOA countries is motivated along four main constructive lines in the light of extant scholarly and policy literature, notably: (i) debates on the effectiveness of the proposed currency areas, especially in the light of concerns surrounding currency unions that are designed to be robust to external macroeconomic shocks; (ii) the growing importance of the trade in the African Union, especially in the light of the African Continental Free Trade Area (AfCFTA); (iii) debates on the relevance of trade shocks in macroeconomic outcomes and (iv) gaps in the extant literature on the subject. The four fundamental motivational points are expanded in what follows in the same order of chronology as highlighted.

First, in line with the relevant literature, a major concern from the recent global economic and financial crises has been that monetary systems that are not designed to be robust to both internal and external macroeconomic shocks are not likely to succeed (Yildirim, 2022; Olamide et al., 2022). This concern is particularly relevant in potential monetary zones in Africa such as the embryonic West African Monetary Zone (WAMZ) which mainly consists of non-UEMOA countries (Egbuna et al., 2020; Sedegah & Odhiambo, 2021). The underlying concern has motivated a stream of studies on the effectiveness of the potential WAMZ, especially as it pertains to how the potential monetary zone can be affected by external shocks (Sedegah et al., 2024). The present study is concerned with trade shocks in the light recent developments in the African continent for trade integration such as the African Continental Free Trade Area (AfCFTA).

Second, the AfCFTA is anticipated to increase intra-African trade as it currently stands at just about 15% (Tchamyou et al., 2024). The projections are that intra-African trade can increase to about 50% five years after the AfCFTA is set in full motion; a projection that is comparable to other extant levels of intra-regional trade, *inter alia*, North America (48%), Asia (58%) and Europe (67%) (ABM, 2018). More trade in Africa also implies countries in the continent will be more exposed to trade shocks. Accordingly, trade in Africa is influenced by fluctuations in global prices and developing countries have been documented to be vulnerable to terms-of-trade (TOT) volatility (Nchofoung, 2022). In the light of the narrative, *inter alia*, the concern is apparent owing to limited access to international market, weak banking sectors and inefficient capital markets (Alimi & Aflouk, 2017). It follows that TOT volatility can affect the proposed WAMZ in the extant contemporary and non-contemporary developments, especially given that these are small open economies can be vulnerable in the absence of robust structures meant to hedge such attendant risks (Kose & Riezman, 2013; Coudert et al., 2015; Mangadi & Sheen, 2017; Avom et al., 2021).

Third, concerning the relevance of trade in macroeconomic outcomes, it is logical to expect trade shocks to affect macroeconomic performance in the proposed WAMZ not least, because the extant literature is consistent on the significant role of commodity prices and TOT on economic performance (Aizenman et al., 2012; Idrisov et al., 2016; Addison et al., 2016; Chaudhuri & Biswas, 2016; Adler et al., 2018; Sanya, 2020; Cacciatore et al., 2020; Nchofoung, 2022). However, these extant studies have not focused on the proposed WAMZ. It is this gap in the literature this study aims to fill as clearly articulated.

Fourth, borrowing from the contemporary literature on the incidence of oil and trade shocks on macroeconomic outcomes (Nchofoung, 2022, 2024), whereas trade in commodities influence the performance of African economies, how the underlying trade influences macroeconomic performance in the proposed West African Monetary Zone (WAMZ) represents a missing gap in the consider literature which has been extensively surveyed by Sedegah and Odhiambo (2021). Moreover, in the light of the narrative from the underlying literature, various forms of shocks, whether internal or external, must be associated with robust fiscal and monetary policies, in order for the unfavorable consequences of attendant shocks not to be felt by the sampled economies, especially as it pertains to small open economies (Enwereuzoh et al., 2021; Rotimi & Ngalawa, 2017; Asafo-Adjei et al., 2021). In essence, as we shall discuss to elaborate detail in Section 2., the surveyed literature on the effectiveness of

monetary policy in curbing external shocks for macroeconomic performance has recommended studies on how policy makers and scholars can be better informed on how trade shocks influence macroeconomic performance in the proposed WAMZ.

In the light of the above, the two studies that are closest to the present exposition in the extant literature are Nchofoung (2022) and Sedegah and Odhiambo (2021). On the one hand, Nchofoung (2022) has assessed the effect of commodity terms of trade (CTOT) shocks on the resilience of the labour market in sub-Saharan African (SSA) countries, with particular emphasis on the countries in the Franc zone vis-à-vis their non-Franc zone counterparts. On the other hand, Sedegah and Odhiambo (2021) have recently surveyed the extant contemporary and non-contemporary studies on how monetary policy can be effective when employed to mitigate the effects of external shocks on macroeconomic performance of countries in the embryonic monetary zone. Building on these premises, the present study thus, responds to a policy recommendation in Sedegah and Odhiambo (2021) on the relevance of informing policy makers with more studies on how external shocks such as trade shocks affect macroeconomic performance in the proposed WAMZ while at the same time complements Nchofoung (2022) with in the remit of the proposed WAMZ. Hence, it follows that the distinguishing features between the present study and Nchofoung (2022) are self-evident, especially as it pertains to inter alia: (i) the scope of the study (i.e., SSA versus non-UEMOA countries) and (ii) focus of study (i.e., the incidence of commodity terms of trade (CTOT) shocks on the labour market resilience versus the impact of TOT shocks on macroeconomic performance in terms of unemployment, real output, and inflation).

In the light of the above, the main contribution of this study to the extant literature is to assess how trade shocks affect macroeconomic performance in non-UEMOA countries and thus, proposed policy initiatives that can be considered by policy makers in view of understanding how unfavorable effects of CTOT on macroeconomic performance can be better forecasted and managed. The remainder of the study is organized as follows. Section 2 discusses the extant literature and the corresponding theoretical underpinnings whereas the data and methodology are covered in Section 3. The empirical results and corresponding robustness checks, including the discussion of empirical results are covered in Section 4 whereas the last section concludes with implications and future research directions.

2. Theoretical underpinnings and literature review

2.1 Theoretical underpinnings

The theoretical underpinnings on the linkage between trade shocks and macroeconomic performance are consistent with extant literature on the importance of trade shocks in macroeconomic dynamics (Nchofoung, 2022). According to the narrative, the theoretical framework is consistent with the Dutch disease hypothesis and thus, is in line with a situation in which resources and/or commodities boom engender an appreciation on the exchange and by extension, a reduction in the competitiveness of the manufacturing sector which ultimately has implications on real output, inflation and unemployment. It also relevant to articulate that, as maintained by Krugman (1987), the notion of Dutch disease is only apparent if the domestic economy fails to recover after the commodity boom.

The underlying theoretical premise is consistent with the present study because commodity terms of trade is used as the main independent variable of interest. Moreover, macroeconomic performance is directly related to unemployment, inflation, and real output (Sedegah et al., 2024). Accordingly, the Dutch disease underpinnings, commodity-rich countries in the presence of commodity booms can engender an improvement in commodity revenues and hence, engendering de-industrialisation externalities that are associated with the economic performance indicators used in the present study, namely: unemployment, inflation, and real output. Hence, along the same theoretical lines, CTOT shocks are conceived in this study are expected to affect macroeconomic performance proxies within the framework of unemployment, inflation, and real output. The underlying theoretical framework is consistent with dynamics observed in small open economies within West Africa, especially as it pertains to their reliance on natural resources and export of commodities in international trade.

2.2 Literature review

The empirical literature can be discussed in three main strands, specially as it pertains to, non-contemporary literature studies, contemporary studies and non-UEMOA centric literature. These three strands are covered in the same chronology as highlighted.

In the first stand on non-contemporary studies or studies that are more than a decade old for the most part, it has been argued by Broda and Tille (2003) that nations that are characterized by exchange rate regimes that are flexible are equally more likely to resist to TOT shocks when compared to nations that have adopted a fixed exchange rate regime instead (Nchofoung, 2022). It has also been established by Cashin et al. (2004) that from the perspective of duration of TOT shock, the underlying shocks are short-lived in almost half of countries in sub-Saharan Africa. This is almost consistent with Zeev et al. (2017) who have argued that CTOT that are improved by news account for about 50% of variations in output in economies that are emerging. According to Broda (2004), a significant role is played by TOT in accounting for fluctuations in business cycles in the countries that are characterized by exchange rate regimes that are fixed. Moreover, it has been argued by Lubik and Teo (2005) that compared TOT shocks, in small open economies, shocks from interest rate elucidate fluctuations in business cycles more.

Within this same non-contemporary strand of studies, Kose (2002) and Mendoza (1995) are some authoritative studies that support the perspective that TOT is fundamentally significant in eliciting economic variations in both developing and poor nations. It is observed by Mendoza (1995) that TOT movement clarify many fluctuations in exchange rate and output and hence, according to the author, TOT responses to economic aggregates varies from when such variations are motivated by other forms of shocks. The results of Kose (2002) are similar to those of Mendoza (1995) after the former employed a model that is more relevant to developing nations. Furthermore, Kose and Riezman (2013) examine the impact of TOT in sub-Saharan Africa to establish that shocks in trade account for approximately 50% of output volatility in the sampled countries. Furthermore, such shocks can explain recessions that are prolonged

especially via their incidence on aggregate investment. According to Couharde et al. (2013), inter-country variations can be explained by heterogeneities in both persistence in inflation and patterns of specialization, given that real exchange rate for the most part, in countries using the Franc CFA, revert to equilibrium whereas for other countries in sub-Saharan Africa, corresponding adjustments are driven by exchange rates that are nominal.

In the second strand on contemporary studies or the literature that is less than a decade old for the most part, it is argued by Ngouhouo and Nchofoung (2021) that most countries in SSA are characterized by fragility. Moreover, according to the authors, from a comparative perspective, countries within the Franc CFA zone have developed less resilient policies compared to their counterparts that are not using the Franc CFA. Kassouri and Altıntaş (2020) have examined the nexus between CTOT and dynamics in real effective exchange rate in Africa to come to the conclusion that: (i) the response of the latter to the former is asymmetric, (ii) the underlying asymmetric responses are contingent on subgroup and are more relevant to countries exporting energy and (iii) exporting subgroups that are concerned with commodities entailing metal and energy are the most that are exposed to the appreciation of real exchange rate in the long term relative to countries which are more focused on the export of commodities that are soft such as beverage, food and agricultural commodities. Okoyeuzu et al. (2023) have more recently examined that incidence of trade shock on inflation, unemployment and inequality in sub-Saharan Africa to establish strong nexuses among inflation, unemployment, inequality and trade. According to the authors, trade gains are elusive in the sub-region and they recommend a rethinking of the trade engagement, restructuring of economies and engagements of strategic nature with partners that are more favorable to trade gain optimization.

Within the same remit of the second strand, Mensah (2023) focus on intra-Africa co-movements in trade and transmission of shocks in the light of the AfCFTA to establish that varying co-movements in trade as well as spillovers from trade shocks in the continent are apparent, with trade co-movements more dominants between Southern and Middle regions of Africa. Moreover, while the evidence of trade shock transmissions is apparent in all four sampled sub-regions, the biggest receiver of trade shock in the Western African region compared to the Southern African region which is the largest contributor to such trade shocks. It follows that trading in the sampled regions in the light of the AfCFTA affects various regions differently and hence, understanding how such CTOT further influence economic performance, as understood within the remit of the present study is worthwhile. In another study, Da and Diarra (2023) examined the impact of international commodity price shocks on Africa's public finance to find that government income as well as other relevant expenditure from the government are sensitive to shocks in the price of commodities. It is also apparent from the findings that for countries that are highly dependent on the extractive industry, relative to those that are more reliant on the agricultural sector, the underlying sensitivity is higher. Furthermore, macroeconomic stability and accommodation of attendant shocks are more apparent in the presence of flexible exchange rate regimes, which ultimately contribute to more mobilization of government income. The authors recommend African governments to leverage on price booms and engage in productive investments that can help isolate public finances from negative shocks when the price of commodities collapses.

In the third stand on contemporary literature that is more focused on the WAMZ or non-UEMOA countries, the corresponding literature has been aptly surveyed by Sedegah and Odhiambo (2021) who have proposed a number of recommendations for future research, *inter alia*, to understand of how external shocks influence economic performance in the sampled region using more updated data. Hence, in addition to the elements of motivation discussed in the introduction, this study is also positioned as a response to the underlying need for more studies on the subject.

3. Data and methodology

3.1 Data

Due to data shortages in two countries—Cape Verde and Guinea-Bissau—the current study focuses on six non-UEMOA nations rather than on the original eight. The chosen periodicity, which spans from 2000 to 2021, is also dependent on the availability of data at the study's time. The rationale for the nations chosen and the frequency of adoption align with Sedegah et al. (2024). Thus, the Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone are the nations included in the sample. It is important to note that the majority of the countries in the planned West African Monetary Zone (WAMZ) are represented by the sampling countries. As a result, the WAMZ—which excludes Cape Verde and Guinea-Bissau for previously mentioned reasons—is a representation of the Economic Community of West African States (ECOWAS), without the UEMOA, which is composed of French-speaking nations that already share a common currency.

Three primary outcome variables are used to proxy for economic performance in accordance with the study's motivating aspects and the narrative presented in Section 2. This approach is consistent with recent research on non-UEMOA nations (Sedegah et al., 2024). Three factors that are reliant on each other are real GDP, unemployment, and inflation. Furthermore, these outcome variables' selection as proxies for economic performance is consistent with the body of research on the relationships between monetary policy, macroeconomic outcomes, and external shocks (Olomola & Adejumo, 2006; Lorenzoni, 2009; Omisakin, 2008; Chileshe et al., 2018). It is therefore important to note that Lorenzoni (2009) clearly stated that the three outcome variables employed in this study are extremely sensitive to external shocks, such as the shock to the price of oil, which serves as the study's primary independent variable of interest.

Commodity terms of trade (CTOT) shock is the primary external shock employed as the independent variable of interest, in line with aspects of the rationale and the narrative in Section 2. Furthermore, while the Hodrick–Prescott (HP) time-series filter (Hodrick & Prescott, 1997) is used in modern literature (Nchofoung, 2024) to extract the shock; however, the PVAR approach used in this study automatically captures the CTOT shock, in part, because the shock is interpreted as an innovation in CTOT. Furthermore, the existing body of research on the connections between external shocks and macroeconomic performance supports the use of the price of crude oil and CTOT as proxies for external shocks (Chowla et al., 2014; Asongu et al., 2017; Shobande et al., 2019; Sedegah & Odhiambo, 2021; Nchofoung, 2022).

The study considers several control factors in order to prevent variable omission. These control variables are: exchange rate, interest rate, bank credit, and total reserves, all of which have been shown in the body of existing literature to have an impact on economic performance (Olomola & Adejumo, 2006; Philip & Akintoye, 2006; Raddatz, 2007; Lorenzoni, 2009; Asongu et al., 2017; Sedegah & Odhiambo, 2021; Sedegah et al., 2024). These control variables are shown as outcome variables in the presentation of results since they are also part of the system of equations in the modeling exercise. As a result, they are individually impacted by all of the system's variables as independent variables of interest. Though the system of results is also published with the intention of providing all findings connected to the multivariate system for robustness purposes, only the findings that are directly related to the problem statement are relevant to policy makers consistent with the study's motivation. Also, because the macroeconomic factors include both positive and negative macroeconomic signals, it is challenging to determine how these particular control variables specifically affect the outcome variables. One way to conceptualize macroeconomic signals is as follows: real GDP per capita is considered a good signal, but unemployment and inflation are considered negative signals. Additionally, as shown by the IRF (impulse response function) analyses that follow, the predicted indications might be time-dependent and dependent on business cycles.

Appendix 1, Appendix 2 and Appendix 3 respectively disclose, the definitions of variables and the corresponding sources, the summary statistics and correlation matrix. Appendix 2 informs

the study as to whether mean values are comparable or not in order to avoid variables with disparity in terms of units compared. Moreover, the correlation matrix is used to inform the study as to whether concerns pertaining to multicollinearity as apparent, not least, because variables with a high degree of substitution should not be involved in the same specification.

3.2 Methodology

The analytical strategy adopted in the study builds on recent studies focusing on the effect of macroeconomic shocks on economic development outcomes (Fotio et al., 2022; Nchofoung, 2022, 2024). In the essence, the extant contemporary studies have adopted the panel vector autoregression (PVAR) estimation strategy within the framework of Abrigo and Love (2016). It follows that the PVAR estimation approach in relevant in assessing the importance of trade shocks in macroeconomic outcomes. The underlying model can be specified as follows in Equation (1):

$$EP_{it} = \beta_0 + \beta_1 < TOT\_shock_{it} + \beta_j X_{it} + v_i + \varepsilon_{it}, i \neq j \quad (1)$$

Where, the dependent variable, EP which reflects Economic Performance encompasses real GDP output, inflation and unemployment, β_k entails the parameters that are to be estimated, TOT_shock is the commodity terms of trade (TOT) shock, X denotes a vector of control variables at time t and for country i (i.e., total reserves, interest rates, bank credit and exchange rate), v_i shows the country fixed effects, and ε_{it} relects the stochastic error term.

Following recent studies on the importance of external shocks on macroeconomic development (Nchofoung, 2022, 2024), a primary condition for the implementation of the PVAR empirical strategy is a unit root test. According to the narrative, the Pesaran (2007) unit root test is adopted because it is a second-generation panel unit test that does not assume cross sectional independence. Accordingly, cross sectional independence is highly unlikely because the considered countries are exposed to similar international trade shocks.

According to the related unit root tests, which are presented in Table 1, four variables—bank credit, real output, inflation, interest rate, and total reserves—are stationary in level, whereas three variables—oil price, exchange, and unemployment—are stationary in first difference. All variables must be stationary at least in first difference in order to use the PVAR model (Traoré & Asongu, 2023; Nchofoung, 2024).

Table 1: Units root tests

Variables	Persaran (2007)			
	Level	P Value	difference	Pvalue
Inflation	-2.423	(0.008)		
Oil price	-0.0024	(0.894)	10.321	(0.000)
Exchang rate	-0.0994	(0.801)	-2.013	(0.022)
Interest rate	-3.296	(0.000)		
Unemployment	-1.003	(0.673	-3.054	(0.001)
Bank credit	-2.413	(0.008)		
Real output	-3.248	(0.001)		
Total reserves	-1.516	(0.065)		

In light of the aforementioned, the Abrigo and Love (2016) perspective on PVAR is based on the GMM approach in order to account for potential endogeneity issues in the model. Consequently, the impulse-response function (IRF) is the sole structural element of the PVAR technique (Nchofoung, 2024). The IRF sets all shocks to zero and describes how one indication reacts when a shock is visible in another variable in the system (Love & Zicchino, 2006; Miamo

& Achuo, 2016). Furthermore, for the IRFs, confidence intervals derived from Monte Carlo simulations are revealed. This approach is in line with the body of existing African-centric research on trade shocks (Nchofoung, 2022) and oil price shocks (Miamo & Achuo, 2022; Nchofoung, 2024). In line with previous research (Muinelo-Gallo et al., 2020; Traoré & Asongu, 2023), it is imperative to clarify that the PVAR estimation approach is applicable in both scenarios where N>T and T>N. Furthermore, as per the related research, the benefit of the estimation method also stems from the fact that the estimation technique is frequently used in scenarios involving dynamic empirical evaluations. The estimation approach can, in essence, be used in events where T>N because the methodology used in this study, PVAR, is essentially an extension of the classic VAR estimation approach by Love and Zicchino (2006), which is specifically designed to combine the classic VAR estimation approach by taking into account a system of indicators that are both endogenous and interdependent. Accordingly, there is a growing strand of literature employing PVAR when T is higher than N (Abid & Rault, 2021; Chen et al., 2022; Aslan & Acikgoz, 2023), not least, because the condition of the T<N as a constraint in PVAR is only relevant when the GMM style is employed in the PVAR estimation. Accordingly, the GMM style is not employed in the present study in the estimation.

In the light of the above, the fundamental methodology takes into consideration both individual and temporal variability, enabling the determination of causal relationships (Canova & Ciccarelli, 2013; Muinelo-Gallo et al., 2020). It follows that the unobserved heterogeneity dimension of endogeneity is taken into account by the underlying estimation technique. Moreover, the estimation methodology is designed in a way that assumes the variables under consideration to be endogenous. Therefore, the estimation strategy is also designed to take endogeneity's simultaneity or reverse causality issues into consideration. Last but not least, as per Grossmann et al. (2014), the estimation technique makes use of the dataset's cross-sectional and time series properties, leading to more reliable results.

4. Empirical results

This section comprises three main sub-sections that present the empirical results. Section 4.1 focuses on the relationships between CTOT shock and inflation, Section 4.2 links CTOT shock with real output, and Section 4.3 connects CTOT shock with unemployment. The elements of style used in the reporting of results are in line with the accompanying literature. Specifically, the empirical results of the PVAR are presented first, and then a number of robustness checks are performed, such as the Granger causality test, the impulse-responses analysis of the baseline model and the IFRs analysis when total reserves are included, and the PVAR stability tests (Muinelo-Gallo et al., 2020; Traoré & Asongu, 2023; Nchofoung, 2024).

Before discussing the aforementioned in the same chronological sequence, it is important to highlight that the underlying research that motivated the publication of these findings concentrated on the connections between macroeconomic outputs and shocks or uncertainty (Muinelo-Gallo et al., 2020; Traoré & Asongu, 2023; Nchofoung, 2024). Furthermore, the fact that an ideal lag selection procedure forms the basis of the modeling exercise of the numerous PVAR estimations must be emphasized. Furthermore, the previous discussion of unit root tests as the foundation for the PVAR's implementation is in line with the body of current research on the topic (Traoré & Asongu, 2023). To provide some context, Appendix 4 uncovers the optimum lag selection for the modeling exercise in Section 4.1, and Appendices 5 and 6, respectively, provide the ideal lag selection criteria for the corresponding modeling approaches in Sections 4.2 and 4.3. Lags that minimize the Akaike Information Criterion (AIC) are the ideal lags utilized in the corresponding models. Hence, based on the AIC, four lags are optimal for respective models.

4.1 Terms of trade shock and inflation

The PVAR findings on the nexus between terms of trade shock and inflation are provided in Table 2. From the corresponding findings, inflation is negatively influenced by exchange rate and interest rate while the effects of TOT and bank credit are not significant. In the second column, interest rate and bank credit positively influence TOT whereas the incidences of inflation and exchange are not negatively and positively significant, respectively. In the third specification column, all the variables (i.e., inflation, TOT, exchange rate and bank credit) negatively affect the interest rate. This tendency is also apparent in the fourth specification column where all the variables (i.e., inflation, TOT, interest rate and bank credit) negatively influence exchange rate. In the last specification column, TOT and exchange rate positively affect bank credit whereas the incidences of inflation and interest rate are not positively significant. Moreover, the instruments for the five specifications are also valid because the Hansen test is not overwhelmingly validated in all corresponding specifications. It is important to note that the null hypothesis of the Hansen test is the position that the instruments are valid.

In line with the highlighted elements of style used in presenting the findings, the corresponding results are further discussed within a robustness framework and the corresponding post-estimation diagnostic tests are: (i) the Granger causality tests; (ii) the baseline IRFs and corresponding/extended IRFs in which total reserves are included and (iii) the PVAR stability tests. The highlighted robustness checks are discussed in the same chronology as highlighted.

Table 2: PVAR mode on CTOT shocks and inflation

VARIABLES	Inflation	Terms of trade	Interest rate	Exchange rate	Bank credit
L.Inflation	0.974***	-0.0282	-2.342***	-0.0489**	0.278
	(0.0159)	(0.0303)	(0.539)	(0.0214)	(0.267)
L.Terms of trade	-0.342	0.830**	-27.90***	-0.903***	9.295***
	(0.345)	(0.407)	(3.858)	(0.325)	(1.687)
L.Interest rate	-0.00559*	0.00898*	0.228***	-0.0122***	0.0549
	(0.00294)	(0.00506)	(0.0643)	(0.00434)	(0.0451)
L.Exchange rate	-0.814***	0.477	-17.89***	-0.0405	9.239***
	(0.280)	(0.349)	(3.836)	(0.294)	(2.484)

L.Bank credit	-0.0151	0.0338*	-0.730***	-0.0454***	1.000***
	(0.00978)	(0.0193)	(0.208)	(0.0132)	(0.0656)
Hansen's P_va	0.637	0.638	0.639	0.640	0.641
Observations	64	64	64	64	64

*** p < 0.01, ** p < 0.05 & * p < 0.1.

First, following recent literature on how macroeconomic shocks affect economic development prospects (Muinelo-Gallo et al., 2020), it is worthwhile for PVAR results to be complemented with Granger causality in order for the underlying effects established in corresponding PVAR results to be considered as causal. The Granger causality test results provided in Table 3 show that inflation is significantly caused by CTOT, exchange and bank credit while the effect of interest rate is not significant. Moreover, the overall causality of the system shows that when all the variables are taken together within a system, they collectively Granger cause inflation.

The underlying causalities are apparent in view of the perspective that previous variations in one indication affect potential changes in the values of other indicators (Granger, 1969). Note should be taken of the perspective that the null hypothesis of the corresponding test argues for the position that past variations in one variable do not affect variations of the other variables. It follows that while CTOT shocks do not significantly influence inflation in the PVAR results, they are significantly causal from the Granger causality findings apparent in Table 3. It is also worthwhile to note that the Granger causality test does not provide evidence on the direction of causality and thus, in order to assess the time-dynamic direction of causality, IRFs are worthwhile.

Table 3: Granger causality tests

Equation \ Excluded	chi2	df	Prob>chi2
Inflation			
Terms of trade does not Granger-cause Inflation (H0)	3.585*	1	0.058
Interest rate does not Granger-cause Inflation (H0)	2.702	1	0.100
Exchange rate does not Granger-cause Inflation (H0)	12.264***	1	0.000
Bank credit does not Granger-cause Inflation (H0)	2.943*	1	0.086
All do not Granger-cause Inflation (H0)	26.263***	4	0.000

The null hypothesis (i.e. H0) is that the excluded variable does not Granger-cause Inflation while the
alternative hypothesis (i.e., H1) is that the excluded variable Granger-cause Inflation. *** p < 0.01, ** p < 0.05 & * p < 0.1.

Second, still building on the relevant PVAR literature (Traoré & Asongu, 2023), the purpose of IRFs to the articulate dynamics of the dependent variables in the advent of an impulse or a shock in other variables within the system. According to the narrative, the system is multidimensional and not understood from a bidirectional perspective as in a strand of the corresponding literature (e.g., Asongu, 2016). It follows that the system is tailored such that inflation and TOT shocks do not interact exclusively in isolation, not least, because such interaction is also contingent on other variables within an economic system. The corresponding IRFs simulations are for a 10-year period, consistent with the relevant literature (Traoré & Asongu, 2023). Moreover, as argued by Sims (1992), the introduction of such IRFs is essential to assess the robustness of a system.

In the light of the above as well as on the positioning of the problem statement, the Choleski decomposition of the PVAR model is consistent with the ordering: (i) inflation, (ii) CTOT shock. It follows that the attendant IRFs relevant to this study are computed in terms of a response of inflation to CTOT shocks. As apparent in Figures 1 and 2, the dotted lines show two standard deviations bands that are essential to articulate the IRF significance (Agénor et al., 1997). Accordingly, while only the

response of inflation to CTOT shocks is relevant to the present exposition, the IRFs graphs corresponding to the other correlation pairs in the system are also disclosed essentially for the robustness purposes, in line with extant contemporary PVAR and IRFs literature (Traoré & Asongu, 2023; Nchofoung, 2024). In Figure 1, a positive shock in CTOT positively affects inflation during the first-four years before the effects dissipates from the 5th year. When total reserves are added to the equation as it is apparent in Figure 2, a positive shock in CTOT significantly increases inflation in the first-two years before a slight decrease in the third and fourth years, after which there is a steady increase from the 5th year to the 10th year.

Figure 1: IRFs for CTOT shocks and inflation

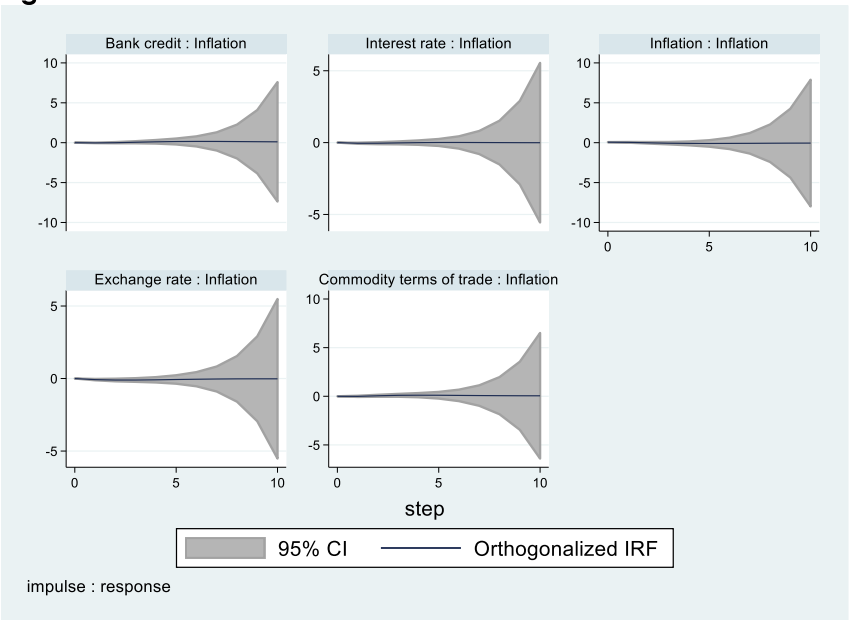
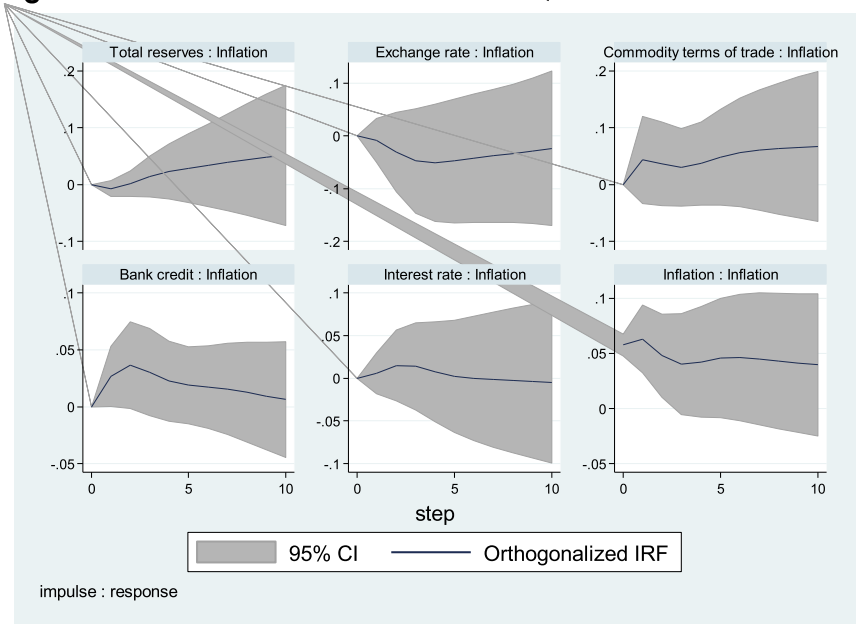
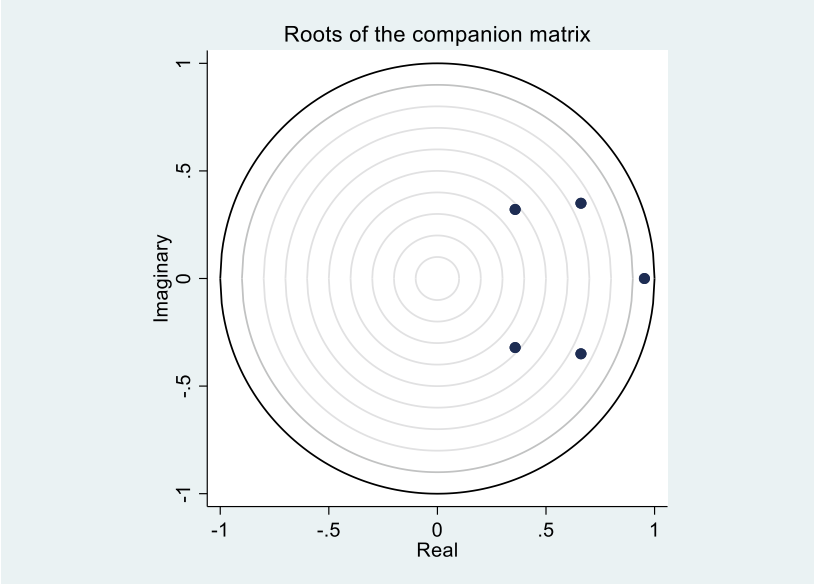


Figure 2: IRFs for CTOT shocks and inflation, with the inclusion of total reserves



Third, the robustness of the PVAR findings can be further assessed using the model stability test proposed by Abrigo and Love (2016) which has also been employed in the extant contemporary PVAR literature (Traoré & Asongu, 2023; Nchofoung, 2024). The information criterion for the stability of the PVAR model is that all eigenvalues should be in a unit circle. This is the case in Figure 3 because all eigenvalues are situated the unit circle of Figure 3, thus confirming the stability of the PVAR model in Table 2.

Figure 3: Model stability test for CTOT shocks and inflation



4.2 Terms of trade shocks and real output

This section presents a PVAR results corresponding to the nexus between CTOT shocks and real output. Table 4, which illustrate the PVAR results shows that all variables in the system (i.e., CTOT shocks, interest rate, exchange rate and bank credit), positively influence real output. It follows that CTOT shocks positively affect real output. Looking at the second specification or third column of Table 4, it is apparent that interest rate and exchange rate positively affect CTOT whereas the effects of real output and bank credit are not negatively and positively significant, respectively. In the fourth column or third specification: (i) CTOT (exchange rate) positively (negatively) affect interest rates and (ii) the effects of bank credit and real output are not positively and negatively significant. Interest rate and bank credit negatively influence exchange rate in the penultimate column whereas the incidences of the remaining indicators are not significant. It is important to note that the Hansen test for the validity of instruments is consistently not significant in all regressions, showing the relevance for the corresponding null hypothesis which argues for the validity of the instruments.

Table 4: PVAR results CTOT shocks and real output

	(1)	(2)	(3)	(4)	(5)
Variables	Real ouput	Terms of Trade	Interest rate	Exchange rate	Bank credit
L.Real output	0.136	-0.00207	-0.0281	-0.000792	0.0267
	(0.0867)	(0.00221)	(0.0256)	(0.00114)	(0.0276)
L.Terms of Trade	26.75***	0.844***	10.40***	0.00932	-3.454**
	(5.954)	(0.208)	(2.814)	(0.151)	(1.739)
L.interest rate	0.932***	0.0117**	0.804***	-0.00629***	0.00576
	(0.170)	(0.00467)	(0.110)	(0.00216)	(0.0504)
L.Exchange rate	34.33***	0.578*	-5.548***	0.0377	10.04***
	(6.381)	(0.316)	(1.875)	(0.206)	(2.019)
L.Bank credit	1.667***	0.0358	0.277	-0.0206***	0.914***
	(0.465)	(0.0232)	(0.186)	(0.00555)	(0.126)
Observations	69	69	69	69	69
Hansen_p-value	0.582	0.582	0.582	0.582	0.582

*** p < 0.01, ** p < 0.05 & * p < 0.1.

In accordance with previously adopted elements of style, as apparent in Table 5, the Granger causality test results show that all the variables in the system, independently and collectively Granger cause real output. It follows that the established nexuses in the PVAR in Table 4 can be extended to causality in Table 5. Thus, concerning the specific problem statement in this study, CTOT Granger cause real output.

Concerning the IRFs, while the response of real output is not very apparent in Figure 4 when total reserves are not included, in Figure 5, a positive shock in CTOT first increases output in the first-two years before a consistent decrease in real output up to the fifth year (with real output becoming negative from the fourth year). After the 5th year, there is a steady increase upto the 8th year in which real output becomes positive again before subsequent slight decrease from the 8th to the 10th year. Moreover, as apparent in Figure 6 on the model stability of the PVAR estimation in Table 4, the estimated model is overwhelmingly stable, not least, because the corresponding eigenvalues are situated in the unit circle.

Table 5: Granger test for CTOT shocks and real output

Equation \ Excluded	chi2	df	Prob>chi2
Real Output			
Terms of trade does not Granger-cause Real Output (H0)	20.184***	1	0.000
Interest rate does not Granger-cause Real Output (H0)	29.931***	1	0.000
Exchange rate does not Granger-cause Real Output (H0)	28.943***	1	0.000
Bank credit does not Granger-cause Real Output (H0)	12.865***	1	0.000
All do not Granger-cause Real Output (H0)	59.191***	4	0.000

The null hypothesis (i.e. H0) is that the excluded variable does not Granger-cause Inflation while the
alternative hypothesis (i.e., H1) is that the excluded variable Granger-cause Real Output. *** p < 0.01, ** p < 0.05 & * p < 0.1.

Figure 4: IRFs for CTOT shocks and real output

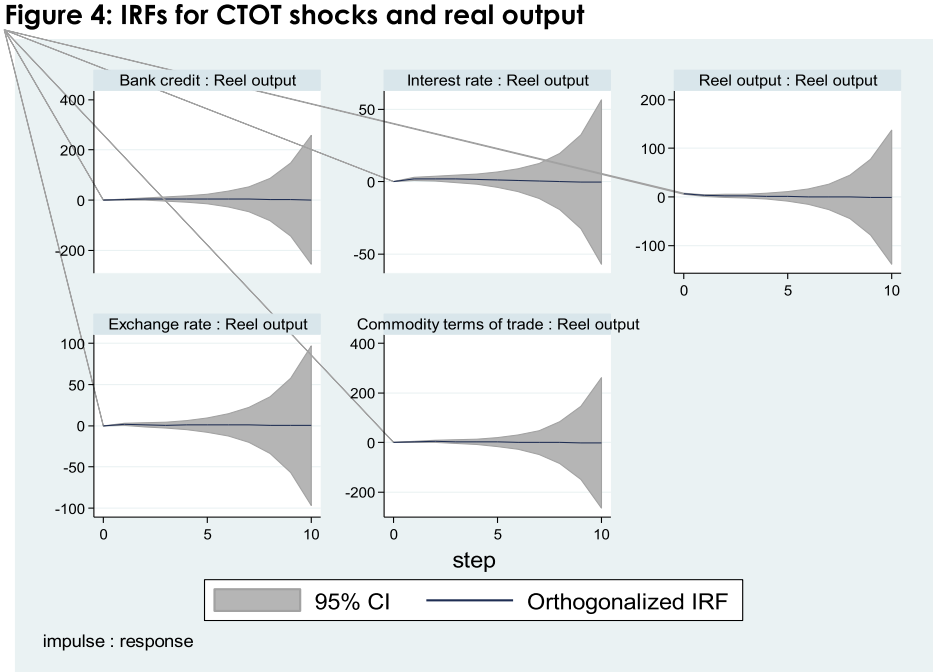


Figure 5: IRFs for CTOT shocks and real output, with the inclusion of total reserves

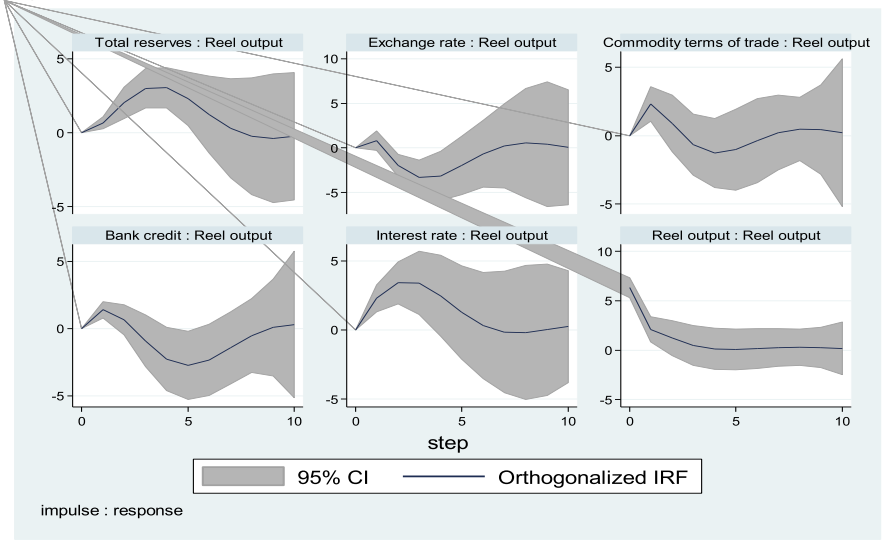
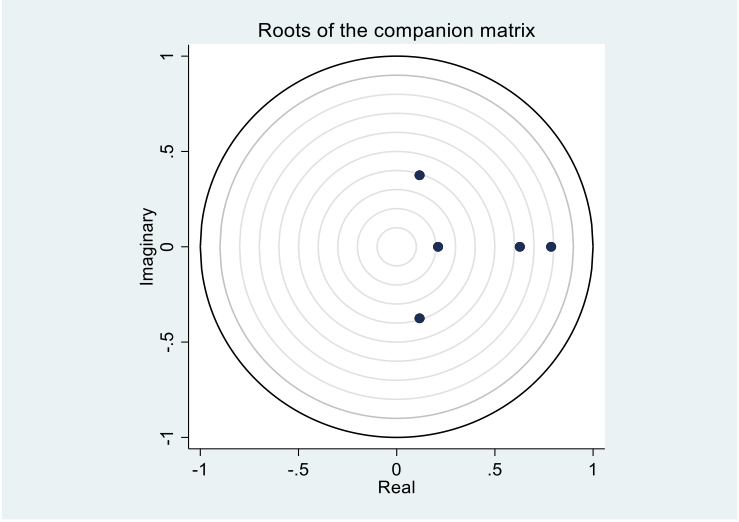


Figure 6: Model stability test for CTOT shocks and real output



4.3 Terms of trade shocks and unemployment

The linkages between CTOT shocks and unemployment are covered in this section. As previously considered in Sections 4.1 and 4.2, the PVAR findings are first disclosed, followed by a series of robustness checks, especially as it pertains to Granger causality test, IRFs and the stability test of the model. Table 7 shows the findings of the PVAR model. The following findings are apparent in the following table: (i) CTOT shock negatively affects unemployment. Moreover, the remaining variables (i.e., interest rate, exchange rate and bank credit) also negatively impact unemployment. (ii) In the second specification or third column in the corresponding table, unemployment negatively influences CTOT while the remaining indicators do not have a significant influence on CTOT. (iii) CTOT and bank credit positively affect interest rate while the effect of unemployment and exchange are not positively and negatively significant, respectively. (iv) Unemployment positively impacts exchange rate while the remining variables in the system do not have significant effects on the exchange rate. (v) In the last-column, corresponding to the last specification, bank credit is not significantly affected by any of the variables. It is important to articulate that the Hansen test employed to assess the validity of the instruments, confirms the validity of the considered instruments, not least because the null hypotheses of the Hansen test are not rejected, overwhelmingly.

Table 7: PVAR results for CTOT shocks and unemployment

VARIABLES	Unemployment	Terms of trade	Interest rate	Exchange rate	Bank credit
L.Unemployment	0.130	-1.182**	2.202	0.456***	3.833
	(0.118)	(0.597)	(2.399)	(0.102)	(2.689)
L.Terms of trade	-0.386***	0.298	6.785***	-0.0177	1.700
	(0.0886)	(0.186)	(2.207)	(0.112)	(2.323)
L.Interest rate	-0.00592**	0.00508	0.831***	-0.00343	-0.00681
	(0.00243)	(0.00504)	(0.134)	(0.00284)	(0.0487)
L.Exchange rate	-0.401***	-0.126	-3.412	0.471***	2.482
	(0.109)	(0.240)	(2.429)	(0.108)	(2.365)
L.Bank credit	-0.0308***	-0.00508	0.645***	-0.00395	0.876***
	(0.00554)	(0.0186)	(0.132)	(0.00758)	(0.143)
Hansen's P_va	0.934	0.935	0.936	0.937	0.938
Observations	69	69	69	69	69

*** p < 0.01, ** p < 0.05 & * p < 0.1.

Table 8: Granger test results for CTOT shocks and unemployment

Equation \ Excluded	chi2	df	Prob>chi2
Unemployment			
Terms of trade does not Granger-cause Unemployment (H0)	30.032***	1	0.000
Interest rate does not Granger-cause Unemployment (H0)	22.937***	1	0.000
Exchange rate does not Granger-cause Unemployment (H0)	37.879***	1	0.000
Bank credit does not Granger-cause Unemployment (H0)	13.943***	1	0.000
All do not Granger-cause Unemployment (H0)	65.916***	4	0.000

The null hypothesis (i.e. H0) is that the excluded variable does not Granger-cause Inflation while the
alternative hypothesis (i.e., H1) is that the excluded variable Granger-cause Unemployment.
*** p < 0.01, ** p < 0.05 & * p < 0.1.

In line with the narrative on the previous tables, as shown in Table 8, the Granger causality test findings confirm that the previous findings are causal, especially as it pertains to the CTOT shocks negatively affecting unemployment. Moreover, the other variables in the system significantly Granger cause unemployment. It follows that CTOT independently and collectively Granger cause unemployment. This is essentially because the test for combined Granger causality is also significant, hence, shown that all variables in the system Granger cause the outcome of unemployment.

The IRFs findings shown in Figure 7 and Figure 8 are respectively concerned with the baseline impulse-responses without the total reserves and extended impulse-responses for which total reserves are included in the model. From Figure 1, it is apparent that a positive shock in CTOT induces a negative effect on unemployment in the first year, but small slight improvements up to the fifth year and then stabilization till the 10th year. With respect to Figure 8, a positive CTOT shock induces a slight reduction in unemployment in first year before a slight increase of unemployment in a second year, after which there is a consistent decrease in the unemployment till the 10th period. This is broadly consistent with the PVAR results in Table 7 showing that CTOT shocks negatively affect unemployment. Furthermore, as is shown in Figure 9, the PVAR model stability results show that the PVAR results disclosed in Table 7 are stable. This is essentially because the attendant eigenvalues are situated in the unit circle.

Figure 7: IRFs for CTOT shocks and unemployment

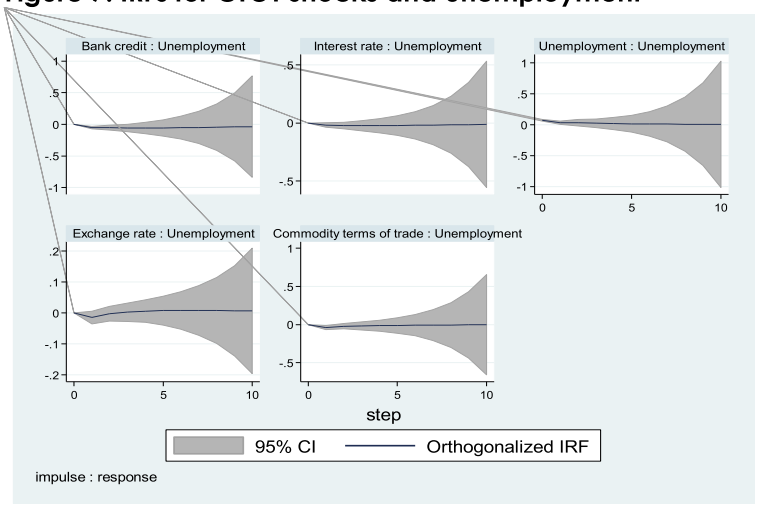


Figure 8: IRFs for CTOT shocks and unemployment, with the inclusion of total reserves

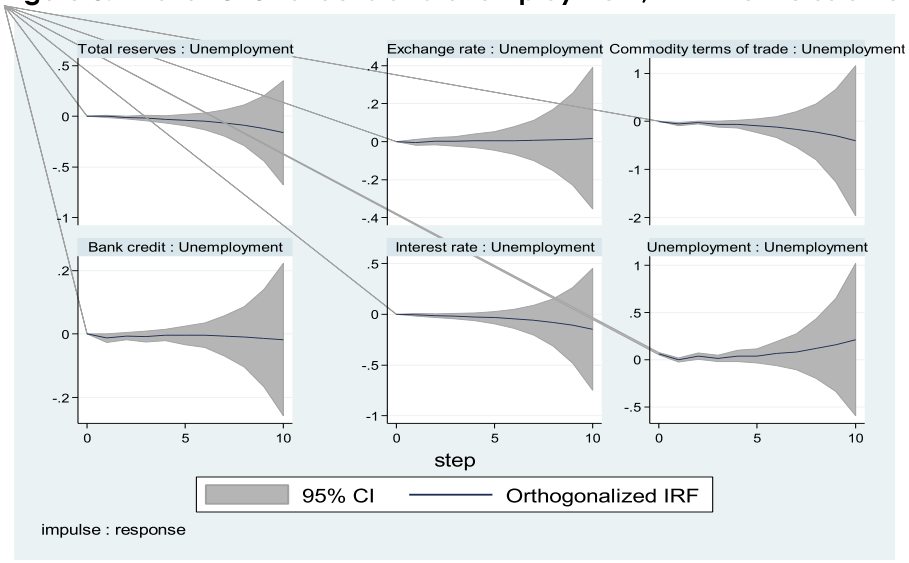
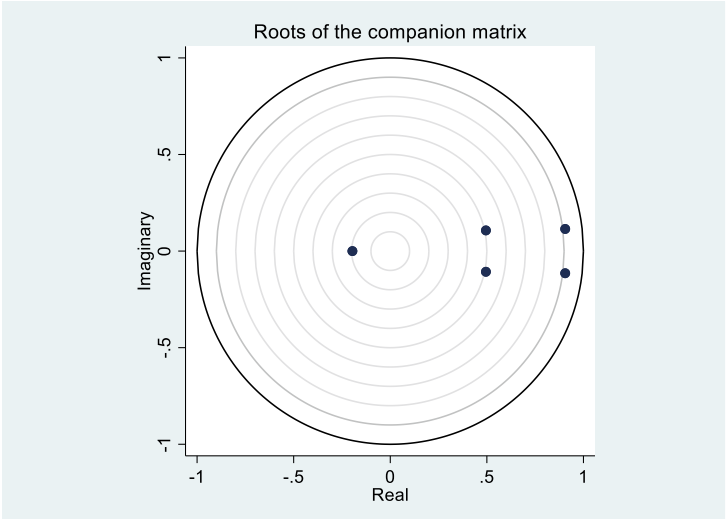


Figure 9: Model stability test for CTOT shocks and unemployment



4.4 Further discussion of results

Prior to further discussing the results in the light of extant literature on the subject, it is important to recall that the main findings, contingent on time, are as follows: (i) CTOT shocks negatively affect inflation though the effect is not very significant and (ii) CTOT shocks positively and negatively affect real output and unemployment, respectively. The findings are consistent with the relevant literature, not least, because TOT has been established to be ambiguous from a theoretical standpoint and thus, inconclusive findings can also be apparent. Accordingly, depending on whether the CTOT shock is positive or negative, the findings can either be consistent with the extant literature or not. It is important to recall that the TOT refers to the ratio of an export price index to an import price index (Singh, 2023). Moreover, according to the narrative, a consistent enhancement of TOT engenders improvements in international reserves, improved ability of the country to pay external debts, movement of income to the domestic economy from the rest of the world, mitigation of cost-push inflation, improvements in long run investment, higher real output and ameliorations in standards of living.

From a theoretical perspective, the findings are consistent with the Harberger–Laursen-Metzler hypothesis (Laursen & Metzler, 1950; Harberger, 1950) which maintains that a deterioration (improvement) of TOT engenders a (an) decline (an increase) in real GDP per capita and thus, a reduction (improvement) in the country's current balance. In essence, our findings have shown that TOT shocks are relevant in the distribution of trade gains, not least, because declining TOT is associated with reduction in the degree of gains from international trade owing to decrease in the exports' purchasing power and vice versa. Accordingly, a reduction in the TOT is associated with concerns in trade financing and corresponding deficits in trade balances and thus, accumulation of external debt. The finding in this study that positive CTOT shock is associated with a decline in inflation, reduction of unemployment and increase in real output is consistent with extant empirical literature, especially as it pertains to how CTOT shocks theoretically (Laursen & Metzler, 1950; Harberger, 1950) and empirically (Alquist, et al., 2020; Fernández et al., 2017, 2020; Bussolo & Luongo, 2020) affect economic development in developing countries.

The positive relevance of the findings, in light of the economic development externalities associated with commodity terms of trade (CTOT) shocks, can be traced to the growing influence of globalization in commodity markets. Globalization has heightened competition, leading to a relative decline in the valuation of manufactured goods compared to commodities. This trend has ultimately contributed to a sustained deterioration in the terms of trade for developing countries (Singh, 2023). Accordingly, developing nations (including those in the proposed WAMZ) have experienced less TOT deteriorations. Moreover, from a developing countries' standpoint, there is increasingly more reliance on services and manufactured products that are essential in the process of structural transformation, especially in the light of transitioning to the service sector from the agriculture and industrial sectors. It follows that structural shifts in the export composition to competitively valued commodities in terms of low price as well as services of low price that are more competitive in developing countries, may have engendered improvement in TOT that have led to the favorable economic development consequences established in this study.

Another reason for the tendency in the established finding can be traceable to rapid information and communication technology development which has eased an improvement in trade services (which traditionally were considered as non-tradables) and hence, enhanced structural transformation and global value chains. The surge in TOT shocks over the years can also be traceable to outsourcing of trade to developing countries (i.e., including WAMZ nations) already benefiting from such trade externalities (Grossman & Rossi-Hansberg, 2012, 2008; Baldwin & Robert-Nicoud, 2014; Inklaar & Timmer, 2014; Choi et al., 2018; Hummels et al., 2018; Eppinger, 2019). In essence, the findings that are specific to the WAMZ are in line with the extant literature on the positive economic development externalities of TOT (Basu & McLeod, 1991; Mendoza, 1997; Deaton, 1999; Kaneko, 2000; Bleaney & Greenaway, 2001; Kose & Riezman, 2001; Ding & Field, 2005; Grimes, 2006; Blattman et al., 2007; Eicher et al., 2008; Kehoe & Ruhl, 2008; Schmitt-Grohé & Uribe, 2018; Rodríguez et al., 2018) and not consistent with the

relevant literature on the negative economic performance externalities of TOT (Turnovsky & Chattopadhyay, 2003; Hadass & Williamson, 2003; Wong, 2010)

The understanding of above findings should also be understood in the perspective that the results are panel-based and contingent on time (i.e., as apparent in the IRFs) and country heterogeneities, not least, because WAMZ countries are yet heterogenous in terms of, *inter alia*, institutional quality, growth structures, natural resources and commodity endowments, public infrastructures and human resources. Hence, while these findings are based on the main PVAR model, country-specific findings are still worthwhile for more targeted and specific time-oriented insights.

5. Conclusion, implications and future research directions

The AfCFTA is associated with trade opportunities that are relevant both in increasing intra-African trade as well as in providing avenues for domestic competitiveness that are worthwhile in improving international trade (Tchamyou et al., 2023). Against this backdrop, shocks in trade are likely to affect corresponding domestic economies, especially in small open economies such that those in the proposed WAMZ or non-UEMOA countries. The purpose of this study has been to improve the extant literature by assessing how commodity terms of trade (CTOT) shocks affect economic performance in the non-UEMOA countries in West Africa. The empirical evidence is based on PVAR analyses and the corresponding estimations are complemented with Granger causality tests and impulse-response functions (IRFs). The analyses are tailored such that economic performance is viewed in terms of unemployment, inflation and real output. The following main findings are established. CTOT shocks negatively affect inflation though the effect is not very significant. CTOT shocks positively and negatively affect real output and unemployment, respectively. Policy implications are discussed in what follows.

Prior to engaging the policy implications, it is important to point-out that the findings are consistent with the theoretical expectations, especially as it relates to the positive role of CTOT in reducing inflation and unemployment while boosting real output. Hence, policy makers need to understand that improvements in the price of commodity exports relative to the price of commodity imports is relevant to stabilizing inflation, fighting unemployment and boosting real GDP outcome in the sample countries. These intuitively have other favorable externalities linked to positive current account balances and international reserves.

The underlying findings have relevant policy implications when it concerns the formulation of economic measures in the proposed WAMZ that are designed to fight both inflation and unemployment as well as boost GDP per capita. Hence, policy makers should also consider diversifying trade, especially in commodities for which export prices are forecasted to improve as time unfolds. This is essentially because it is important to contain inflation in view of preventing exchange rate depreciation and by extension, TOT deterioration which will have negative consequences on employment and economic output. Moreover, for the long-term prospects, the sampled countries should not exclusively focus on the improvement of commodities for which prices are expected to increase in the near and distant future. The sampled countries should also consider improving the quality of other commodities in the industrial and service sectors that are exported, not least, because these are also crucial in long run TOT positive changes.

The above policy implications should be considered within the remit of understanding how CTOT shocks influence various economic sectors as well as individual sampled countries. This is essentially because the effects of the CTOT shocks on inflation, unemployment and real output could also be contingent on sector and country-specific initial conditions. These should also be substantiated with empirical validity in order to understand *inter alia*, the incidence of TOT on economic development dynamics. The underlying decompositions are essential in articulating countries that have exports vis-à-vis imports that are concentrated in a broad or a restricted set of commodities as well as industries that are more involved in international trade compared to domestic trade.

Prior to discussing limitations and corresponding future research directions, it is relevant to discuss broader policy implications for a broader structural agenda. In essence, the policy implications of the study can also benefit from a broader structural framework, especially as it pertains to going beyond the narrow focus of boosting terms of trade and improving export of commodities, policy makers should also focus on the development of high-productivity sectors, reduce institutional fragility and promote of technological capabilities. Accordingly, structural transformation, *inter alia*, is a necessary condition for turning short-term macroeconomic improvements into long-term development gains. Hence, ignoring these deeper constraints risks reinforcing a path of low diversification, external vulnerability, and limited capacity for innovation and inclusive growth.

Policymakers can manage the volatility of commodity terms of trade through diversification efforts and reserve strategies. Diversification, such as broadening export goods and encouraging economic variety, can lessen dependence on a single resource. Also, reserve management, like creating fiscal reserves and using stabilization funds, can lessen the effects of price swings.

First, regarding diversification, on the one hand, export diversification involves expanding the variety of goods and services exported to lessen exposure to single-commodity price changes. This might include developing new industries, encouraging value-added processing of current commodities, and supporting trade. Conversely, economic diversification means reducing reliance on one sector (for example, mining) to build a more stable economy. This can be achieved through investments in education, infrastructure, and other sectors to attract foreign investment and promote entrepreneurship.

Second, in terms of reserve management, three key strategies are important, especially in: (i) fiscal buffers or creating fiscal rules that enable governments to save during commodity booms and spend during downturns to help reduce the effects of price volatility on public finances. (ii) Stabilization funds or establishing sovereign wealth funds or commodity-specific stabilization accounts, to build reserves during high-price periods and draw from them during economic downturns to shield the economy from shocks. (iii) Debt management or carefully managing debt by diversifying sources and avoiding heavy reliance on commodity-linked debt, can lessen vulnerability to price swings.

This study obviously leaves space for future research, especially as it pertains understanding how the considered CTOT shocks affect sustainable development goals (SDGs) in the sampled WAMZ countries. Moreover, understanding how the underlying shock is relevant in influencing economic performance in UEMOA countries, the ECOWAS region and other economic/monetary regions in Africa, will go a long way to improving insights into how external shocks in the light of the AfCFTA are affecting economic development of Africa in general and African regions in particular. These future studies should also consider disaggregated analyses for country-specific policy implications in order to address the apparent shortcoming of country-specific heterogeneity that can only be robustly captured using the relevant country-specific estimation techniques.

Furthermore, while the reliance on CTOT is consistent with the main motivation of the present study, over-reliance on CTOT and corresponding short-term benefits can overlook the long-term risks associated with excessive reliance on commodity exports. Economic literature and development theory have consistently shown that such dependence often limits the potential for structural transformation, making economies more vulnerable to external shocks and commodity price volatility. These limitations are well captured in the Dutch disease hypothesis, developed within the New Developmentalist school, which argues that resource booms can lead to real exchange rate appreciation and a crowding-out of tradable sectors, undermining long-term competitiveness (Lashitew & Werker, 2020; Heresi, 2023; Branstetter & Laverde-Cubillos, 2024). Hence, future studies should be tailored to recognise the perspective that for sustained growth and development, it is not sufficient to rely on commodity-driven windfalls. A more robust policy framework would involve efforts to upgrade and diversify the productive structure, particularly through investment in industry, services, and innovation. Without a shift towards more complex and technologically advanced sectors, the gains from favourable terms of trade are likely to be transitory. These should be considered in future research.

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Appendices

Appendix 1: Definitions and sources of variables

Variables	Signs	Definitions	Sources
		Panel A: Dependent variables (Economic Performance)	
Real Output	GDPpc	Logarithm of GPD per capita	World Bank (WDI)
Unemployment	Ump	Unemployment, total (% of total labor force)	
Inflation	CPI	Consumer Price Index	
		Panel B: External policy syndromes (Oil price and terms of trade)	
Oil price	Oprice	Crude oil price (dollars per barrel)	EIA WDI
Terms of Trade	TOT	Commodity terms of trade (i.e., batter terms of trade): ratio of exports to import of commodity prices	
		Panel C: Monetary policy moderators	
Interest rate	RIR	Real interest rate (%) Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator	World Bank (WDI)
Exchange rate	REER	Real effective exchange rate index (2010=100): Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs	
Domestic credit	Credit	domestic loans provided to the private sector (%GDP)	
		Panel D: Control variables	
Total reserves	Reserves	Total reserves (% of total external debt): International reserves to total external debt stocks	
Domestic Investment	GFCF	Gross Fixed Capital Formation (%DGP)	World Bank (WDI)
Economic growth	GDPg	growth rate of GDP	
Domestic Savings	Savings	Gross domestic savings (% of GDP)	
Resource Rents	Resource	Total natural resource rents (%GDP)	
Internet	Internet	percentage of population with access to the internet	

Total Debt Service	Debt	Total debt service (%GNI) is the sum of principal repayments and interest actually paid in currency, goods, or services on long-term debt, interest paid on short-term

WDI: World Development Indicators. EIA: Energy information Administration.

Appendix 2: Summary statistics

	Mean	S.D	Min	Max	Obs
Real Output	2.860	0.291	2.344	3.505	120
Unemployment	4.702	1.976	2.080	9.607	120
Inflation	124.345	68.503	27.181	305.983	110
Oil Price	62.254	23.992	25.980	99.670	120
Terms of Trade	121.864	40.935	42.843	224.354	120
Interest rate	10.562	10.450	-29.708	29.585	80
Exchange rate	100.552	20.414	68.181	183.536	80
Domestic credit	8.113	5.366	0.001	19.603	118
Total reserves	48.335	61.245	0.015	335.122	120
Domestic investment	19.756	7.232	7.278	52.669	100
Economic growth	4.414	5.980	-30.415	26.524	120
Domestic savings	8.669	12.568	-16.437	44.331	100
Resource rents	12.376	6.268	2.489	34.177	120
Internet	10.752	12.505	0.031	56.682	118
Total Debt Service	2.737	7.183	0.100	59.671	120

S.D: Standard Deviation. Min : Minimim. Max : Maximum. Obs : Observations
GDPpc: Real Output. Ump: Unemployment. CPI: Inflation. Oprice: Oil price. TOT: Terms of Trade. RIR: Interest Rate. REER: Real Effective Exchange Rate. Credit: Domestic Credit. Reserves: Total Reserves. GFCF: Gross Fixed Capital Formation. GDPg: Gross Domestic Product growth. Savings: Domestic Savings. Resource: Resource Rents. Internet: Internet Penetration. Edu: Education. Debt: Total Debt Service.

Appendix 3: Correlation Matrix

	Economic Performance			**External Policy Syn.**		**Monetary Policy**			**Control Variables**						
	GDPpc	Ump	CPI	Oprice	TOT	RIR	REER	Credit	Reserves	GFCF	GDPg	Savings	Resource	Internet	Debt
GDPpc	1.000														
Ump	-0.254	1.000													
CPI	0.203	-0.006	1.000												
Oprice	0.298	0.169	0.110	1.000											
TOT	0.924	-0.193	-0.012	0.405	1.000										
RIR	-0.044	0.676	0.094	0.226	-0.069	1.000									
REER	-0.033	0.090	0.690	0.318	-0.217	0.206	1.000								
Credit	0.797	-0.036	-0.133	0.059	0.779	0.199	-0.390	1.000							
Reserves	0.663	-0.349	-0.196	0.332	0.738	-0.207	-0.224	0.605	1.000						
GFCF	-0.370	-0.409	-0.409	-0.229	-0.248	-0.493	-0.525	-0.235	-0.020	1.000					
GDPg	-0.061	-0.025	-0.344	0.247	0.022	0.192	-0.362	0.003	0.008	0.203	1.000				
Savings	0.533	-0.466	-0.455	-0.160	0.649	-0.440	-0.720	0.595	0.553	0.377	0.163	1.000			
Resource	0.062	-0.714	-0.404	-0.161	0.252	-0.673	-0.463	0.023	0.413	0.485	0.059	0.620	1.000		
Internet	0.610	-0.032	0.852	0.053	0.410	0.115	0.393	0.345	0.081	-0.477	-0.309	-0.036	-0.319	1.000	
Debt	-0.308	0.037	-0.371	-0.461	-0.180	-0.273	-0.425	-0.168	-0.198	0.351	-0.032	0.290	0.331	-0.318	1.000

GDPpc: Real Output. Ump: Unemployment. CPI: Inflation. Oprice: Oil price. TOT: Terms of Trade. RIR: Interest Rate. REER: Real Effective Exchange Rate. Credit: Domestic Credit. Reserves: Total Reserves. GFCF: Gross Fixed Capital Formation. GDPg: Gross Domestic Product growth. Savings: Domestic Savings. Resource: Resource Rents. Internet: Internet Penetration. Debt: Total Debt Service.

Appendix 4: Optimal lag selection for the nexus between terms of trade shock and inflation

lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	0.9965935	24.20589	0.085103	-44.65915	-7.794107	-22.50003
2	0.9969354	9.671511	0.6447539	-41.97727	-14.32849	-25.35793
3	0.9972977	7.698067	0.4635056	-26.73445	-8.301933	-15.65489
4	0.9948687	3.77414	0.4374347	-13.44212	-4.22586	-7.90234

Appendix 5: Optimal lag selection for the nexus between terms of trade shock and real output

lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	0.3971288	21.32185	0.1664683	-49.57122	-10.67815	-26.31284
2	0.3138287	9.266146	0.6800456	-43.90366	-14.73385	-26.45987
3	0.4890261	3.931301	0.8632679	-31.51523	-12.0687	-19.88604
4	0.2900257	2.993433	0.5589251	-14.72983	-5.006567	-8.915239

Appendix 6: Optimal lag selection for the nexus between terms of trade shock and unemployment

lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	-0.0351699	11.64315	0.768158	-59.24992	-20.35685	-35.99154
2	0.2987782	7.718747	0.8067051	-45.45105	-16.28125	-28.00727
3	0.3205291	4.311747	0.8279584	-31.13479	-11.68825	-19.5056
4	0.4355161	5.274236	0.2602985	-12.44903	-2.725764	-6.634436