

The Impact of Global Coffee Prices on Tanzania's Coffee Export Performance and GDP Growth (1974–2024)

Christina Nyimbo¹

¹Department of Economics, Mzumbe University, P.O Box 5, Tanzania.

@Correspondence: nyimbotinah@gmail.com

Abstract

This study looks into how Tanzania's GDP growth and coffee export performance are affected over the long run by changes in the world coffee price between 1974 and 2024. Cointegration and Vector Error Correction Models, two time series econometric techniques, are used in the study to demonstrate a robust long-term relationship between rising global coffee prices and export earnings, which in turn support economic growth. However, short-term impacts are statistically negligible, highlighting Tanzania's economy's susceptibility to outside shocks. Critical junctures characterised by market liberalisation, policy changes, and climate events that profoundly influenced the course of the coffee industry are identified by structural break tests. The results indicate that Tanzania is more vulnerable to global market volatility due to its reliance on exporting unprocessed coffee. The study suggests several tactics to lessen this, such as strengthening cooperatives, adopting price stabilisation mechanisms, developing farmer capacity, and using agro-processing for value addition. The aforementioned measures are intended to improve economic resilience, income stability, and the coffee industry's long-term contribution to national development.

Citation:

Nyimbo, C (2026). The Impact of Global Coffee Prices on Tanzania's Coffee Export Performance and GDP Growth (1974–2024). *AJAE*, 1(2), 54-75

Key Terms: Global Coffee Price Fluctuations, Coffee Export Performance, GDP Growth



Copyright: © 2025 by the authors.

Licensee Mzumbe University,
Tanzania.

This article is an open access article
distributed under the terms and
conditions of the Creative Commons
Attribution (CC BY) license

(<https://creativecommons.org/licenses/by/4.0/>).

1. INTRODUCTION

Over the past five decades, the global coffee market has experienced persistent volatility due to a range of institutional, economic, and environmental factors. Key disturbances such as the 1975 frost in Brazil and the 1989 collapse of the International Coffee Agreement (ICA) triggered sharp fluctuations in coffee prices, leaving producing countries vulnerable to macroeconomic instability (International Coffee Organization [ICO], 2021; Ponte, 2001). These fluctuations were further intensified by the liberalized trade regimes that emerged after the ICA's collapse, leading to recurring cycles of supply gluts and market downturns (ICO, 2011; ICO, 2021). As a result, many coffee-exporting developing countries have faced significant threats to income predictability and economic planning.

Tanzania exemplifies this vulnerability as a primary commodity exporter highly exposed to global price shocks. The coffee sector contributes between 3% and 5% of the country's total export revenues and supports more than 400,000 smallholder farmers (Tanzania Coffee Board [TCB], 2021; Laurent, 2025). Historically, the industry has navigated through several policy shifts from centralized state control in the 1970s and 1980s to liberalization in the 1990s with varying implications for performance and farmer welfare (Sarris & Van den Brink, 1993; Temu & Due, 2000). While liberalization improved price transmission mechanisms, it also exposed producers to greater price volatility on the global stage (Baffes, 2007).

Comparative studies reveal that neighbouring countries such as Uganda and Ethiopia have outperformed Tanzania in both production growth and export value, largely due to diversified production strategies and stronger institutional frameworks (World Bank, 2020). In response, Tanzania has launched a series of policy initiatives such as the National Coffee Development Strategies (2011–2021; 2021–2025), which aim to revitalize the sector through international marketing, productivity improvements, and quality control mechanisms (Ministry of Agriculture, 2022; Tanzania National Business Council [TNBC], 2022). Reforms have also emphasized traceability, cooperative marketing, and origin branding like Kilimanjaro Coffee in Japan as strategies for enhancing market competitiveness.

Nonetheless, Tanzanian farmers and the broader economy continue to suffer from international coffee price volatility, exacerbated by climate variability and rising input costs. The heavy dependence on coffee exports renders the economy particularly susceptible to global shocks. Volatile prices not only undermine farmer incomes but also contribute to erratic export earnings and fluctuations in GDP growth. Despite a series of liberalization efforts and support programs, the country still faces recurring boom-and-bust cycles tied to the international coffee market.

This enduring vulnerability reflects a significant gap in both policy and academic understanding. Existing reforms have not fully mitigated the risks associated with price shocks, indicating the need for more targeted strategies and a deeper understanding of the mechanisms driving this instability. Thus, this study addresses a critical research question: What is the long-term impact of global coffee price volatility on Tanzania's coffee export performance and overall economic growth?

Empirical evidence further underscores this sectoral fragility. Kassanga and Jovin (2021) found that price fluctuations have undermined cooperative functions, even though they have not directly compromised sustainability. Mbunduki (2024) highlighted enduring constraints in extension services and agronomic practices, while Abafita and Tadesse (2021), using a gravity model, noted that trade infrastructure and GDP levels significantly affect global coffee trade performance, whereas regional trade agreements have had limited effect.

The primary objective of this study is to investigate the long-term impact of global coffee price fluctuations on Tanzania's coffee export performance and GDP growth from 1974 to 2024. Specifically, the study seeks to quantify the effects of global coffee price volatility on Tanzania's coffee export earnings by employing time series econometric techniques which includes cointegration and error correction models (ECM) to analyse both short-run and long-run dynamics between global prices and export revenues, and to examine the relationship between coffee export performance and Tanzania's GDP growth by exploring how variations in export volume and price levels influence broader economic indicators over time. By addressing these objectives, the study aims to provide nuanced insights into the economic risks posed by commodity dependence and offer evidence-based recommendations for strengthening Tanzania's resilience to international market shocks.

2. LITERATURE REVIEW

Aduteye *et al.* (2023) in their study *"Time Series Analysis of Global Prices of Coffee: Insights into a Complex Market"* used ARIMA models to examine global Arabica coffee prices from 1990 to 2023. The study aimed to uncover the key drivers of coffee price fluctuations, including supply/demand, climate change, and geopolitical events. The methodology used time series analysis to identify price volatility patterns and forecast future trends. Their findings revealed that coffee prices are significantly influenced by global demand shifts, climatic conditions, and disruptions in the supply chain. This research contributes to understanding the external factors affecting coffee prices and serves as a basis for evaluating how global price volatility impacts coffee-exporting economies like Tanzania. The study's insights are relevant for the empirical modeling of coffee price impacts in Tanzania's economy.

The study *"Export and Economic Growth in Tanzania: Co-Integration and Causality Analysis"* by Tumaini and Bwana (2025) investigates the causal relationship between coffee exports and GDP growth in Tanzania from 1998 to 2018. Using Granger causality and cointegration analysis, the authors found that coffee exports have a positive long-term effect on Tanzania's economic growth. However, the short-term effects are not as strong, indicating that Tanzania's reliance on coffee exports is vulnerable to short-term price volatility. This study offers important empirical evidence for the export-led growth hypothesis, contributing to the understanding of how price fluctuations affect both short-term and long-term economic performance in Tanzania.

Maurice and Davis (2023) conducted a study titled *"Unravelling the Underlying Causes of Price Volatility in World Coffee and Cocoa"*, where they analyzed the effect of oil price shocks and market regulations on coffee prices using a cointegration and Granger causality approach. Their objective was to examine how oil price fluctuations influence coffee price movements, and they found that oil price shocks directly affect coffee prices, causing asymmetric volatility patterns. The study revealed that while supply shocks dominate coffee

price fluctuations, global policy changes and oil prices also have significant spillover effects. Their findings provide empirical evidence that supports the hypothesis of external shocks affecting global coffee prices, which is essential for understanding the vulnerability of Tanzania's coffee export market to global price fluctuations.

Mbunduki et al. (2024) investigate the effect of credit to the agriculture sector on coffee export growth in Tanzania, providing key empirical insights into how agricultural financing shapes export performance. Using time series data and econometric modelling, the study highlights a significant positive relationship between agricultural credit and coffee export growth, both in the short-run and long-run. Their findings reveal that increasing credit accessibility for agricultural producers, particularly smallholder coffee farmers, enhances productivity and international competitiveness, thereby boosting export volumes. This aligns with the premise of the current study, which explores the impact of global coffee prices on Tanzania's coffee export performance and GDP growth from 1974 to 2024. By integrating the findings of Mbunduki et al. (2024), the present research recognizes that domestic policy instruments like agricultural credit play a complementary role to global price dynamics in influencing export outcomes. This reinforces the need for a holistic framework that considers both external market signals and internal structural supports to fully understand the drivers of Tanzania's coffee export performance.

Kassanga and Jovin (2021) conducted a study titled *"Effect of Coffee Price Fluctuations on Sustainability of Agricultural Marketing Co-operatives in Tanzania"*, focusing on Kilimanjaro Native Cooperative Union (KNCU). They used survey methods and regression analysis to examine how coffee price volatility affects cooperatives' financial stability. Their findings suggest that although cooperatives are structurally strong, price fluctuations limit their ability to support farmers effectively, which ultimately affects the sustainability of the cooperative system. This study is highly relevant for your research, as it links the broader economic implications of coffee price fluctuations to the livelihoods of farmers and the cooperatives that support them, emphasizing the need for policy interventions.

3.0. THEORETICAL REVIEW

The Standard Trade Theory, developed by trade economists including Paul Krugman and Maurice Obstfeld, generalizes earlier models like Ricardian and Heckscher-Ohlin by integrating both supply-side and demand-side factors. The Standard Trade Model offers a comprehensive framework to understand the dynamics of international trade by integrating both supply and demand sides, extending the classical and neoclassical theories of comparative advantage. Built upon four core relationships which are the production possibility frontier (PPF) and the relative supply curve, relative prices and relative demand, world relative supply and demand, and the terms of trade and national welfare, this model provides a powerful lens for evaluating how global prices affect a country's trade performance (Krugman, Obstfeld, & Melitz, 2018).

Within the Standard Trade Model, the relationship between relative supply and the terms of trade is foundational to understanding how changes in production and global market dynamics affect national welfare. Relative supply (RS) refers to the ratio of the quantity of a country's export good to its import good, and is determined by the PPF and prevailing relative prices. The terms of trade (TOT), defined as the ratio of export

prices to import prices (P_x/P_m), directly affect a country's capacity to import goods for a given volume of exports. These two concepts RS and TOT are interconnected through global supply and demand conditions.

Graphically, this relationship is captured in the RS-RD (relative supply-relative demand) framework. The RS curve is upward sloping, showing that as the relative price of the export good increases, the economy produces more of it and less of the import good. The RD curve is downward sloping, reflecting the fact that as the relative price of coffee increases, global consumers tend to substitute away from coffee, reducing demand. The intersection of RS and RD determines the equilibrium relative price and the global terms of trade as illustrated in Figure 1



Figure 1 Relative supply and Terms of trade, source: Krugman, Obstfeld, & Melitz, 2018

As the price of P_C/P_F rises Q_C/Q_F rises this makes the relative supply curve upward sloping.

First, the theory justifies the proposition that fluctuations in global coffee prices directly influence Tanzania's export volume and revenue. As a price-taking exporter of coffee, Tanzania adjusts its production along its production possibility frontier based on relative prices. When global coffee prices rise, the country has an incentive to allocate more resources toward coffee production, increasing exports. Conversely, price declines lead to lower profitability, reduced production, and smaller export volumes.

Second, the theory suggests that the relationship between global coffee prices and Tanzania's coffee exports is mediated by relative supply responses and the terms of trade. If global prices are favourable, Tanzania's terms of trade improve, allowing the country to earn more foreign exchange per unit of coffee exported, thereby increasing its import capacity and improving welfare. However, an outward shift in relative supply can worsen terms of trade if it causes a global oversupply and depresses prices.

Third, the theory links coffee exports to economic growth through the channel of national income and trade gains. As coffee exports constitute a significant portion of Tanzania's export revenues, changes in export performance influence GDP growth. Improved terms of trade enhance national income, enabling greater investment and consumption. On the other hand, declining terms of trade can reduce GDP by decreasing the value of exports, leading to balance-of-payment pressures and lower public and private expenditure.

3.1. Conceptual Framework

The price of coffee on global markets is likely to influence Tanzania's coffee export performance. Higher global prices may encourage greater coffee production and export, as farmers and exporters benefit from higher revenues. Conversely, lower global prices may decrease export profitability, leading to reduced exports.

Coffee exports are a significant source of revenue for Tanzania, contributing to foreign exchange earnings, employment, and economic development. Strong export performance can stimulate growth in other sectors such as agriculture, transportation, and services, which, in turn, drives GDP growth. See Figure 2.

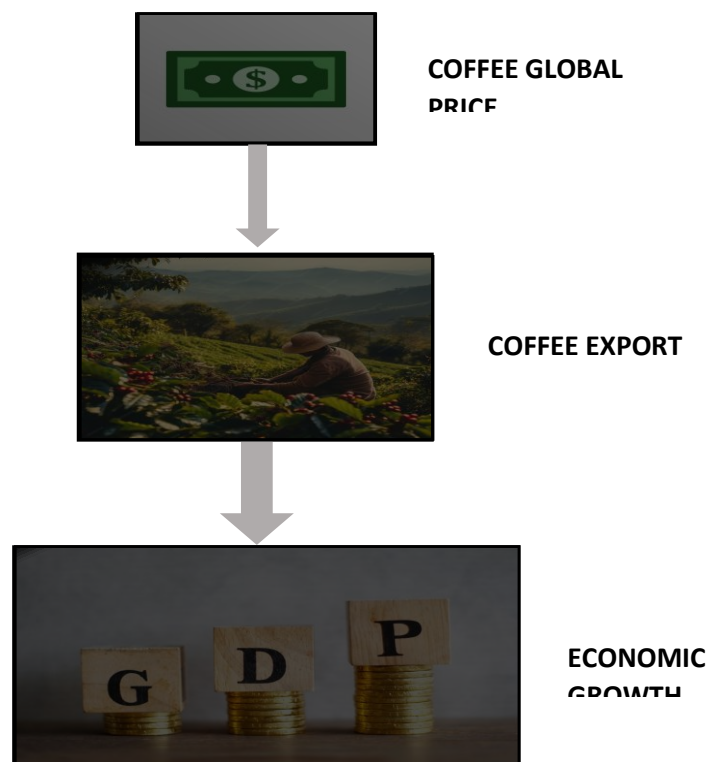


Figure 2: Conceptual framework

4.0. METHODOLOGY

4.1. Data Sources

The secondary data for this study were sourced from FAOSTAT and Macrotrends, both of which are recognized for their reliability and credibility in macroeconomic and agricultural research. FAOSTAT, managed by the FAO, offers standardized historical data on coffee production and trade, ensuring consistency across countries and years. Macrotrends provides long-term economic indicators such as Tanzania's GDP and global commodity prices, drawing from trusted sources like the World Bank and IMF. These databases support the study's empirical rigor by offering accurate, comparable, and up-to-date data suitable for analyzing the long-term relationship between global coffee prices, export performance, and economic growth from 1974 to 2023.

This study employs the Vector Error Correction Model (VECM), an advanced timeseries time series econometric technique designed for analyzing the dynamic relationship among non-stationary variables that are cointegrated, specifically GDP, coffee exports earnings and global coffee prices. The value of the VECM lies in its ability to capture both short-run fluctuations and long-run equilibrium relationships among variables compared to VAR, which treats all variables as stationary and disregards equilibrium correction, the VECM is more appropriate when the data series are integrated of order one and exhibit cointegration as confirmed by the Johansen test results in this study. This makes VECM optimal for the research objective, which aims to analyze not only how global coffee prices impact exports and GDP in the short run, but also how these variables converge toward a stable long-term path over time. By incorporating the error correction mechanism, VECM provides deeper insights into the adjustment process following external shocks, which is particularly relevant for understanding the volatility and long-term dependence within Tanzania's coffee export sector.

4.2. Study Area

Tanzania, located in East Africa, is known for its diverse geography, including coastal plains, mountains, and vast savannahs as presented in Figure 3. It is a major agricultural producer, with coffee being one of the key crops. Coffee farming in Tanzania is primarily concentrated in the Northern and Southern Highlands, particularly in regions such as Kilimanjaro, Arusha, Mbeya, and Ruvuma. The fertile volcanic soils and favorable climate in these areas make them ideal for growing both Arabica and Robusta coffee varieties. Kilimanjaro and Arusha are especially famous for their high-quality Arabica coffee, which plays a crucial role in the country's economy through both local consumption and export markets (FAOSTAT, 2021).

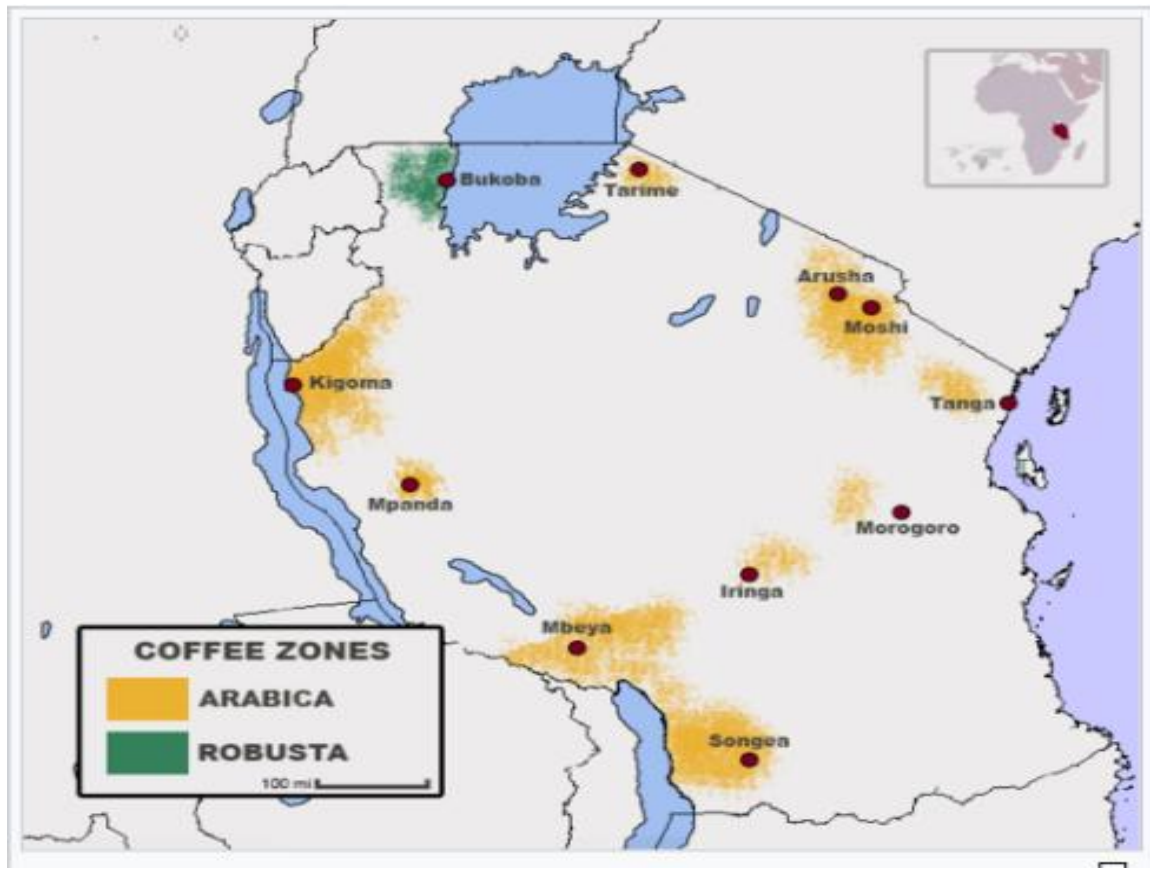


Figure 3 Eleven coffee zones, Source: Google

4.3. Descriptive Analysis

Table 1 Description of variables

	Mean	SD	Min	Max	Unit of Measurement
Economic- growth	24358.59	23035.33	4039.509	80170	GDP (Million dollars)
Export	51535.77	11487.36	35359	90000	Tones of exports
Price	1.354202	0.546223	0.462	3.2049	US dollar/ Pound

The standardized time series chart for Tanzania's GDP, exports, and prices from 1974 to 2024 shows distinct trends. GDP demonstrates steady growth, especially after 2005, while exports and prices exhibit significant fluctuations, reflecting sensitivity to external factors like global coffee prices and inflation. Export values in Figure 4 show cyclical patterns, and price levels remain relatively stable compared to exports. The synchronization of these variables increases after 2010, indicating a growing interdependence between economic output, coffee export performance, and global price changes. The standardized scale allows for clear comparison, revealing that GDP consistently outpaces the variability in exports and prices.

STANDARDIZED CHART

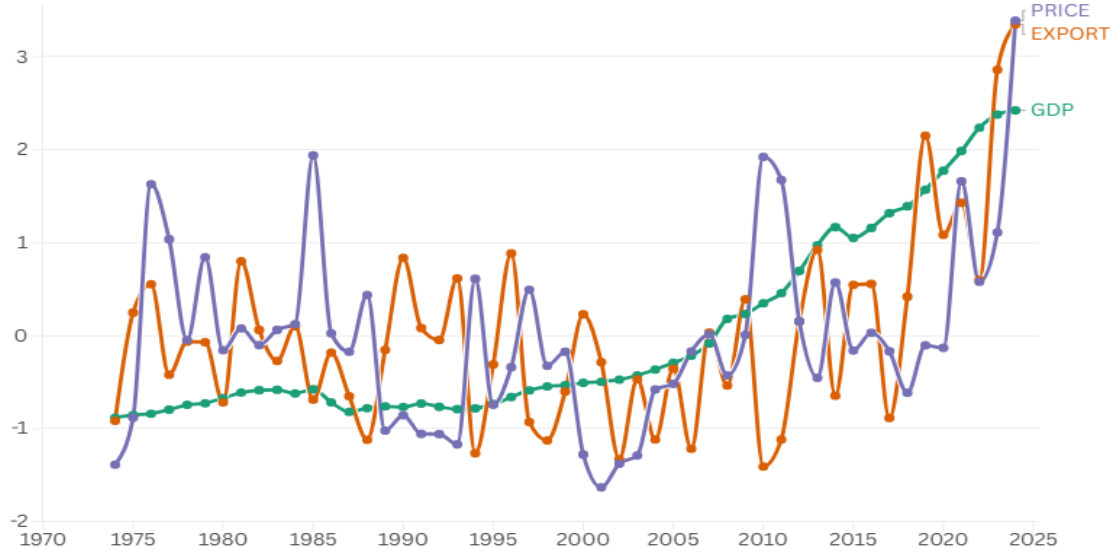


Figure 4: Visualization of the variables

4.4. Empirical Model

VECM

The Vector Error Correction Model (VECM) in time series analysis is used to model the relationships between multiple cointegrated variables, accounting for both short-term dynamics and long-term equilibrium. It helps capture how variables adjust over time towards their long-run equilibrium while considering the immediate changes in the system.

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t$$

Where:

Y_t : a vector of non-stationary variables (GDP, exports, prices)

ΔY_t : represents their first differences

$\Pi = \alpha \beta$, β cointegration vector(s) (long-run relationships), α adjustment coefficients (error correction terms)

Γ_i : short-run dynamics matrices

ε_t : white noise residuals.

Stationarity for VECM Model

For a Vector Error Correction Model, the stationarity of the system is essential to ensure that the time series behaves consistently over time. In the context of VECM models, stationarity refers to the condition where the statistical properties of the system do not change over time. To test for stationarity, we check if the roots of the characteristic equation of the model lie outside the unit circle.

$$\det (I - A_1L - A_2L^2 \dots A_pL^p) = 0$$

Where:

- I the identity matrix
- A1, A2..., Ap are the coefficient matrices of the VECM model
- L is the lag operator

Hypothesis for Stationarity Test

- H0: The series has a unit root
- H1: The series does not have a unit root

Rule of Thumb for Stationarity Testing

If the p-value from the unit root test (ADF test) is less than the chosen significance level (0.05), we reject the null hypothesis of a unit root, indicating that the series is stationary.

If the p-value is greater than the significance level, we fail to reject the null hypothesis, indicating that the series is non-stationary.

Johansen Cointegration Test Results

The Johansen cointegration test is used to determine if there are any cointegrating relationships between a set of variables. The test provides two statistics: the trace statistic and the maximum eigenvalue statistic. The null hypothesis for the test is that there are r cointegrating relationships, and the alternative hypothesis is that there is r+1 cointegrating relationships.

Trace Test:

$$Trace\ statistics = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i)$$

Where $\hat{\lambda}_i$ the eigenvalues, T is the sample size, and r is the number of cointegrating relationships.

Maximum Eigenvalue Test:

$$Max\ Eigenvalue\ Statistic = -T \ln(1 - \hat{\lambda}_{r+1})$$

Serial Correlation Test (Portmanteau Test)

The Portmanteau test is used to check for serial correlation (or autocorrelation) in the residuals of a model. Serial correlation occurs when the residuals (errors) of a time series model are correlated over time, which could violate the assumption of no autocorrelation.

$$Q = T \sum_{k=1}^h \hat{P}_k^2$$

- Q is the test statistic
- T is the sample size
- $\hat{P}_k^2$ is the sample autocorrelation at lag k
- h is the maximum lag considered

Hypothesis H_0 : There is no serial correlation in the residuals

H_1 : There is serial correlation in the residuals

Rule of Thumb for Serial Correlation Testing

If the p-value of the Portmanteau test is less than the significance level (usually 0.05), we reject the null hypothesis (H_0) and conclude that serial correlation is present in the residuals. This indicates that the model may be mis specified, and adjustments (e.g., adding more lags or correcting for autocorrelation) may be needed.

Heteroscedasticity Test (ARCH Test)

The ARCH (Autoregressive Conditional Heteroscedasticity) test is used to detect heteroscedasticity in time series data. Heteroscedasticity occurs when the variance of the residuals (errors) is not constant over time. In the context of a VECM model, we use the ARCH test to determine if the squared residuals from the model exhibit conditional heteroscedasticity.

$$\varepsilon_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \cdots \cdots \cdots + \alpha_q \varepsilon_{t-q}^2 + v_t$$

Hypothesis for the ARCH Test

H0: There is no heteroscedasticity

H1: There is heteroscedasticity

If the p-value of the ARCH test is less than the significance level (usually 0.05), we reject the null hypothesis (H0) and conclude that there is heteroscedasticity in the residuals. This means that the residuals have non-constant variance, and the model may need adjustment.

Impulse Response Function (IRF) Equation

The IRF traces the effect of a one-time shock to one of the innovations ε_{jt} on current and future values of the endogenous variables Y_t

Then the IRF at horizon h is:

$$IRF(h) = \frac{\partial Y_{t+h}}{\partial \varepsilon_t} = \Psi h$$

Where:

- Ψh is the impulse response matrix at horizon h
- Each element Ψ_{ij}^h in Ψh shows the response of variable i to a one-unit shock in variable j after h periods

Hypothesis in IRF Analysis

Null Hypothesis (H_0): A shock to variable j has no effect on variable i at horizon h :

$$H_0: \Psi_{ij}^h = 0$$

Alternative Hypothesis (H_1): The shock does affect the variable

$$H_1: \Psi_{ij}^h \neq 0$$

5.0. RESULTS AND ANALYSIS

The analytical modeling for this study primarily relies on econometric time-series techniques to examine the impact of global coffee price fluctuations on Tanzania's coffee export performance and GDP growth over the period from 1974 to 2024. The modeling approach will help identify both the long-term relationships and short-term dynamics between the key variables: global coffee prices, coffee export earnings, and GDP.

5.1. Stationarity Test

The Augmented Dickey-Fuller (ADF) test was conducted to determine whether each time series variable exhibits stationarity or contains a unit root.

Null Hypothesis (H_0): The time series has a unit root

Alternative Hypothesis (H_1): The time series is stationary

Table 2: Stationarity test

Variable	p-value (Leel)	Stationarity at Level	p-value (1st Diff)	Stationarity at 1 st Differencing
EXPORTS	0.9900	Non-stationary	0.0100	Stationary
GDP	0.9900	Non-stationary	0.0682	Weak Stationarity
PRICE	0.6148	Non-stationary	0.0245	Stationary

Interpretation

The ADF tests for coffee exports, GDP, and the global price index all indicate non-stationarity at the level. Coffee exports show a statistic of 0.025 with a p-value of 0.99, suggesting a unit root, but becomes stationary after first differencing with a statistic of -5.5695 and a p-value of 0.01, indicating $I(1)$. Similarly, GDP has a statistic of -0.0079 and a p-value of 0.99 at level, and after first differencing, the statistic improves to -3.3872 with a p-value of 0.068, suggesting weak evidence of stationarity and $I(1)$. The global price index also shows non-stationarity at level (statistic = -1.8995, p-value = 0.6148), but after differencing, the statistic improves to -3.8177 with a p-value of 0.0245, confirming $I(1)$. These results are typical for export and macroeconomic data, which tend to follow trends but become stationary when differenced.

5.2. Cointegration Test

The Johansen cointegration test was applied to examine the presence of long-run equilibrium relationships among GDP, coffee exports, and global prices by evaluating the number of cointegrating vectors in the system.

Table 3: Cointegration Table

r	Null Hypothesis	Test Statistic	5% Critical Value	Decision
0	At most 0 cointegrating vectors	42.87	34.91	Reject H_0
1	At most 1 cointegrating vector	14.15	19.96	Do not reject H_0
2	At most 2 cointegrating vectors	1.90	9.24	Do not reject H_0

The Johansen trace test results indicate the existence of one cointegrating relationship among GDP, exports, and prices in Tanzania, as the test statistic for $r = 0$ (42.87) exceeds the 5% critical value (34.91), while subsequent values do not. This suggests a stable long-run association among the three variables. The loading matrix shows that GDP and exports adjust significantly to restore equilibrium, while prices have minimal short-run adjustment.

5.3. VECM Estimation Results

Objective 1: To Quantify the Impact of Global Coffee Price Fluctuations on Tanzania's Coffee Export Earnings (1974–2024)

Table 4: VECM results for export equation

Variable	Coefficient Estimate	Std. Error	t-value	p-value	Significance
ECT (Error Correction Term)	0.2018	0.05318	3.794	0.00044	***
GDP (lagged difference)	0.1018	0.5397	0.189	0.85117	
Export (lagged difference)	-0.749	0.1391	-5.383	2.55E-06	***
Price (lagged difference)	-2831	2907	-0.974	0.33537	

Error Correction Term (ECT):

Highly significant and positive with the p value of (0.00044), this means that when there's a long-run deviation from the equilibrium (caused by changes in GDP, exports, or prices), exports adjust by about 20.2% each

year to restore equilibrium. This confirms the long-run relationship is active and corrective. The coefficient is not statistically significant with a p value (0.33537), suggesting that short-run changes in global coffee prices do not have a significant immediate impact on export earnings. Changes in global coffee prices do not significantly impact exports in the short term based on this model (p-value > 0.05).

Table 5: Long-Run Relationship (Cointegration Vector for Exports)

Variable	Long-Run Coefficient	Interpretation
GDP	0.6059	Positive long-run relationship
Export	0.1019	Normalized variable in the cointegration equation.
Price	0.0000458854	Very small positive long-run effect

$$EXPt = 0.6059 \cdot GDPt + 0.0000459 \cdot PRICet + Constant$$

Price coefficient (0.0000459): Indicates that global coffee prices have a very small but positive long-run effect on export earnings. While the effect is statistically small, it confirms that increases in global coffee prices slightly contribute to higher export earnings over time.

Objective 2: To Investigate the Impact of Coffee Export Performance on Tanzania's Economic Growth (1974–2024)

Table 6: VECM GDP Equation Results

Variable	Coefficient Estimate	Std. Error	t-value	p-value	Significance
ECT	0.02441	0.01003	2.433	0.019	*
GDP	0.60592	0.10182	5.951	3.69E-07	***
Export	0.02142	0.02625	0.816	0.419	
Price	569.23	548.44	1.038	0.305	

The coefficient of the lagged change in coffee exports is 0.02142 with a p-value of 0.419, indicating no statistically significant short-run effect on GDP in Tanzania from 1974 to 2024. However, the positive and significant error correction term (0.02441, p = 0.019) suggests that GDP adjusts by about 2.4% annually to restore long-run equilibrium, which includes the impact of exports. This implies that while the short-run effect of exports on GDP is weak, exports still play a role in the long-term relationship between the variables.

$$GDP = 2.0175593e - 01 EXP - 7.538982e - 06 PRICE + CONSTANT$$

Interpretation of the Effect of Export on GDP (1974–2024)

The long-run coefficient of 0.20176 from the VECM cointegration relationship indicates a positive long-term relationship between coffee export performance and Tanzania's economic growth (GDP). This means that as coffee export earnings increase, GDP also tends to increase proportionally over time, reinforcing the role of exports as a driver of economic growth in the Tanzanian economy.

However, from the short-run dynamics in the VECM GDP equation, the coefficient of the lagged differenced export variable is not statistically significant (coefficient = 0.02142, $p = 0.419$). This implies that in the short run, variations in coffee exports do not have a meaningful immediate impact on GDP. Instead, GDP adjusts gradually over time through the long-run equilibrium channel, as confirmed by the significance of the error correction term.

5.4. Structural Break

The Recursive CUSUM test on the residuals of GDP, coffee exports, and global coffee prices from 1974 to 2024 suggests that deviations beyond critical bounds indicate potential structural breaks. These breaks may reflect significant shifts due to historical events like the 1980s structural adjustment programs, global coffee price fluctuations, economic liberalization, and climate impacts on coffee production. Additionally, domestic economic policies on agriculture, exports, and trade could have influenced these changes, which the CUSUM test captures as periods of significant shifts in the model's residuals as highlighted in Figure 5.

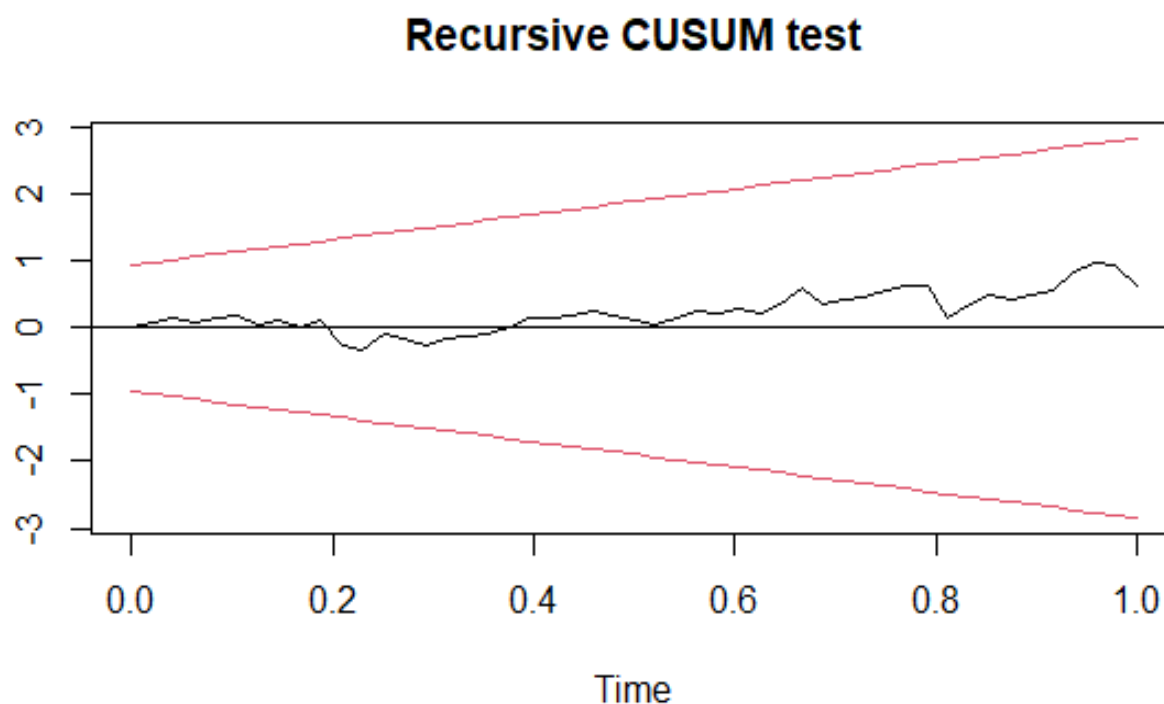


Figure 5: Structural Break

5.5. Error Correction Model (ECM)

The Error Correction Model (ECM) measures the short-term dynamics and long-term equilibrium relationships between variables in a time series context, particularly when variables are cointegrated. In essence, ECM analyzes how the system adjusts to long-term equilibrium after short-term shocks or deviations from equilibrium.

Table 7: ECM table

Equation	Variable	Estimate	t-value	p-value	Interpretation
GDP Equation	(Error correction)	0.02441	2.433	0.019	A positive and significant error correction term (2.44%), indicating adjustment to long-run GDP equilibrium.
	(Lag GDP)	0.60592	5.951	<0.001	Past GDP changes significantly affect current GDP, with a positive relationship.
	(Lag EXP)	0.02142	0.816	0.419	Past export changes have no significant impact on current GDP.
Exports Equation	(Error correction)	0.2018	3.794	0.00044	The error correction term is significant, indicating a 20.18% adjustment to the long-run export equilibrium.
	(Lag EXP)	-0.749	-5.383	<0.001	Past export changes have a significant negative impact on current exports.
	(Lag Price)	-2831	-0.974	0.335	Past price changes do not significantly affect current exports.

5.6. Impulse Response Function

Impulse Response Functions (IRF) presented in Figure 6 are a crucial tool in econometrics and time series analysis, they measure the dynamic response of one variable to a one-time shock or innovation in another variable, holding everything else constant.

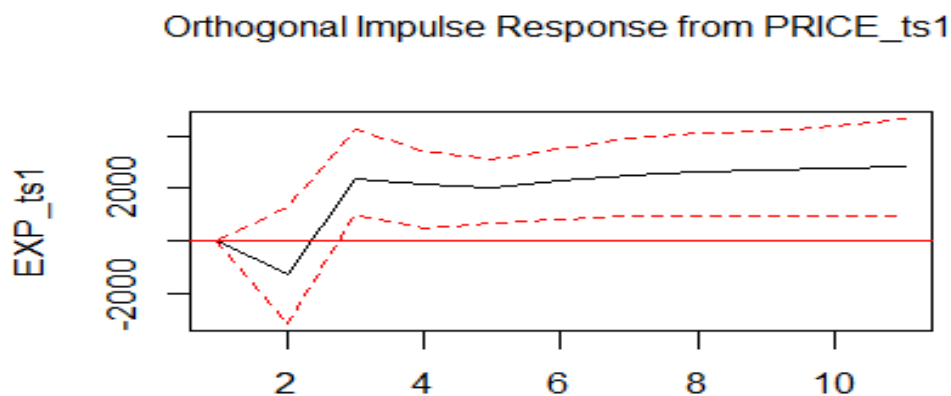


Figure 6: Effect of Global Price Shocks on Export Performance

In the short term (Period 2), a shock to global coffee prices leads to a temporary decline in Tanzania's coffee exports (around 1,271.96), likely due to market adjustments or delayed producer responses. However, from Periods 3 to 11, the effect turns positive, with export volumes rising significantly, reaching approximately 2,850.35 by Period 11, suggesting that higher prices eventually incentivize increased production and export

activity. Confidence intervals confirm the robustness of this positive trend, as even the lower bounds remain above zero in the long run, indicating a sustained, favourable relationship between global coffee prices and Tanzania's coffee export performance.

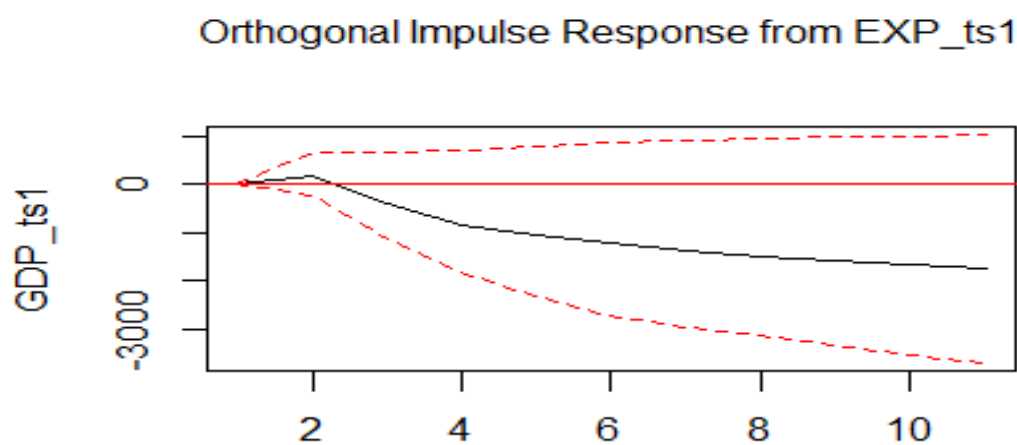


Figure 7: Effect of Coffee exports on GDP

Initially, a shock to coffee exports has little to no immediate effect on GDP, as economic impacts take time to appear. In the short run (Periods 2–3), GDP responds positively, likely due to increased export revenues and activity. However, over the long term, the impact turns negative, with GDP declining significantly by Period 11 as indicate in Figure 7. This suggests that while coffee exports may offer short-term gains, their prolonged reliance could harm economic growth due to limited diversification and exposure to price shocks.

5.7. Autocorrelation Test

The Portmanteau Test (asymptotic) was performed tests for autocorrelation in the residuals

Table 8: Autocorrelation results

Statistic	Chi-squared Statistic	Degrees of Freedom (df)	p-value
Value	74.426	93	0.9215

Since the p-value is 0.9215, which is greater than 0.05, we fail to reject the null hypothesis. This means that there is no significant autocorrelation in the residuals. This is a good indication that the model is well-specified with respect to the autocorrelation of the residuals.

5.8. Heteroskedasticity test

The ARCH test was performed to tests for the presence of heteroskedasticity

Table 9: ARCH Test Results

Statistic	Chi-squared Statistic	Degrees of Freedom	p-value
Value	222	432	1

Since the p-value is 1, which is greater than 0.05, we fail to reject the null hypothesis. This means there is no evidence of heteroskedasticity in the residuals. In other words, the residuals have constant variance over time, and the model does not need adjustments for heteroskedasticity.

5.9. Forecasting

GDP

The forecast results in Figure 8, show that Tanzania's GDP is expected to increase gradually over the next 10 years, from about 80,888 to 82,458. However, the confidence intervals widen over time, indicating growing uncertainty in the long-term projections. This suggests that while economic growth is likely, future outcomes could vary significantly depending on other influencing factors.

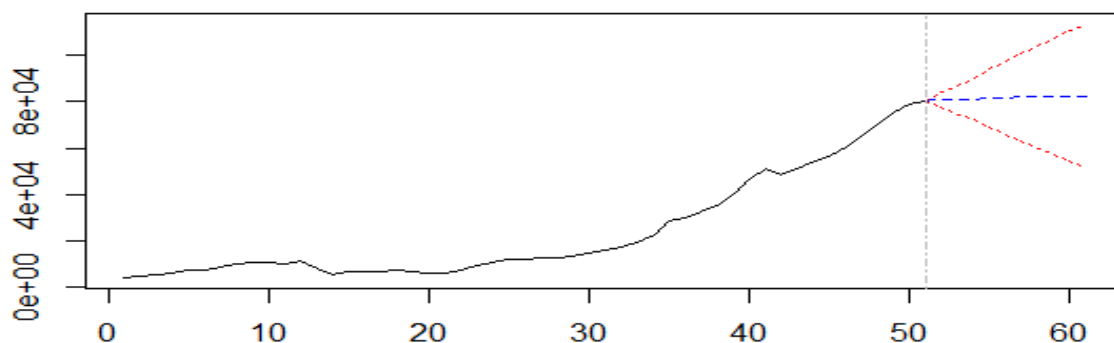


Figure 8: GDP Forecast

EXPORT

The forecast in Figure 9, indicates that Tanzania's exports are projected to rise moderately over the next 10 years, starting from approximately 76,418 in the first period to 84,613 in the tenth. Although the forecasted export values show a general upward trend, the confidence intervals widen progressively from $\pm 16,843$ in the first period to $\pm 24,623$ by the tenth highlighting increasing uncertainty over time. This suggests that while exports are likely to grow, the future export performance may be affected by volatile factors such as global prices, trade policies, and economic shocks.

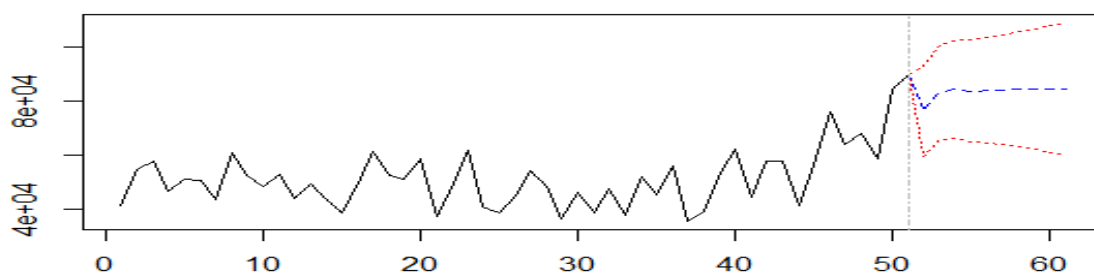


Figure 9: Export Forecast

PRICE

The forecast shows that Tanzania's price index is expected to remain relatively stable, starting at 3.19 in the first period and reaching around 3.07 by the tenth period. Although the point forecasts change only slightly, the confidence intervals widen steadily from ± 0.88 in period 1 to ± 2.19 in period 10 indicating increasing uncertainty in the price outlook over time. This suggests that while prices are projected to be steady, external shocks such as inflation, currency fluctuations, or global commodity trends could significantly affect future prices.

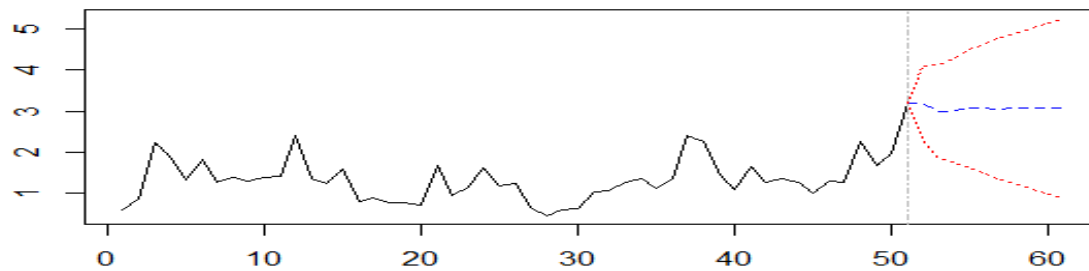


Figure 10: Price Forecast

6.0. CONCLUSION

The study effectively examines the long-term impact of global coffee price fluctuations on Tanzania's coffee export performance and GDP growth from 1974 to 2024. The use of the Vector Error Correction Model (VECM) stands out as a key methodological strength, allowing the study to distinguish between short-run and long-run dynamics, an analytical depth that is often missing in previous studies on Tanzania's coffee sector and related macroeconomic impacts. Additionally, the incorporation of structural break analysis provides further depth by capturing historical economic shifts that have influenced the coffee sector over five decades. This long-range perspective, paired with empirical rigor, offers fresh insights into how Tanzania's economy adjusts to external shocks in the global commodity market. Key findings show that while global coffee prices have a significant long-run positive effect on export performance, their short-run impact is statistically negligible. Similarly, coffee exports exhibit a strong long-term contribution to GDP growth, though their short-term influence remains weak. The study also confirms the presence of one cointegrating relationship among GDP, exports, and global prices, and identifies critical structural breaks aligning with historical policy reforms and market disruptions. What differentiates this study is its integrated approach, assessing the interconnectedness of global coffee prices, export earnings, and GDP growth within a unified empirical framework. The findings not only reaffirm the vulnerability of Tanzania's economy to international price shocks but also offer evidence-based recommendations that address both macroeconomic resilience and sector-specific reform. This contribution is particularly relevant for policymakers and researchers seeking a more nuanced understanding of commodity-dependence in Sub-Saharan Africa.

7.0. RECOMMENDATION

Tanzania's economy, deeply reliant on coffee exports, is particularly vulnerable to the ebb and flow of global price fluctuations, making it highly sensitive to shifts in international market dynamics. To enhance economic

resilience, a long-term strategy should prioritize export diversification and value addition within the agricultural sector. This involves shifting from dependence on unprocessed coffee exports to a broader portfolio that includes horticulture, tea, and spices, while also developing non-agricultural sectors such as tourism and light manufacturing. The study's findings on the limited short-term impact but significant long-run effects of coffee price fluctuations on GDP highlight the need for structural transformation. Increasing investment in agro-processing infrastructure, improving access to quality inputs, and expanding extension services will help raise productivity and stabilize income, while promoting processed coffee exports will enable Tanzania to capture more value from global markets.

Furthermore, the establishment of price stabilization mechanisms such as a national coffee reserve, hedging instruments, and crop insurance is critical for mitigating the risks of price shocks, especially for smallholder farmers. Institutional reforms to strengthen cooperatives, improve credit access, and ensure equitable distribution along the coffee value chain are essential for enhancing sector performance. Climate resilience must also be a key pillar of this strategy, as erratic weather patterns increasingly threaten agricultural output. The promotion of climate-smart agriculture, early warning systems, and adaptive capacity-building will safeguard production and livelihoods. Lastly, consistent monitoring and evaluation of policy impacts, guided by robust data systems, will ensure adaptive governance that aligns with evolving global market dynamics and supports sustainable economic growth.

Future Research Direction: Future research should extend this analysis using disaggregated or panel data to examine regional and farm-level heterogeneity in the impact of global coffee price fluctuations.

Competing interest: Author declares that they are no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding: This paper received no funds.

Data availability: Data will be made available on request.

REFERENCE

- Abafita, J., & Tadesse, T. (2021). Determinants of global coffee trade: Do RTAs matter? Gravity model analysis. *Cogent Economics & Finance*, 9(1), 1892925.
- Aduteye, E. K., Sete, T. T., & Chi, Y. N. (2023). Time series analysis of global prices of coffee: Insights into a complex market. *International Journal of Business & Economics (IJBE)*, 8(2), 138-151.
- Baffes, J. (2007). *Distortions to agricultural incentives in Tanzania*. World Bank Policy Research Working Paper No. 4372. <https://doi.org/10.1596/1813-9450-4372>
- FAOSTAT. (2021). *FAO Statistical Database*. Food and Agriculture Organization. <https://www.fao.org/faostat/>
- International Coffee Organization. (2011). *Coffee market report*. <https://www.ico.org/>
- International Coffee Organization. (2021). *The economics of coffee production*. <https://www.ico.org/>
- Kassanga, G. A., & Jovin, J. (2021). Effect of coffee price fluctuations on sustainability of agricultural marketing co-operatives in Tanzania: The case of Kilimanjaro Native Co-Operative Union. *Issues in Business Management and Economics*, 9(6), 54.
- Krugman, P. R., Obstfeld, M., & Melitz, M. J. (2018). *International economics: Theory and policy* (11th ed.). Pearson.
- Maurice, N., & Davis, J. (2011). Unravelling the underlying causes of price volatility in world coffee and cocoa commodity markets.
- Kassanga, G. A., & Jovin, J. (2021). Effect of coffee price fluctuations on sustainability of agricultural marketing co-operatives in Tanzania: The case of Kilimanjaro Native Co-Operative Union. *Issues in Business Management and Economics*, 9(6), 54.
- Laurent, M. F. (2025). Does Foreign Direct Investment promote Economic Growth and Female Self-Employment in Tanzania?. *Revista Academicus: Revista multidisciplinar*, 3(2), 189-202.
- Ministry of Agriculture. (2022). *National Coffee Development Strategy (2021–2025)*. Government of Tanzania.
- Ponte, S. (2001). Trapped in decline? Reassessing agrarian change and economic diversification on the Uluguru Mountains, Tanzania. *The Journal of Modern African Studies*, 39(1), 81-100.
- Sarris, A. H. (1993). Household welfare during crisis and adjustment in Ghana. *Journal of African Economies*, 2(2), 195-237.
- Tanzania Coffee Board. (2021). *Annual coffee sector performance report*. <https://www.coffeeboard.or.tz/>

- Tanzania National Business Council. (2022). *Coffee industry development plan (2021–2025)*. <https://www.tnbc.go.tz/>
- Temu, A. E., & Due, J. M. (2000). The business environment in Tanzania after socialism: challenges of reforming banks, parastatals, taxation and the civil service. *The journal of modern African studies*, 38(4), 683-712.
- Tumaini, J. W., & Bwana, K. M. (2025). Export and Economic Growth in Tanzania: Co-Integration and Causality Analysis. *African Journal of Applied Research*, 11(1), 814-824.
- World Bank. (2020). *Tanzania economic update: Addressing the impact of COVID-19 on productive jobs*. <https://www.worldbank.org/>
- Macrotrends. (n.d.). *Historical data: Tanzania GDP and coffee prices*. <https://www.macrotrends.net/>
- Mbunduki, R. (2024). The Effect of Credit to the Agriculture Sector on Coffee Export Growth in Tanzania. *Pan-African Journal of Business Management*, 8(2), 238-259.