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Economic growth, Terms of Trade, and Trade Performance Nexus in Tanzania: A time series analysis (1987-2023)[1]

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Abstract: This study examines the relationship between Tanzania's economic growth, terms of trade, and trade performance from 1987 to 2023. Addressing a notable gap in the literature that often overlooks their combined effects, the study aims to evaluate the dynamic interplay among these variables. Guided by the Prebisch-Singer Hypothesis and the augmented gravity model, the analysis employs the Autoregressive Distributed Lag (ARDL) bounds testing approach to capture both short-run and long-run dynamics, complemented by Granger causality analysis. The results reveal that exchange rate appreciation negatively impacts trade performance, while economic growth and governance quality have positive and significant long-term effects. Terms of trade have a short-run positive impact, indicating a limited long-term influence of global commodity prices. Tariff rates reduce trade performance, whereas infrastructure development enhances it. Granger causality results confirm bidirectional relationships between trade and GDP, emphasizing the interdependence of trade and macroeconomic indicators. The study concludes that improving institutional effectiveness, macroeconomic stability, and structural reforms are crucial for enhancing trade performance. Policy recommendations include strengthening governance, investing in infrastructure, promoting export diversification, and maintaining a competitive exchange rate.

Keywords: *Economic growth, Terms of Trade, Trade performance, Augmented Gravity model, Prebisch-Singer Hypothesis*, *ARDL, Tanzania*

Crescimento económico, termos de troca e desempenho comercial na Tanzânia: uma análise de séries temporais (1987-2023)

Resumo: Este estudo examina a relação entre o crescimento económico, os termos de troca e o desempenho comercial da Tanzânia no período de 1987 a 2023. Preenchendo uma lacuna importante na literatura, que frequentemente negligencia seus efeitos combinados, o estudo visa avaliar a interação dinâmica entre essas variáveis. Guiada pela Hipótese de Prebisch-Singer e pelo modelo gravitacional aumentado, a análise emprega a abordagem de teste de limites do Modelo Autorregressivo de Defasagem Distribuída (ARDL) para capturar as dinâmicas de curto e longo prazo, complementada pela análise de causalidade de Granger. Os resultados revelam que a apreciação da taxa de câmbio impacta negativamente o desempenho comercial, enquanto o crescimento económico e a qualidade da governança têm efeitos positivos e significativos no longo prazo. Os termos de troca têm um impacto positivo no curto prazo, indicando uma influência limitada dos preços globais das commodities no longo prazo. As tarifas alfandegárias reduzem o desempenho comercial, enquanto o desenvolvimento da infra-estrutura o aprimora. Os resultados da causalidade de Granger confirmam relações bidirecionais entre comércio e PIB, enfatizando a interdependência entre comércio e indicadores macroeconómicos. O estudo conclui que a melhoria da eficácia institucional, da estabilidade macroeconômica e das reformas estruturais são cruciais para aprimorar o desempenho comercial. As recomendações de políticas incluem o fortalecimento da governança, o investimento em infraestrutura, a promoção da diversificação das exportações e a manutenção de uma taxa de câmbio competitiva.

Palavras-chave: Crescimento económico, Termos de troca, Desempenho comercial, Modelo de Gravidade Aumentada, Hipótese de Prebisch-Singer, ARDL, Tanzânia

Nexo entre crecimiento económico, términos de intercambio y desempeño comercial en Tanzania: Un análisis de series temporales (1987-2023)

Resumen: Este estudio examina la relación entre el crecimiento económico, los términos de intercambio y el desempeño comercial de Tanzania entre 1987 y 2023. Abordando una importante laguna en la literatura que a menudo pasa por alto sus efectos combinados, el estudio busca evaluar la interacción dinámica entre estas variables. Basándose en la hipótesis de Prebisch-Singer y el modelo de gravedad aumentada, el análisis emplea el método de prueba de límites de rezagos distribuidos autorregresivos (ARDL) para capturar la dinámica a corto y largo plazo, complementado con un análisis de causalidad de Granger. Los resultados revelan que la apreciación del tipo de cambio impacta negativamente el desempeño comercial, mientras que el crecimiento económico y la calidad de la gobernanza tienen efectos positivos y significativos a largo plazo. Los términos de intercambio tienen un impacto positivo a corto plazo, lo que indica una influencia limitada a largo plazo en los precios mundiales de las materias primas. Los aranceles reducen el desempeño comercial, mientras que el desarrollo de infraestructura lo mejora. Los resultados de causalidad de Granger confirman las relaciones bidireccionales entre el comercio y el PIB, destacando la interdependencia del comercio y los indicadores macroeconómicos. El estudio concluye que mejorar la eficacia institucional, la estabilidad macroeconómica y las reformas estructurales es crucial para optimizar el desempeño comercial. Las recomendaciones de política incluyen fortalecer la gobernanza, invertir en infraestructura, promover la diversificación de las exportaciones y mantener un tipo de cambio competitivo.

Palabras clave: Crecimiento económico, Términos de intercambio, Desempeño comercial, Modelo de Gravedad Aumentada, Hipótesis de Prebisch-Singer, ARDL, Tanzania.

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Introduction

International trade is widely regarded as a key driver of economic development, particularly for developing nations seeking sustained growth, industrialization, and poverty reduction (Mota et al., 2021). The dynamics of trade performance are influenced by several macroeconomic factors, including economic growth, terms of trade (ToT), infrastructure quality, and trade policies (Krugman & Obstfeld, 2004). Favorable ToT allows countries to import more for a given level of exports, thereby stimulating production, improving current account balances, and enhancing overall trade performance (Di Pace et al., 2025). However, when ToT deteriorates, countries may face constrained foreign exchange earnings, inflationary pressures, and trade imbalances, negatively affecting trade performance (Sauti, 2018).

Africa's trade performance has been hindered by heavy reliance on primary commodity exports, vulnerability to global price fluctuations, and structural trade deficits, with the continent's share in global trade remaining under 3% (UNCTAD, 2020). Despite these challenges, lowering tariffs, increasing competitiveness, and lowering reliance on outside parties, initiatives like the African Free Trade Area aim to improve intra-African commerce. Research highlights the potential of regional integration to boost trade and mitigate Africa's vulnerability to external shocks (UNCTAD, 2020). However, Africa's reliance on primary exports and their inelastic demand in global markets continues to impede its trade growth, limiting the continent's ability to transition into a more diversified and resilient trading economy (Chindengwike, 2023; Mchukwa et al., 2025).

Tanzania has experienced moderate and stable economic growth over the past decade, with real GDP growth averaging 6-7% pre-COVID, and rebounding to 5.45% in 2024 (World Bank, 2024). The country has also seen improvements in export performance, particularly in gold, tourism, and agricultural products. These positive developments are supported by enhanced infrastructure, such as the Standard Gauge Railway, port expansions, and policy reforms that have improved the business environment. In 2024, Tanzania's exportable goods and services increased from USD 13,980.3 million in 2023 to USD 16,093.1 million, a 15.1% increase. The country's terms of trade improved significantly between 2015 and 2021, rising from 100% to 121%, largely driven by favorable global commodity prices and sound macroeconomic policies (Bank of Tanzania, 2025; National Bureau of Statistics [NBS], 2024).

Despite some encouraging developments, Tanzania's trade performance remains constrained by deep-rooted challenges. Structural trade imbalances, external vulnerabilities, and an overreliance on primary commodity exports continue to hinder sustainable trade growth (Utouh, 2024). At the same time, the government has taken notable steps such as revising the National Trade Policy in 2023, engaging in the African Continental Free Trade Area (AfCFTA), and investing in infrastructure to reduce trade costs and boost competitiveness (URT, 2024). These measures have yet to yield a significant transformation. Notably, trade's contribution to GDP remains modest, accounting for only 26% in 2023, which signals persistent inefficiencies and underperformance in the trade sector (NBS, 2024).

Previous studies have focused on isolated aspects of trade performance, such as the relationship between trade and growth (Sauti, 2018; Misati, 2021; Utouh, 2024; Utouh & Tile, 2024), trade openness and foreign direct investment, and macroeconomic stability (Chindengwike, 2023; Magai, 2021). However, the role of terms of trade has often been overlooked, despite its importance in shaping trade performance. Additionally, factors such as infrastructure quality, government quality, and tariff rates, which play a key role in trade dynamics, have not been adequately explored in Tanzania (Utouh 2024; Magai, 2021; Utouh, 2025; Misati & Ngoka, 2021).

This study aims to close this gap by concentrating on the following goals:

i. To analyze the effect of economic expansion and terms of trade on trade performance

ii. To investigate the causal connection between trade performance, economic growth, and terms of trade.

This study provides empirical insights into the dynamic relationship between terms of trade, economic growth, and trade performance in Tanzania, addressing a gap in the existing literature. The findings can inform policymakers in formulating trade policies aligned with macroeconomic objectives to strengthen regional trade among developing economies. Additionally, the results offer a reference point for future research on trade performance and the potential impacts of international trade policies within trading blocs, supporting evidence-based decision-making and contributing to the broader understanding of economic development.

Literature review & hypothesis development

Empirical Review

There are many different viewpoints in this complex field of study about the connection between terms of trade, economic expansion, and trade performance. One dominant theme is export diversification. Carrasco and Tovar-Garcíaet (2021) argue that diversification away from primary commodities enhances economic resilience, positioning countries to withstand external shocks. They employ panel data analysis to show that diversified export portfolios lead to improved stability and progress. Similarly, Mota et al. (2021) support this by emphasizing the effectiveness of export promotion programs, using cross-country analysis to demonstrate how these programs help countries transition to value-added exports and improve competitiveness.

In contrast, Shahzad et al. (2023) and Singh (2023) suggest that terms of trade (ToT), even without diversification, can drive growth. Shahzad et al. (2023) use time-series analysis to find that favorable ToT significantly boosts U.S. economic performance. Singh (2023) supports this for India, finding that positive ToT contributes to growth, even with limited export diversification. This underscores the significant role global commodity price changes play in shaping national economic outcomes.

On the other hand, Abreo et al. (2021) and Omoke and Opuala-Charles (2021) argue that strong institutions improve trade by lowering transaction costs and fostering stability. Abreo et al. (2021) use cross-country analysis to show that effective governance enhances export performance, while Omoke and Opuala-Charles (2021) find that institutional quality amplifies the benefits of trade openness in Nigeria through econometric modeling. However, Mwatu (2022) argues that the positive effects of institutions on export performance may not always translate into broad economic growth, as seen at the firm level in Kenya, based on firm-level data analysis.

Conversely, Di Pace et al. (2025) argued that positive ToT shocks benefit developing countries, while negative shocks exacerbate vulnerabilities. Di Pace et al. (2025) apply SVAR modeling to show the differential impact of ToT shocks. Utouh (2024, 2025) further supports this by showing mixed effects of trade liberalization in Tanzania, using time-series analysis to highlight that some industries benefit from favorable ToT, while others struggle due to global price fluctuations.

Nguse et al. (2021) and Mesagan et al. (2022) found that exchange rate fluctuations undermine trade stability, especially for export-dependent countries like Ethiopia. Their findings, based on econometric models, show that volatility creates uncertainty, affecting trade outcomes. However, Mazengia et al. (2023) argue that financial development can help mitigate these negative effects, using the ARDL approach to demonstrate how access to finance and stable markets support exporters in managing exchange rate risks.

In a different eye, Utouh (2024, 2025) and Misati & Ngoka (2021). They argue that regional integration, particularly within the East African Community (EAC), enhances market access and reduces trade barriers, fostering economic growth. Utouh (2024, 2025) highlights the benefits of

cross-border trade using time-series analysis, demonstrating new economic opportunities in East Africa. However, Stern and Ramkolowan (2021) caution that regional integration in Southern Africa has not reached its full potential due to persistent barriers like poor infrastructure, as seen in their data analysis of South Africa's trade policy.

There remains a significant gap in research exploring the specific link between terms of trade (ToT), economic expansion, and trade performance. While numerous studies have analyzed the impacts of trade liberalization, foreign direct investment (FDI), institutional quality, and regional integration on export performance and economic growth, they often overlook this particular relationship. Moreover, these studies typically fail to account for critical variables such as infrastructure quality, the effectiveness of governance, and trade policy. This study is therefore at the right pace to bridge these gaps.

Theoretical Foundations

Prebisch-Singer Hypothesis

The Prebisch-Singer Hypothesis, developed by Raúl Prebisch and Hans Singer (1950), argues that the terms of trade (ToT) for developing countries tend to deteriorate over time relative to developed nations (Jahan et al., 2021). The hypothesis assumes that primary commodities, mainly exported by developing countries, experience a long-term price decline, while manufactured goods from industrialized nations tend to rise. This imbalance requires developing nations to export more to maintain the same level of imports, hindering their economic growth (Toye &Toye, 2003). This theory is highly relevant to Tanzania, as its reliance on commodity exports makes it vulnerable to fluctuating prices, which directly impact its trade performance and long-term development.

H1: Terms of trade do not influence the trade performance.

H2: Economic growth has a significant positive effect on trade performance

Augmented Gravity Model

The gravity model of trade, originally developed by Jan Tinbergen in 1962, explains trade flows based on the economic sizes of two countries and the distance between them. It draws an analogy from Newton's law of gravity, where trade is expected to increase with a country's economic mass (GDP) and decrease with distance-related barriers (Abbas et al., 2025). Over time, the new or augmented gravity model has been used by economists like Anderson and van Wincoop (2003) to incorporate additional variables beyond just GDP and distance, such as tariff rates, exchange rates, infrastructure quality, institutional strength, and government effectiveness (Shurong et al., 2024). These enhancements allow the model to capture the complex determinants of trade. In this study, the gravity model underpins the analysis by providing a framework through which factors like economic growth, infrastructure, government quality, and trade policy (tariffs) are examined for their influence on trade performance.

H3: There is no granger causation between economic performance, terms of trade, and trade.

H4: Infrastructure quality, exchange rates, tariff rates, and government quality do not improve trade

Conceptual Framework

The conceptual framework explains that Tanzania's trade performance is driven by six key factors: economic growth, terms of trade, infrastructure quality, exchange rate movements, government quality, and tariff rates. Economic growth boosts production and exports, while favorable terms of trade increase export earnings. Good infrastructure and strong institutions reduce trade costs and improve efficiency, whereas the exchange rate affects export competitiveness. Tariff rates influence the ease of trading across borders. Together, these variables interact to determine

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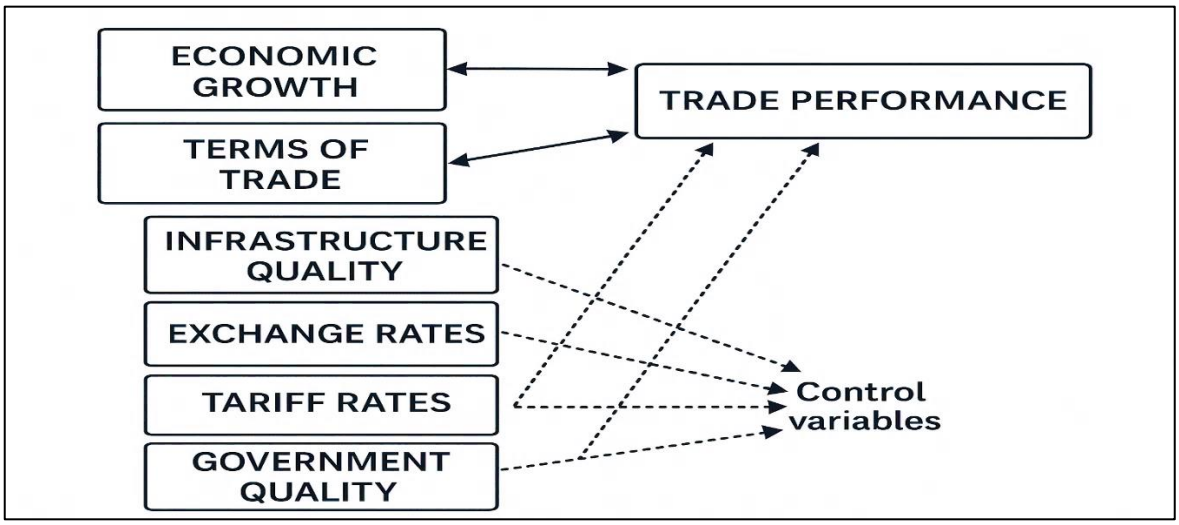
overall trade performance.

Figure 1: Conceptual Framework



Source: Author's Design (2025)

Materials and methods

Data Sources and Types

The study utilized a chronological series of data sourced from reputable databases of the National Bureau of Statistics (NBS) and World Bank (WB) that covered 37 years, from 1987 to 2023. These databases are worth rusting due to the data validations and cleaning process to ensure that the results are more robust and reliable (Mbwambo et al., 2024).

Research Design

This study adopts statistical design supported by an econometric model, which enables the systematic collection, analysis, and interpretation of data to examine the relationships between variables (Mchukwa et al., 2025; Mbwambo & Dimoso, 2025). The econometric model provides a quantitative framework for testing hypotheses, estimating parameters, and identifying both short and prolonged dynamics, ensuring objectivity, reliability, and validity in the research findings (Utouh, 2024).

Econometric model

Model Selection and Justification

This study examines the short- and long-run relationships between Tanzania's trade performance and key macroeconomic variables by employing the Autoregressive Distributed Lag (ARDL) bounds testing methodology, as outlined by Pesaran et al. (2001); Mbwambo et al. (2024) and Mbwambo & Dimoso (2025). The ARDL model works well with time series data that has variables integrated of mixed orders I(0) and I(1), as long as none of them are I(2). Its ability to estimate dynamic short- and long-term interactions within a single framework, robustness in small

samples, and flexibility in managing different integration levels are some of its main benefits (Mbwambo et al., 2024).

ARDL Estimation

A number of crucial processes are included in the ARDL estimate process. Since ARDL is only valid for variables that are integrated of order one and zero, it starts with a unit root test (ADF or PP tests) to make sure none of the variables are integrated of order two I(2) (Pesaran et al., 2001). Second, information criteria (such as AIC or SBC) are employed to identify the appropriate lag length. Third, the Least Squares method is used to approximate the ARDL model. Fourth, the Pesaran boundaries testing Approach is used to compare the F-statistic to key boundary values to determine whether a long-term association exists (Pesaran et al., 2001). To capture short-term dynamics and the speed of adjustment toward equilibrium, the fifth step involves estimating the long-run coefficients and constructing the Error Correction Model (ECM) if cointegration is verified (Mbwambo et al., 2024). To confirm the model's dependability, it is lastly put through diagnostic and stability tests

Unit Root

The ADF is conducted to ensure that all variables exhibit stationarity before estimating the ARDL model. The formula for the ADF test is as follows:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-1} + \varepsilon_t \qquad (1)$$

Where: *Yt* is the variable under consideration (TRADE, GDP, TOT, OER, INFQ, TARI, GOVT); Δ denotes the first difference operator; *t* is a deterministic time trend; γ is the coefficient of interest; δi There are lagged difference terms to control for serial correlation; *εt* is the error term.

The null hypothesis, *H*0: γ=0, indicates non-stationarity or the existence of a unit root. If this hypothesis is disallowed, the variable is considered stationary at level I(0); otherwise, it may attain stationarity after first differencing, denoted as I(1).

Lag Length Selection

Once the order of integration is confirmed, the optimal lag length for the ARDL is selected using criteria such as the Schwarz Bayesian Criterion (SBC) and the Akaike Information Criterion (AIC). The information criterion's value is minimized as the basis for the lag selection

$$AIC(z) = \ln\left(\frac{SSRz}{V}\right) + \frac{2Z}{V},\ SBC(z) = \ln\left(\frac{SSRz}{V}\right) + \frac{Zln(M)}{V} \qquad (2)$$

Where: *SSR* =sum of residual squares at lag z, *V* =observations, and z is the estimated

parameters. The lag length with the lowest AIC or SBC is selected for the ARDL model.

3.3.5 ARDL Model Specification

The ARDL (r, s_1, s_2, ..., s_6) model for this study is specified as:

$$\Delta lnTRADE_t = \alpha_0 + \sum_{i=1}^{r} \alpha 1^i \Delta lnTRADE_{t-1} + \sum_{j=0}^{s1} \emptyset_1^j \Delta lnGDP_{t-j} + \sum_{k=0}^{s2} \emptyset_2^k \Delta lnTOT_{t-k} + \sum_{l=0}^{s3} \emptyset_3^l \Delta lnOER_{t-l} + \sum_{m=0}^{s4} \emptyset_4^m \Delta lnINFQ_{t-m} + \sum_{n=0}^{s5} \emptyset_5^n \Delta lnTARI_{t-n} \sum_{p=0}^{s6} \emptyset_6^p \Delta lnGOVT_{t-P} + \beta_1 lnTRADE_{t-1} + \beta_2 lnGDP_{t-1} + \beta_3 lnTOT_{t-1} + \beta_4 lnOER_{t-1} + \beta_5 lnINFQ_{t-1} + \beta_6 lnTARI_{t-1} + \beta_7 lnGOVT_{t-1} + \varepsilon_t \quad (3)$$

Where, α0 is the constant term; Δ represents the first-difference operator; $\emptyset_{ij}$ denote the short-run dynamic coefficients; β_i indicate the sustained coefficients; and ε_t refers to the error term.

Bounds Testing for Cointegration

The ARDL Bounds test is applied to examine if there exists a sustained relationship between the vector of variables

H0: $\beta_1 = \beta_2 \ldots\ldots\ldots = \beta_7$ (No long-run relationship)

H1: At least one $\beta_i \neq 0$ (Long-run relationship exists)

If the computed F-statistic exceeds the critical value of the upper bound provided by Pesaran et al. (2001), the null hypothesis is rejected, indicating the presence of cointegration.

Estimation of Long-Term and Short-Term Models

The long-run coefficients are taken out of the ARDL model when cointegration has been verified (Mbwambo & Dimoso, 2025). The error correction term captures the short-term dynamics:

$$\Delta lnTRADE_t = \delta_0 + \sum_{i=1}^{r} \delta 1^i \Delta lnTRADE_{t-1} + \sum_{j=0}^{s1} \theta_1^j \Delta lnGDP_{t-j} + \sum_{k=0}^{s2} \theta_2^k \Delta lnTOT_{t-k} + \cdots\ldots\ldots\ldots\ldots + \sum_{p=0}^{s6} \emptyset_6^p \Delta lnGOVT_{t-P} + \varphi ECM_{t-1} + V_t \quad (4)$$

Where: V_t indicates the random disturbance term, φ captures the adjustment speed toward equilibrium in the long run, and ECM stands for the lagged term representing deviations from the established long-run relationship.

Diagnostic and Stability Tests

The following diagnostic procedures are tested to guarantee the robustness of the estimated ARDL model: The Durbin-Watson statistic is employed to detect serial correlation; the Breusch-Pagan-Godfrey test is used to assess heteroscedasticity; the Jarque-Bera test evaluates the normality of residuals; and model stability is examined using the Cumulative Sum of Squares (CUSUMSQ) tests (Mbwambo et al., 2024).

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Results and discussion

Variable Description

Table 1: Definition and Measurement

Variable	Description	Dimension/measurement	Data Source
TRADE	Trade performance	Trade % of GDP	WB
TOT	Terms of trade	The ratio between the import and export price indices	WB
GDP	Economic growth	GDP per capita (current USD)	WB
OER	Official exchange rate	Official exchange rate, stated as the number of domestic currency units equivalent to one US dollar	NBS
GOVT	Government quality	Measures the effectiveness, transparency, and accountability of a country's institutions	WB
INFQ	Infrastructure quality	Composite index (transport, energy, ICT)	WB
TARI	Tariff rate	Average applied tariff (%)	NBS

This study employs seven key variables to examine trade performance in Tanzania. Trade performance (TRADE) is measured by its contribution to GDP growth, while TOT is represented by the ratio of the import and export price indices. Economic growth (GDP) is captured through GDP per capita in current USD. The official exchange rate (OER) reflects the units of local currency per US dollar, sourced from the National Bureau of Statistics (NBS). Government quality (GOVT) assesses institutional effectiveness, transparency, and accountability. Infrastructure quality (INFQ) is measured using a composite index of transport, energy, and ICT services, which were sourced from the World Bank (WB). Lastly, tariff rate (TARI) is the average applied tariff percentage sourced from NBS.

Summary Statistics

Table 2: Overview of Summary Statistics

Variable	*Observ.*	*Average*	*Standard dev*	*Minimum*	*Maximum*
lnTRADE	*37*	*3.2434*	*0.2880*	*2.6963*	*3.8027*
lnTOT	*37*	*4.3652*	*0.2368*	*4.0739*	*4.8028*
lnGDP	*37*	*6.2742*	*0.5638*	*5.4138*	*7.1103*
lnOER	*37*	*6.7758*	*0.9457*	*4.1629*	*7.8200*
lnGOVT	*37*	*3.5787*	*0.2347*	*3.1892*	*4.0267*
lnINFQ	*37*	*10.7021*	*1.4494*	*8.2855*	*13.4187*
lnTARI	*37*	*3.6792*	*0.1556*	*3.5967*	*4.1956*

Table 2 depict the immediate statistics for the variables used in the study. The trade performance variable (lnTRADE) has an average value of 3.2434 and deviation of 0.2880, signifying notable fluctuations over time. The minimum observed value for lnTRADE is 2.6963, while the maximum reaches 3.8027. Understanding the dynamic linkages in the dataset requires that other variables, including GDP per capita (lnGDP), INFQ, TARI, terms of trade (lnTOT), and government quality (lnGOVT), also display fluctuation with reasonable standard errors. This guarantees the reliable and unbiased estimation

Unit root

The ADF test was carried out for the stationarity assumption to fit the ARDL model estimation and avoid spurious results

Table 3: Augmented Dickey-Fuller Test for Stationarity (Level)

Variable	*t-statistics*	*Crit. Value at 5%*	*Crit. value at 5%*	*Crit. Value at 10%*	*Decision*
lnTRADE	*-2.006*	*-3.675*	*-2.969*	*-2.617*	*Not stationary*
lnTOT	*-0.770*	*-3.675*	*-2.969*	*-2.617*	*Not stationary*
lnGDP	*0.479*	*-3.675*	*-2.969*	*-2.617*	*Not stationary*
lnOER	*-9.076****	*-3.675*	*-2.969*	*-2.617*	*Stationary*
lnGOVT	*-2.142*	*-3.675*	*-2.969*	*-2.617*	*Not stationary*

lnINFQ	*-0.843*	*-3.675*	*-2.969*	*-2.617*	*Not stationary*
lnTARI	*-4.921****	*-3.675*	*-2.969*	*-2.617*	*Stationary*

*Notes ***p<0.01*

The Augmented Dickey-Fuller (ADF) test was applied to assess whether the variables are stationary. The majority of the variables (TRADE, TOT, GDP, GOVT, and INFQ) were non-stationary at the level, as indicated in Table 3, but became stationary at the first difference, as indicated in Table 4. The only two that were stationary at the level were TARI and OER. The ARDL technique, which can include variables of multiple integration orders as long as none are I(2), is satisfied by a mix of I(0) and I(1) variables.

Table 4: Augmented Dickey Fuller Results (First Differencing)

Variable	*T-Statistic*	*1% Crit. Value*	*5% Crit.Value*	*10% Crit. Value*	*Decision*
$\Delta lnTRADE$	*-4.389****	*-3.682*	*-2.972*	*-2.618*	*Stationary*
$\Delta lnTOT$	*-5.664****	*-3.682*	*-2.972*	*-2.618*	*Stationary*
$\Delta lnGDP$	*-3.855****	*-3.682*	*-2.972*	*-2.618*	*Stationary*
$\Delta lnOER$	*-3.439****	*-3.682*	*-2.972*	*-2.618*	*Stationary*
$\Delta lnGOVT$	*-4.888****	*-3.682*	*-2.972*	*-2.618*	*Stationary*
$\Delta lnINFQ$	*-7.119****	*-3.682*	*-2.972*	*-2.618*	*Stationary*
$\Delta lnTARI$	*-9.900****	*-3.682*	*-2.972*	*-2.618*	*Stationary*

*Note: *** p<0.01*

Lag Selection

The appropriate lag length for the ARDL model was three was chosen as the ideal by all criteria (*Table 5*). The efficient capturing of the dynamic interactions and delayed impacts of explanatory variables on trade performance is ensured by the use of an appropriate lag span.

Table 5: VAR lag results

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	62.7093	–	8.1e-11	-3.3763	-3.2695	-3.0589
1	289.4250	453.4300	1.8e-15	-14.1470	-13.2925	-11.6074
2	362.1720	145.5000	6.6e-16	-15.5862	-13.9841	-10.8246
3	489.6650*	254.9900*	2.4e-17*	-20.3434*	-17.9936*	-13.3597*
4	.	.	-5.5e-62*	.	.	.

*Note: * optimal lag selected by the criterion*

Bounds Test for Cointegration

The bounds testing approach to cointegration was conducted using the F-statistic approach proposed by Pesaran et al. (2001). As shown in Table 6, the F-statistic value of 10.134 is higher than the critical values at the 1%, 5%, and 10% significance levels. This means there is strong proof that trade performance and the chosen economic factors move together over the long term. So, we can confidently reject the idea that there is no long-term connection between them.

Table 6: ARDL Bound (Pesaran/Shin/Smith (2001))

	Significant Level	Lower Bound	Upper Bound
$F\ statistics = 10.134$	10%	2.12	3.23
	5%	2.45	3.61
	2.5%	2.75	3.99
	1%	3.15	4.43

H0: No link between levels; reject if test statistics exceeds upper bound threshold

Short-Term Relationships

The short-run coefficients obtained from the ARDL model in *Table 7*. A number of variables were determined to be statistically significant, including: The ARDL model's short-run estimation findings show several statistically significant correlations. First off, in the short term,

conditions of trade significantly and favorably affect trade performance. In particular, trade performance rises by about 0.73% for every 1% improvement in terms of trade. Likewise, there is a positive and robust correlation between economic progress and trade, presenting that a 1% rise in GDP per capita improves trade performance by roughly 1.34%. Additionally, the official exchange rate has a notable and advantageous short-term impact. This indicates that exchange rate depreciation promotes trade competitiveness by making exports more affordable in global markets. Furthermore, there is a positive lag of government quality, suggesting that better institutional quality fosters favorable trade and investment conditions. However, in the near term, neither the contemporaneous nor the first-lag values of trade openness nor the quality of the infrastructure are statistically significant. The lagged dependent variable, which captures inertia effects in the trade dynamics, is significant at the 10% level, suggesting that past trade performance levels have a slight but enduring impact on current trade performance.

Table 7: Short-Run ARDL Estimates

Variable	*Coef.*	*Standard error*	*t-Statistic*	*p-Value*
LD. lnTRADE	*0.2461**	*0.1365*	*1.80*	*0.090*
D1.lnTOT	*0.7320****	*0.2148*	*3.41*	*0.004*
D1. lnGDP	*1.3380****	*0.4119*	*3.25*	*0.005*
D1.lnOER	*1.5321****	*0.4107*	*3.73*	*0.002*
LD. lnGOVT	*-0.1850*	*0.1440*	*-1.28*	*0.217*
L2D.lnGOVT	*0.2934****	*0.0793*	*3.70*	*0.002*
D1. lnINFQ	*-0.0268*	*0.0208*	*-1.29*	*0.216*
Const.	*-0.0840*	*0.6781*	*-0.12*	*0.903*

*Notes: *** p<0.01, **p<0.05, *p<0.1*

Long-run Estimates

The long-run ARDL estimation in *Table 8* reveals that Government quality has a strong positive impact on trade performance, with a 1% improvement leading to a 0.85% increase in trade. Economic expansion also demonstrates a positive and significant effect, supporting the notion that expanding economies engage more in trade. Conversely, the official exchange rate has a significant negative effect, suggesting that currency appreciation undermines export competitiveness. Infrastructure quality presents a positive but marginally significant impact, indicating that better infrastructure supports trade. Tariffs negatively affect trade, albeit weakly, by increasing transaction costs. Terms of trade are not statistically significant in the long run. The error correction term is significantly negative, confirming a stable long-run relationship and indicating that 83.1% of disequilibrium adjusts within one year.

Table 8: Long-Run Coefficients from ARDL Model

Variable	*Coefficient*	*Standard Error*	*t-Statistic*	*p-Value*
ECT	*-0.8310****	*0.2299*	*-3.61*	*0.002*
lnTOT	*-0.1343*	*0.2367*	*-0.57*	*0.578*
lnGDP	*0.3038**	*0.1598*	*1.90*	*0.076*
lnOER	*-0.1950***	*0.0744*	*-2.62*	*0.019*
lnGOVT	*0.8516****	*0.1289*	*6.61*	*0.000*
lnINFQ	*0.0740**	*0.0406*	*1.82*	*0.088*
lnTARI	*-0.1902**	*0.0984*	*-1.93*	*0.071*

*Note: ***p<0.01, ** p<0.05, * p<0.1*

Granger Causation

The pairwise Granger causation tests presented in Table 9 reveal important directional relationships among the variables: Economic growth (GDP), exchange rate (OER), and

infrastructure quality (INFQ) granger-cause trade performance, confirming that these variables have predictive power over trade. Additionally, trade performance Granger-causes both terms of trade and GDP, implying that trade activity contributes to broader macroeconomic performance. Also, government quality, tariff rates, and infrastructure quality influence terms of trade, suggesting that these structural variables affect the balance of trade. Several bidirectional causality relationships exist, particularly between trade performance and GDP, as well as between trade and exchange rate, reinforcing the interdependence among these macroeconomic indicators.

Table 9: Granger-Causality Results

From (Cause)	*To (Effect)*	*Chi2*	*p-value*	*Direction of Cause*
GDP	*TRADE*	*7.73*	*0.021*	*GDP → TRADE*
OER	*TRADE*	*7.16*	*0.028*	*OER → TRADE*
INFQ	*TRADE*	*9.89*	*0.007*	*INFQ → TRADE*
TRADE	*TOT*	*12.86*	*0.002*	*TRADE → TOT*
GDP	*TOT*	*14.86*	*0.001*	*GDP → TOT*
OER	*TOT*	*15.08*	*0.001*	*OER → TOT*
GOVT	*TOT*	*13.45*	*0.001*	*GOVT → TOT*
INFQ	*TOT*	*7.79*	*0.020*	*INFQ → TOT*
TARI	*TOT*	*7.62*	*0.022*	*TARI → TOT*
TRADE	*GDP*	*18.94*	*0.000*	*TRADE → GDP*
TOT	*GDP*	*23.37*	*0.000*	*TOT → GDP*
OER	*GDP*	*22.71*	*0.000*	*OER → GDP*
GOVT	*GDP*	*25.58*	*0.000*	*GOVT → GDP*
TRADE	*OER*	*19.88*	*0.000*	*TRADE → OER*
TOT	*OER*	*9.32*	*0.009*	*TOT → OER*
GDP	*OER*	*11.87*	*0.003*	*GDP → OER*
GOVT	*OER*	*17.99*	*0.000*	*GOVT → OER*
TRADE	*GOVT*	*9.31*	*0.009*	*TRADE → GOVT*
INFQ	*GOVT*	*14.31*	*0.001*	*INFQ → GOVT*

Autocorrelation

The Durbin-Watson (DW) statistic in Table 10 was used to test for autocorrelation in the residuals. Near the optimal value of 2, the DW value of 1.7763 was attained. This shows no autocorrelation. The precision of coefficient estimates and the general trustworthiness of the model depend on the residuals being independent over time.

Table 10: Autocorrelation test

Test for Autocorrelation	*Statistic*
Durbin-Watson d-statistic	*(17, 33) = 1.7763*

Heteroscedasticity

The LM-decomposition of skewness and kurtosis supports the homoscedasticity (constant variance of the error term) implied by the White test's p-value of 0.4180, which is more than 0.05. Therefore, the model maintains a constant variance across time (Table 11).

Table 11: Heteroscedasticity test

White test	$\boldsymbol{Chi2(32) = 33.00}$ $\boldsymbol{Prob > chi2 = 0.4180}$		
LM decomposition test			
Source	Chi2	df	p-value
Skewness Test	19.92	16	0.2238
Kurtosis Test	2.69	1	0.1010
Joint	55.61	49	0.2399

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Normality

The p-value for the Jarque-Bera test in Table 12 is 0.0777, no evidence to reject the null. As a result, the residuals follow normal assumptions, meeting the fundamental requirements for the regression model's validity and guaranteeing objective and effective estimators.

Table 12: Normality test (Jarque Bera)

Variable	Observ.	p-skewness	p-kurtosis	Adj chi2	prob>chi2
Resid	33	0.0745	0.1523	5.11	0.0777

Parameter stability

The Cumulative Sum (CUSUM) test was used to evaluate the mode's parameter constancy during the sample time. The results indicate test statistic remained within the 1%, 5%, and 10% critical bounds, confirming the absence of structural breaks in the estimated coefficients. This implies that the relationship between trade performance and its macroeconomic determinants remained stable throughout the study time, thereby strengthening the dependability and consistency of the ARDL model's estimations

Table 13: Cumulative Sum (CUSUM) Test for Parameter Stability

Test Type	Test Statistic	1%	5%	10%	Conclusion
Recursive	0.3696	1.1430	0.9479	0.8499	No structural break detected

CUSUM of Squares Plot

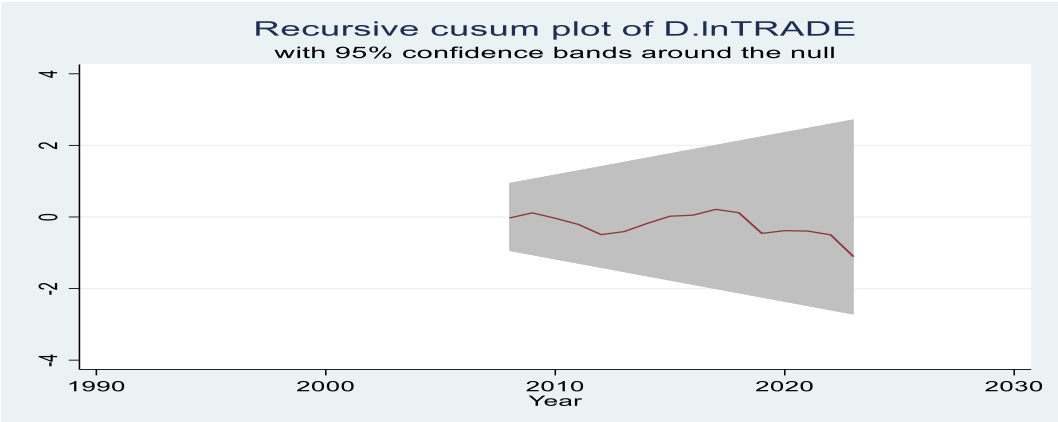

Figure 2: Cusum of square plot

Source: Author's Computation (2025)

Discussion

The study's findings reveal that government quality, economic growth, exchange rates, infrastructure, and tariff rates significantly influence trade performance in Tanzania. Government quality had the strongest positive long-term effect, supporting the findings of Abreo et al. (2021) and Omoke & Opuala-Charles (2021), who emphasized the role of institutional strength in enhancing trade through reduced transaction costs and improved governance. Similarly, the positive impact of economic growth on trade aligns with studies by Utouh & Tile (2024) and Sauti (2018), which found that expanding economies tend to engage more in international trade. In the short run, terms of trade (ToT) have a significant positive effect on trade, consistent with Shahzad et al. (2023) and Singh (2023), who have shown that favorable ToT boosts trade and economic performance. The exchange rate also showed mixed effects, positive in the short run and negative in the long run, echoing the findings of Nguse et al. (2021) and Mesagan et al. (2022), who noted that exchange rate volatility and appreciation harm export competitiveness. Infrastructure quality showed a marginally significant effect, consistent with Misati & Ngoka (2021) and Stern &

Ramkolowan (2021), who observed that poor infrastructure limits trade potential in Sub-Saharan Africa.

However, the findings diverge from some studies. For example, Carrasco and Tovar-García (2021) and Mota et al. (2021) found that long-term improvements in terms of trade and export diversification lead to sustained trade performance gains, a result not strongly supported in this study. Additionally, while Mwatu (2022) found that institutional improvements enhance firm-level exports but don't necessarily translate into macro-level trade growth, this study suggests that institutional quality does, in fact, significantly affect national trade performance. The Granger causality results also revealed strong bidirectional and unidirectional causal relationships, especially between trade performance, GDP, and exchange rates, confirming the dynamic interplay among macroeconomic variables (Jahan et al, 2021; Di Pace et al., 2025). Overall, the results validate the augmented gravity model's claim that institutional and economic factors play a crucial role in trade outcomes, support the study's hypotheses, and add context-specific evidence from Tanzania to the body of existing information.

Conclusion

This research explored the link between economic growth, terms of trade, and trade performance in Tanzania using the ARDL bounds testing method and data from 1987 to 2023. The findings show that government quality and economic growth exert a substantial and positive influence on trade performance in the longer term, highlighting the importance of strong institutions and sustained economic expansion in enhancing trade outcomes. While terms of trade had a positive influence on trade in the near term, their long-term effect was statistically insignificant, suggesting that Tanzania's reliance on primary commodity exports may limit the long-term benefits of favorable trade prices. Exchange rate movements showed mixed effects, supporting trade in the short run through depreciation but negatively affecting it when appreciation occurs over time. Infrastructure quality and tariff rates also played meaningful roles, with infrastructure positively influencing trade marginally, and higher tariffs exerting a suppressive effect. The findings support the augmented gravity model's relevance in explaining trade dynamics in developing countries like Tanzania. They align with global research emphasizing the role of macroeconomic stability, strong institutions, and structural reforms in enhancing trade. However, the limited sustained impact of terms of trade reflects the challenges faced by commodity-dependent economies. The study highlights the need for policies that improve institutional quality, infrastructure, export diversification, and exchange rate management to boost Tanzania's trade performance and long-term resilience.

Theoretical Implications

The findings of this study contribute to trade and growth theory in several ways. First, the results support classical and modern trade theories such as the Prebisch-Singer hypothesis and the augmented gravity model by demonstrating that terms of trade, economic growth, and institutional factors jointly shape trade performance in developing economies. The study also reinforces the theoretical view that macroeconomic fundamentals and institutional quality are critical determinants of trade outcomes. Secondly, the study expands the theoretical understanding of how long-run and short-run adjustments occur in small open economies, thereby contributing to the broader literature on international economics and development.

Practical Implications

The study offers several policy-relevant insights for improving Tanzania's trade performance. First, the strong link between economic growth and trade outcomes suggests that policies promoting industrialization, productivity growth, and value addition can enhance export competitiveness. Second, the significance of terms of trade signals the need for diversification away

from primary commodities toward higher-value manufactured and processed goods. Third, the role of institutional quality highlights the importance of strengthening governance, streamlining regulations, and enhancing policy stability to reduce trade costs. Fourth, improvements in infrastructure such as transport networks, energy supply, and port efficiency can facilitate smoother trade flows. Finally, the influence of macroeconomic indicators such as the exchange rate and tariff policies underscores the need for sound fiscal and monetary management to maintain competitiveness and support sustainable trade growth. Together, these implications provide actionable guidance for policymakers seeking to boost Tanzania's participation in regional and global markets.

Limitations

This study is subject to several limitations that should be acknowledged. First, it relies solely on secondary time-series data from the World Bank and the National Bureau of Statistics, which may contain measurement inconsistencies or revisions that could affect the precision of the results. Second, although the ARDL model is appropriate for variables with mixed integration orders, it does not fully capture potential structural breaks, nonlinear dynamics, or regime shifts that may characterize Tanzania's trade patterns over the long study period. Despite these limitations, the study offers valuable empirical evidence by integrating key macroeconomic and institutional variables that have been underexplored in the Tanzanian context. Its findings contribute to the existing body of knowledge by providing a comprehensive assessment of the interplay between economic growth, terms of trade, and trade performance, and by offering policy-relevant insights

Future Research

Future research can build upon the findings of this study in several important ways. First, incorporating sector-specific analyses, particularly in agriculture, manufacturing, and mining, would provide deeper insights into how trade determinants affect different segments of the economy. Second, future studies could employ advanced econometric approaches such as nonlinear ARDL, threshold models, or structural break tests to capture potential regime shifts and nonlinearities in Tanzania's trade dynamics. Lastly, comparative studies across East African Community (EAC) member states could help identify regional patterns and shared constraints affecting trade outcomes.

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