EFFECT OF EXCHANGE RATES AND TARIFFS ON TERMS OF TRADE IN KENYA

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ABSTRACT

Purpose – This study investigates the effect of exchange rates and tariffs on Kenya's terms of trade (ToT) between 2001 and 2021. It addresses a gap in empirical literature concerning the interaction between these trade variables and ToT, particularly in the context of Kenya's structural economic transitions and exposure to external shocks.

Methodology – An explanatory research design was adopted using annual time series data. The study applied the Autoregressive Distributed Lag (ARDL) model and Toda-Yamamoto Granger causality testing to evaluate both the short-run and long-run impacts of exchange rates, tariffs, exports, and imports on ToT. Diagnostic tests for multicollinearity, normality, and autocorrelation were conducted to validate model robustness.

Findings – Granger causality results indicated that exchange rates, tariffs, exports, and imports significantly influence ToT, with bi-directional causality observed for all except exports. The ARDL model showed strong overall fit (R^2 = 82%) but failed to find statistically significant long-run effects from any single trade variable. In the short run, exchange rate depreciation significantly improved ToT, while import growth had a marginally negative effect. Exports and tariffs demonstrated limited immediate influence despite their predictive relevance.

Conclusion – Kenya's ToT dynamics are most responsive to short-term exchange rate adjustments and import levels, with limited long-run determinacy from individual trade variables. The findings underscore the need for a flexible exchange rate regime, smarter tariff policy aligned with industrial goals, and export diversification. Coordinated macroeconomic and trade strategies are vital for insulating Kenya's trade performance from external volatility and enhancing its global competitiveness.

Keywords: Terms of trade, exchange rates, tariffs, ARDL, Granger Causality
JEL Codes: F14, F31, C32

1. INTRODUCTION

A country's terms of trade (TOT) provide significant information concerning the health of its economy. The ratio of the index of a country's export prices to the index of its import prices is a key indicator of a country's international competitiveness. The terms of trade (ToT) in Kenya, like many developing economies, are significantly influenced by exchange rates and tariffs. These factors play a crucial role in determining the country's export and import performance, economic growth, and overall trade balance. This article explores how exchange rates and tariffs shape Kenya's ToT dynamics, drawing insights from various studies and empirical evidence.

Historically, the newly formed Kenyan government in 1964 inherited a trade and industrial policy from the British which was mainly aimed at import substitution. Manufacturing in Kenya dated as far back as the early twentieth century, but it was minimally developed save for the processing of agricultural goods; the market was severely undermined, and local capital or skilled management was negligible at best. The government began recovery efforts by implementing a policy to attract foreign investors to produce for the domestic and regional market. An influx of multinational corporations such as Union Carbide, Firestone, United Steel, Del Monte, Schweppes, and Lonrho began producing in Kenya (Bigsten, 2002). Protectionism policies were very strict, and many established firms enjoyed near monopolies. Between 1964 and 1969, manufacturing value added increased by 44 percent in real terms (World Bank, 2007); leading sectors that benefited from this included textiles and apparel, food, beverages, and tobacco.

From 1970–1971, Kenya suffered a balance of payments crisis, which was exacerbated by the first oil shock two years later. The government's response to these issues was intensified import-substitution policies; tariffs increased and import licensing

became more severe. Riding on this protection Kenya's manufacturing sector soared; annual growth in the sector averaged over 25 percent between 1971 and 1973 (World Bank, 2007). All through the decade import-substituting manufacturing continued to grow at an impressive rate, and diversified to sectors including plastics, pharmaceuticals, and vehicles.

 A substantial increase in the price of coffee in the late 1970s caused Kenyan exports to improve further, more than quadrupling between 1975 and 1977 (Bevan, Collier, & Gunning, 1999). Another key Kenyan export that was affected by the coffee boom was the price of tea. The coffee boom had a net effect of a 54% increase in Kenya's terms of trade by 1977, the peak year of the boom. This spike in the value of Kenya's commodity exports enabled the government to temporarily avert a foreign exchange shortage, and thus stayed economic reform for a short term (Gertz, 2008).

By 1980, however, the price of coffee had subsided and the earlier gains from trade were reversed. In Kenya, the longest policy regime was the import substitution phase in comparison to the other policy regimes. The policies associated to import substitution brought in mixed results; with high rates of growth being experienced in the industrial and manufacturing sectors during the first decade after independence but without the commensurate creation of jobs. The good performance in the industrial and manufacturing sectors can be attributed to high demand for the goods produced. Kenya's main market for her produce was the neighboring countries of Tanzania and Uganda partly due to the agreement between EAC members. Trade between Kenya and other EAC members was soaring up to the late 70s, and a strong fiscal policy contributed greatly to Kenya's export growth under the EAC common market. (Wagacha M. , 2000)

However, the combined events of Kenya's poor economic performance in the late 70s and the collapse of the EAC in 1977 caused this good growth phase to come to a halt. A major contributor to this poor economic performance was the slowdown in industrial production which became unsustainable due to the small size of the domestic market. The inclination of industrial policies at the time was towards producing specifically for domestic markets, which modeled an inward-looking regime that could not support production. The result was a major slump in job creation and job losses. (Ikiara, Nyunya, & Odhiambo, 2004)

The oil crisis of 1973 also played a major role. It resulted in very high costs of production which exerted pressure on the balance of payments, which in turn made it hard to acquire imported raw materials and equipment. The government was also sorely unprepared to deal with the changes that were happening to the economy and lacked fiscal discipline. With another oil shock following in 1977 and failure to deal favorably with external terms of trade following the coffee boom of the late 70s, the government could only watch its fortunes slipping away.

The government of Kenya began to change tact in the early 1980s; this was partly due to the increasing pressure for structural adjustment reforms. The vision and commitment were directed to a liberalization policy, a major component of which was a shift from import-substitution to export-promotion strategy. This shift was heralded by the *Sessional Paper No.1 of 1986 on Economic Management for Renewed Growth* in which the government committed itself to liberalizing the economy through the adoption of an outward-looking development strategy. But it was a case of too little too late as by this time, Kenyan exports had deteriorated tremendously. Merchandise export earnings as a percentage of GDP had for example declined from 19.6% in the 1970s to 16.97% over 1980- 84 and to 13.6% over 1985-89 (Glenday & Ndii, 2000).

It should be noted however, that during the first half of the 1980s, despite its liberalization rhetoric, the government made only limited attempts to reform the Kenyan economy. The share of imports not subjected to quota restrictions did increase from 24 percent in 1980 to 48 percent and average tariffs decreased by about 8%, but this had little impact on Kenya's trade (Swamy G. , 1994).

The government only followed through on policy reforms when it was compelled to do so by outside pressures, and was quick to abandon liberalization in the face of other economic priorities: in an effort to counter the foreign exchange crisis of 1982–1984, Kenya uniformly raised all tariffs by a full 10 percent (Gertz, 2008).

All efforts notwithstanding, export orientation in the 1980s remained weak mainly due to very high effective rates of protection accorded to domestic industries, exchange rate bias against exports, high cost of imported inputs, foreign exchange controls and administrative delays, high transaction costs that militated against the profitability of exports, among others. In addition, the export incentive schemes remained unattractive and less successful due to weaknesses in implementation and poor coordination (Were, et al, 2002).

In the second half of the 1980s, with continued pressure from donors, Kenya set off on a more concerted and sustained effort at significant trade liberalization. This was highlighted by a shift in import restrictions from quotas to tariffs, and subsequently a decrease in tariff levels. The government embarked on phased tariff reductions and rationalization of the tariff bands in 1990. By 1991, quantitative restrictions affected only 5% of imports compared with 12% in 1987 (Swamy, 1994). Over the 1987-92 period, the number of tariff categories and maximum tariff rates were reduced from 25 to 11 and 170% to 70% respectively (Mwega, 2002).

By 1997/98, the simple average tariff rate had been reduced to 16.2% and the trade weighted tariff rate to 12.8%, down from 25.6% (Glenday & Ndii, 2000). The number of tariff bands (including duty free) was reduced from 15 in 1990/91 to four (4) in

1997/98 and the top regular tariff rate from 100% to 25% over the same period. That notwithstanding, the most significant shift in trade policy regime came in May 1993 with the abolition of trade licensing requirements and more importantly, foreign exchange controls (Were, et al, 2002). Foreign exchange retention schemes for exporters were introduced at a rate of 50% and later increased to 100% in February 1994 (Mwega, 2002).

Kenya's TOT have experienced significant volatility through the years, reflecting the continuously shifting nature of global market conditions and trade policy. In spite of having several policies aimed and boosting trade performance in the country, Kenya's TOT still finds itself vulnerable to external shocks and internal inefficiencies. Fluctuations in exchange rates and evolving tariff policies directly impact relative prices of exports and imports. However, there is limited empirical evidence assessing the interaction of these variables. This knowledge gap causes difficulty in designing evidence-based strategies meant to improve or stabilize TOT. This article therefore seeks to examine the effect of exchange rates and tariffs on Kenya's TOT.

General objective of the study is to examine the effect of exchange rates and tariffs on Kenya's terms of trade, while accounting for the roles of exports and imports. Specific objectives are to determine the short-run and long-run impact of exchange rate fluctuations on Kenya's terms of trade, assess the influence of tariff levels on Kenya's terms of trade, evaluate the role of export performance in shaping the terms of trade, and analyze the effect of import volumes on the terms of trade in Kenya.

Null Hypotheses of the study;

H_{01}: Exchange rates have no significant effect on Kenya's terms of trade.

H_{02}: Tariffs have no significant impact on the terms of trade in Kenya.

H_{03}: Exports do not significantly influence the terms of trade.

H_{04}: Imports do not have a significant effect on the terms of trade.

2. LITERATURE REVIEW

2.1. Empirical Analysis of Exchange Rates and Tariff Policy Changes on Kenya's Terms of Trade

Terms of trade (TOT) are a critical indicator of a country's economic health because they reflect the ratio of export prices to import prices. In Kenya, gaining an in depth understanding of how exchange rates and tariff policies affect TOT. This is especially necessary as a guide for formulating effective trade and economic policies as a potential solution to the country's debt and heavy reliance on foreign aid. This literature review analyses empirical evidence from various studies showing the influence of fluctuations in exchange rates and changes in tariff policies on Kenya's TOT.

The direct impact of TOT on the economic growth of Kenya is well-documented. (Manyinsa, Omwenga, & Ndungu, 2015) found that TOT has a significant positive relationship with GDP growth, indicating that favourable TOT tend to stimulate economic growth. (Matiy & Matundura, 2019) further found that unfavourable TOT has a significant negative impact on manufactured exports, indicating that adverse TOT may lead to economic stagnation or negative economic growth.

Increased trade openness and other trade liberalization policies also have an impact on TOT. (Manyinsa, Omwenga, & Ndungu, 2015) and (Githanga, 2015) suggest that increasing trade openness can improve TOT through increased competitiveness of domestic products and expansion of export markets. It should be noted though, that Kenya's ability to benefit from trade liberalization depends on whether domestic industries within the country have the ability to compete internationally.

2.2. Exchange Rates and Terms of Trade

Kenya's real exchange rate (RER) is subject to significant volatility which disrupts trade balances hence having a ripple effect on TOT. This affects the competitiveness of its exports. (Gachunga, 2018) pointed out that uncertainty in RER has long term adverse effects on exports, while imports remain largely unaffected in the short run. (Nyambariga, 2017) confirmed this by highlighting that analysis of RER displays a significant impact on both exports and imports, with RER showing long-term adverse effects on exports. It is important to note, that the responsiveness of Kenya's exports to changes in the exchange rate has critical influence on terms of trade dynamics in the country. (Umutesi & Gor, 2014) reveal that Kenyan exports are relatively price inelastic, meaning that a depreciation of the exchange rate does not lead to an increase in export volumes, suggesting that RER fluctuations may not significantly improve TOT through an increase in exports.

Further studies have shown that misalignment in the real effective exchange rate (REER) also has an indirect impact on terms of trade in Kenya. (Musyoki, Pokhariyal, & Pundo, 2014) found that a misalignment in REER, characterized by a depreciating trend will negatively impact economic growth which then negatively affects TOT. This can lead to a deterioration in the quality of the country's exports and cause a decline in the competitiveness of domestic products in international markets.

(Nyambariga, 2017) in his study notes that in order for the country to mitigate the adverse effects of exchange rate volatility, more macroeconomic policies aimed at stabilizing the REER should be developed and implemented. Stable exchange rates can improve trade balances and enhance the competitiveness of exports.

2.3. Tariff Policy Changes and Terms of Trade

Various tariff policy changes such as reductions in tariffs have played a key role in Kenya's trade liberalization policies. However, it's impact on TOT has been mixed. (Nzuma & Sarker, 2010) and (Nzuma, 2007) discovered that reductions in tariffs lead to a decrease in prices across various market levels thus increasing consumption but reducing the capacity for domestic production. This causes producer surplus to decline while consumer surplus increases. This indicates that gains from tariff reductions might not offset the losses faced by domestic producers. This is clearly observable in the agricultural sector, where (Nzuma & Sarker, 2010) and (Nzuma, 2007) note that maize exports are significantly impacted by changes in tariff policies, finding that trade openness in the maize sector led to a decline in domestic production due to an influx of cheaper imports in spite of increased consumption. (Chepng'eno, 2018) found that both price and exchange rate volatility in the tea sector affects export demand, with significant implications for TOT.

Inconsistencies in tariff policies also contribute to price volatility in key sectors, with (d'Hôtel, Cotty, & Jayne, 2013) demonstrating that inconsistent tariff adjustments, especially as a response to changes in international prices tend to trigger domestic price volatility, which can disrupt trade balances and have a negative impact on TOT. (Igesa, Okiyama, & Tokunaga, 2018) noted that sector specific interventions are necessary to address the challenges that keys sectors such as agriculture and manufacturing face. Targeted tariff reductions and fiscal policies can protect domestic production while improving welfare in specific industries such as tea and coffee. (d'Hôtel, Cotty, & Jayne, 2013) recommended that policy makers should push for consistent tariff policies because they are essential for improving TOT and reducing price volatility.

The empirical literature review emphasizes the multifaceted relationship between exchange rates, tariff policies, and Kenya's terms of trade. The studies reviewed reveal that volatility in RER and inconsistencies in the application of tariff policies have significant implications for TOT, causing potentially adverse effects on economic growth. To improve TOT, it is necessary for policymakers to focus on strengthening the domestic market which will stabilize exchange rates. This can be achieved through adopting sector- specific interventions which will enhance domestic product competitiveness in international markets, and developing tariff policies which can be consistently applied to strengthen trade balances and TOT.

3. METHODOLOGY

Research Design and Model Fit - This study will use the explanatory research design to explain the effect of exchange rates and tariffs on Kenya's terms of trade. This study seeks to establish the causal relationship between exchange rates and tariffs on Kenya's terms of trade. As such, the target population for this study is the time series data for the dependent and independent variables spanning 2001-2021 in Kenya, with the independent variables of focus being exchange rates, tariffs, exports, and imports with the dependent variable being terms of trade. The target population will be the annual observations of the variables under study.

Data analysis and presentation - This section will define the data analysis and presentation tools meant to be used in the study. Data collected will be analysed using STATA software. The study will use annual time series data for the period 2001 to 2021. This study will utilize a trade performance model to link its terms of trade to its contributing factors. In this case, the output will be terms of trade, measured as the net barter terms of trade index (25=100) and the contributing elements will be exchange rates, tariffs, exports, and imports.

More generally we may write

$$TOT = ER + TR + EX + IM \tag{1}$$

Where TOT: Terms of Trade, ER: Exchange Rates, TR: Tariffs, EX: Exports, IM: Imports

In order to apply function (1) to study the effect of each variable on TOT, an Autoregressive Distributed Lag (ARDL) approach will be used. The function is rewritten as:

$$TOT = \sum_{k=o}^{n} X + \mathcal{E} \tag{2}$$

Where TOT: net barter terms of trade index (25=100), X: Vector of factors that affect TOT, $\mathcal{E}$: Error term, k= 0,1, 2, …, n represents the number of variables in the vector X.

Model Specification - The model considers a production function with independent variables being Exchange rates (ER), Tariffs (TR), Exports (EX), and Imports (IM). The dependent variable is Terms of trade (TOT). The Autoregressive Distributed Lag (ARDL) is built upon the following augmented production function:

$$TOT_t = f (ER, TR, EX, IM) \tag{3}$$

The model will explicitly be defined as;

$$TOT_t = \alpha_0 + \alpha_1 ER_t + \alpha_2 TR_t + \alpha_3 EX_t + \alpha_4 IM_t + \mathcal{E}_t \tag{4}$$

Descriptive & Diagnostic Tests - The data set will undergo the following descriptive and diagnostic tests, summary statistics, test for multicollinearity using Variance Inflation Factor (VIF), Ordinary Least Square (OLS) regression and the tests for normality, heteroskedasticity and the Durbin-Watson test for autocorrelation.

Causality Test - The Granger no-causality (modified Wald) test developed by Toda and Yamamoto (1995), will be carried out to test the causality link between exchange rates, tariffs and terms of trade. To measure the level of causality between the independent variables and TOT, equation (4) is differentiated with respect to the regressors

$$\widehat{TOT} = \sum_{k=0}^{n} x^k + \mathcal{E} \tag{5}$$

As X is the vector of independent variables, equation (6) will represent the regression equation of the independent variables with respect to Terms of Trade:

$$TOT_t = \alpha_0 + \alpha_k X_t + \mathcal{E}_t \tag{6}$$

The Toda Yamamoto Granger Causality test is outlined in equations (9) to (13) as below:

$$TOT_t = \alpha_{10} + \sum_{i=1}^{p+d} \alpha_{1i} TOT_{t-i} + \sum_{i=1}^{q+d} \beta_{1i} ER_{t-i} + \sum_{i=1}^{r+d} \gamma_{1i} TR_{t-i} + \sum_{i=1}^{s+d} \delta_{1i} EX_{t-i} + \sum_{i=1}^{v+d} \eta_{1i} T.IM_{t-i} + \mu_{1t} \tag{7}$$

$$ER_t = \alpha_{20} + \sum_{i=1}^{p+d} \alpha_{2i} TOT_{t-i} + \sum_{i=1}^{q+d} \beta_{2i} ER_{t-i} + \sum_{i=1}^{r+d} \gamma_{2i} TR_{t-i} + \sum_{i=1}^{s+d} \delta_{2i} EX_{t-i} + \sum_{i=1}^{v+d} \eta_{2i} IM_{t-i} + \mu_{2t} \tag{8}$$

$$TR_t = \alpha_{30} + \sum_{i=1}^{p+d} \alpha_{3i} TOT_{t-i} + \sum_{i=1}^{q+d} \beta_{3i} ER_{t-i} + \sum_{i=1}^{r+d} \gamma_{3i} TR_{t-i} + \sum_{i=1}^{s+d} \delta_{3i} EX_{t-i} + \sum_{i=1}^{v+d} \eta_{3i} IM_{t-i} + \mu_{3t} \tag{9}$$

$$EX_t = \alpha_{40} + \sum_{i=1}^{p+d} \alpha_{4i} TOT_{t-i} + \sum_{i=1}^{q+d} \beta_{4i} ER_{t-i} + \sum_{i=1}^{r+d} \gamma_{4i} TR_{t-i} + \sum_{i=1}^{s+d} \delta_{4i} EX_{t-i} + \sum_{i=1}^{v+d} \eta_{4i} IM_{t-i} + \mu_{4t} \tag{10}$$

$$IM_t = \alpha_{50} + \sum_{i=1}^{p+d} \alpha_{5i} TOT_{t-i} + \sum_{i=1}^{q+d} \beta_{5i} ER_{t-i} + \sum_{i=1}^{r+d} \gamma_{5i} TR_{t-i} + \sum_{i=1}^{s+d} \delta_{5i} EX_{t-i} + \sum_{i=1}^{v+d} \eta_{5i} IM_{t-i} + \mu_{5t} \tag{11}$$

The modified wald test applies to any order of integration among variables, either I(0), I(1) or I(2). In the specified equations (7-11), d is the maximum possible order of integration amongst the variables that is determined using the appropriate criteria, while p,q,r,s,v are the ideal lag length of the corresponding variables. $\mu_{1t}, \mu_{2t}, \mu_{3t}, \mu_{4t}, \mu_{5t}$ stand for the error terms with zero mean, constant variance and without autocorrection.

ARDL Model estimation - The ARDL test will be used to estimate the structural relationship between TOT and the independent variables in the study. The ARDL(1,0,1,0,1) will test for model fit and general interpretation (R^2) and ARDL(1,1,1,1,1) with ECT will analyse for long-run and short-run relationships. To satisfy the bounds test assumption of the ARDL model, each variable must be I(0) or I(1). The purpose will be to eliminate spurious regression and erroneous inferences. Unit root is the statistical concept which describes a time series where the current value is equal to its previous value plus a random error term. That is, the series has no trend and fluctuates around a constant mean.

Cointegration Test - The essence models in the ARDL bounds test framework are the following unrestricted error correction models, testing for both long-run and short-run relationships among the variables. Further, transforming the equation gives the essence models in the ARDL bounds test framework presented as the following unrestricted error correction models. A series of test will be applied in the ARDL procedure and include;

Long-run bounds test equation

$$TOT_t = \alpha_0 + \sum_1^P \alpha_{11} TOT_{t-1} + \sum_0^q \alpha_{21} ER_{t-1} + \sum_0^r \alpha_{31} TR_{t-1} + \sum_0^s \alpha_{41} EX_{t-1} + \sum_0^v \alpha_{51} IM_{t-1} + \varepsilon_{1t} \tag{12}$$

Where p,q,r,s,v are the optimal lag length of respective variables. The existence of a long-term relationship among the variables is validated by utilizing the bounds test statistic.

Short-run bounds test equation

The short-run ARDL model based on an Error Correction Form (ECT) becomes:

$$\Delta TOT_t = \beta_0 + \sum_1^P \beta_{11} \Delta TOT_{t-1} + \sum_0^q \beta_{21} \Delta ER_{t-1} + \sum_0^r \beta_{31} \Delta TR_{t-1} + \sum_0^s \beta_{41} \Delta EX_{t-1} + \sum_0^v \beta_{51} \Delta IM_{t-1} + \Delta ECT_{t-1} + \varepsilon_{1t} \tag{13}$$

The error correction term (ECT) determines the rapidity of error correction to long-run stability from a short-run shock, assimilating short-run constraints with long-run evidence. ECT is derived from the residuals of equation (5) by one period lag. The coefficient of ECT must be negative, <1, and statistically significant to validate the long-run relationship while the short-run coefficient is established by significant values of the regressors.

4. FINDINGS AND DISCUSSIONS

4.1. Descriptive Statistics and Diagnostic Tests

The descriptive and diagnostic statistics indicate that while there is no severe multicollinearity (mean VIF= 4.906), exports and imports exhibit moderate multicollinearity, likely due to their interconnected nature. The OLS regression model explains 55.5% of the variation in Kenya's terms of trade (ToT) and is jointly significant (p = 0.008), although no individual variable reaches statistical significance. Imports show the strongest negative influence on ToT. Diagnostic tests confirm the absence of heteroskedasticity and support normality assumptions. However, the Durbin-Watson statistic (1.19) signals positive autocorrelation, suggesting that short-run interpretations should be approached with caution due to potential serial correlation in the residuals.

Table 1: Variance Inflation Factor

	VIF	1/VIF
ex	7.734	.129
im	5.928	.169
er	4.938	.203
tr	1.025	.976
Mean VIF	4.906	.

Table 2: Linear Regression

tot	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
tr	-.097	.229	-0.42	.677	-.583	.388	
er	.219	.142	1.54	.143	-.083	.52	
ex	.438	.421	1.04	.314	-.455	1.331	
im	-.586	.362	-1.62	.125	-1.354	.182	
Constant	84.007	19.416	4.33	.001	42.846	125.168	***

Mean dependent var	93.744	SD dependent var	5.053
R-squared	0.555	Number of obs	21
F-test	4.985	Prob > F	0.008
Akaike crit. (AIC)	119.617	Bayesian crit. (BIC)	124.840

*** p<.01, ** p<.05, * p<.1*

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
    Ho: Constant variance
    Variables: fitted values of tot
    chi2(1)   =   2.21
    Prob > chi2 =   0.1368

Table 3: Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj_chi2(2)	Prob>chi2
tot	21	0.411	0.475	1.300	0.522
tr	21	0.039	0.153	5.890	0.053
er	21	0.488	0.051	4.430	0.109
ex	21	0.810	0.116	2.850	0.240
im	21	0.346	0.231	2.610	0.271

Durbin-Watson d-statistic(5,   21) = 1.194691

4.2. Granger Causality Wald tests

Granger causality tests revealed that tariffs, exchange rates, exports, and imports all significantly predict Kenya's terms of trade (ToT), indicating strong historical precedence of these variables in shaping ToT dynamics. Notably, exchange rate emerged as a central driver, influencing all other variables. Reverse causality tests showed bidirectional relationships between ToT and tariffs, exchange rates, and imports—suggesting feedback loops, where shifts in ToT may influence policy decisions like tariff adjustments or exchange rate management. However, exports did not Granger-cause ToT or the exchange rate, highlighting their limited influence—possibly due to Kenya's dependence on low-value primary exports. Overall, tariffs and exchange rates stand out as key levers of trade performance, with exchange rate policy exerting widespread effects across the trade system.

Table 4: Granger Causality Wald Tests

Equation	Excluded	chi2	df	Prob>Chi2
lntot	lntr	36.115	2	0.000
lntot	lner	10.703	2	0.005
lntot	lnex	32.124	2	0.000
lntot	lnim	81.508	2	0.000
lntot	ALL	236.910	8	0.000
lntr	lntot	12.630	2	0.002
lntr	lner	14.583	2	0.001
lntr	lnex	21.125	2	0.000
lntr	lnim	15.842	2	0.000
lntr	ALL	206.510	8	0.000
lner	lntot	19.195	2	0.000
lner	lntr	33.618	2	0.000
lner	lnex	35.742	2	0.000
lner	lnim	25.300	2	0.000
lner	ALL	170.410	8	0.000
lnex	lntot	4.426	2	0.109
lnex	lntr	7.285	2	0.026
lnex	lner	2.866	2	0.239
lnex	lnim	8.295	2	0.016
lnex	ALL	27.013	8	0.001
lnim	lntot	14.360	2	0.001
lnim	lntr	11.549	2	0.003
lnim	lner	6.692	2	0.035
lnim	lnex	6.702	2	0.035
lnim	ALL	44.381	8	0.000

4.3. ARDL Model Estimation

The analysis estimated two ARDL models to assess the relationship between terms of trade (ToT) and key trade variables. The ARDL(1,0,1,0,1) model demonstrated a good overall fit (R^2 = 82%), while the ARDL(1,1,1,1,1) with an Error Correction Term (ECT) distinguished between short- and long-run effects. The ECT was negative and moderately significant (p = 0.083), indicating a stable long-run equilibrium, with 70.3% of deviations corrected annually. However, none of the long-run coefficients—tariffs, exchange rate, exports, or imports—were statistically significant, although the exchange rate showed some promise. Short-run effects were also statistically insignificant, likely due to the small sample size and data volatility. The ARDL bounds test failed to confirm a long-run relationship. Economically, while the exchange rate appears influential, the lack of significance across variables suggests that ToT adjustments occur rapidly but are not strongly driven by any single factor.

ARDL(1,0,1,0,1) regression
Sample: 2002 - 2021, but with gaps   Number of obs =   16
                          F(7,   8) =   5.35
                          Prob > F   =   0.0154
                          R-squared   =   0.8241
                          Adj R-squared =   0.6701
Log likelihood = 39.178238   Root MSE   =   0.0296

lntot	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
lntot						
L1.	0.287	0.296	0.970	0.359	-0.394	0.969
lntr	-0.049	0.054	-0.910	0.387	-0.173	0.075
lner						
--.	0.541	0.175	3.090	0.015	0.138	0.943
L1.	-0.359	0.169	-2.120	0.066	-0.748	0.031
lnex	0.150	0.115	1.300	0.229	-0.115	0.414
lnim						
--.	-0.375	0.125	-3.010	0.017	-0.662	-0.088
L1.	0.191	0.110	1.740	0.121	-0.063	0.445
_cons	2.695	1.343	2.010	0.080	-0.401	5.792

Table 5: ARDL (1,0,1,0,1) Regression

ARDL(1,1,1,1,1) regression
Sample: 2002 -   2021, but with gaps   Number of obs =   16
R-squared   =   0.8424
Adj R-squared =   0.6060
Log likelihood = 39.948779   Root MSE   =   0.0325

D.lntot	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
ADJ						
lntot						
L1.	-0.703	0.339	-2.080	0.083	-1.532	0.126
LR						
lntr	-0.137	0.164	-0.830	0.436	-0.540	0.265
lner	0.324	0.243	1.340	0.230	-0.270	0.917
lnex	0.209	0.299	0.700	0.510	-0.522	0.941
lnim	-0.247	0.395	-0.630	0.555	-1.214	0.720
SR						
lntr						
D1.	0.032	0.053	0.610	0.566	-0.097	0.161
lner						
D1.	0.330	0.194	1.700	0.140	-0.144	0.805
lnex						
D1.	0.114	0.316	0.360	0.730	-0.659	0.887
lnim						
D1.	-0.298	0.383	-0.780	0.466	-1.236	0.639
_cons	2.529	1.568	1.610	0.158	-1.309	6.367

note: estat btest has been superseded by estat ectest
   as the prime procedure to test for a levels relationship.
   (click to run)

Table 6: ARDL (1,1,1,1,1) Regression

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship   F = 1.712
*   t = -2.076*
Critical Values (0.1-0.01), F-statistic, Case 3

	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
	L_1	L_1	L_05	L_05	L_025	L_025	L_01	L_01

k_4	2.450	3.520	2.860	4.010	3.250	4.490	3.740	5.060

accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors
Critical Values (0.1-0.01), t-statistic, Case 3

	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
	L_1	L_1	L_05	L_05	L_025	L_025	L_01	L_01
k_4	-2.570	-3.660	-2.860	-3.990	-3.130	-4.260	-3.430	-4.600

accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors
k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)
Table 7: Critical values from Pesaran/Shin/Smith (2001)

4.4. VAR Short Run Test

The VAR-type ARDL (1,1,1,1,1) model highlights that in the short run, Kenya's terms of trade (ToT) are significantly influenced by exchange rates and, to a lesser extent, imports. A 1% depreciation in the exchange rate improves ToT by approximately 0.56% (p = 0.035), suggesting that the exchange rate policy can positively impact trade performance. Imports show a marginally significant negative effect, implying that increased import volumes tend to worsen ToT, likely due to higher foreign expenditure. In contrast, tariffs and exports do not exhibit statistically significant short-run effects, nor do most lagged variables—indicating limited persistence. Overall, short-run ToT dynamics appear most responsive to exchange rate fluctuations and import levels, while tariff policy and export volumes have limited immediate influence despite their predictive relevance in prior Granger causality tests.

Table 8: VAR Short-run Test

ARDL(1,1,1,1,1) regression
Sample: 2002 - 2021, but with gaps   Number of obs =   16
$F(9, 6) = 3.51$
Prob > F   =   0.0703
R-squared   =   0.8402
Adj R-squared =   0.6006
Log likelihood = 39.948779   Root MSE   =   0.0325

lntot	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
lntot						
L1.	0.297	0.339	0.880	0.415	-0.532	1.126
lntr						
--.	-0.064	0.107	-0.600	0.569	-0.327	0.198
L1.	-0.032	0.053	-0.610	0.566	-0.161	0.097
lner						
--.	0.558	0.206	2.710	0.035	0.055	1.061
L1.	-0.330	0.194	-1.700	0.140	-0.805	0.144
lnex						
--.	0.261	0.206	1.270	0.252	-0.243	0.765
L1.	-0.114	0.316	-0.360	0.730	-0.887	0.659
lnim						
--.	-0.472	0.199	-2.370	0.055	-0.959	0.015
L1.	0.298	0.383	0.780	0.466	-0.639	1.236
_cons	2.529	1.568	1.610	0.158	-1.309	6.367

5. CONCLUSIONS AND IMPLICATIONS

This study examined the effect of exchange rates and tariffs on Kenya's TOT using the Granger causality and ARDL approaches over the period 2001-2021. Granger causality tests suggested that exchange rates, tarrifs, exports and imports all have unidirectional causality with TOT, while there is a strong bi-directional causality observed between ToT and tariffs, exchange

rates, and imports. Findings revealed that while the ARDL model was a good fit for the data, none of the key variables exert statistically significant long-run effects on TOT. However, the error correction mechanism indicates that deviations from long-run equilibrium are corrected rapidly, reflecting a stable and mean-reverting trade system. In the short run, exchange rate depreciation significantly improves ToT, while rising import volumes tend to deteriorate it.

The analysis results indicated that exchange rates are a critical factor in influencing short run trade outcomes. It is necessary for Kenya to adopt a more strategic and flexible exchange rate policy, to mitigate for exchange rate volatility caused by constantly shifting global dynamics exacerbated by events such as COVID-19, the Russia-Ukraine conflict, and rising protectionism as seen in the current US regime. It is important for policymakers to ensure stability and competitiveness of the Kenya shilling which will support export earning while avoiding excessive depreciation fueled by high import costs and inflation.

The study also reveals a need for tariff policies to be refocused, with policymakers focusing on tariff policies which are strategic. They need to develop policies which will strike a balance between protecting local industries while mitigating international competition to avoid excessive consumer price inflation or trade retaliation. Analysis has revealed that the current tariffs in the country have a limited impact on TOT, indicating a need for policymakers to prioritize import substitution strategies and to explore local value addition to lower the country's dependency on global markets.

On the other hand, exports had an insignificant direct impact on TOT, and this is likely due to the country's concentration on low value primary goods. The country needs to diversify its export base, invest more in manufacturing and processing industries, and build stronger trade linkages with emerging markets under frameworks like the African Continental Free Trade Area (AfCFTA). This will serve to enhance export competitiveness and improve pricing power in international markets.

In summary, while the trade variables do not individually determine Kenya's TOT in the long-run, their predictive power and short-run effects underscore the need for coordinated and strategic trade and macroeconomic policies. A combination of flexible exchange rate management, strategic import controls, and export diversification is essential for strengthening Kenya's resilience and improving its position in global trade markets.

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