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THE DETERMINANTS INFLUENCING KENYA'S TEA EXPORTS AND THEIR IMPLICATIONS ON BALANCE OF TRADE: EVIDENCE FROM THE GRAVITY MODEL ANALYSIS

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Abstract

Kenya's tea industry faces significant threats from three main structural problems; market concentration, exchange rate instability as well as climate-related performance issues. An augmented gravity model was used in evaluating factors that influence Kenya's tea export and its effect on trade balance performance. Panel data across 20 main destination markets between 2000 and 2023 was used. Findings reveal that, over 72% of exports are concentrated in five markets (Pakistan, Egypt, UK, UAE, Sudan), exposing the sector to geopolitical instability and demand fluctuations. Despite theoretical expectations that currency depreciation enhances export competitiveness, results indicate that rising input costs and delayed price adjustments have counteracted these benefits. The proposed recommendations include three strategic elements that begin with engaging the Africa Continental Free Trade Area (AfCFTA) to access West and North Africa markets and continue with aiming for 30% organic or Fair Trade export certifications by 2030 and then establishing innovation centers to enhance value-based product development. The Tea Export Stabilization Fund financial tools with their implementation strategies aim to stabilize currency fluctuations by partnering with regional neighbors for operational trade growth. The proposed measures will boost export competitiveness to create better agricultural sustainability outcomes by reducing trade imbalances in Kenya.

Keywords: *Tea exports, trade balance, augmented gravity model, market diversification, climate adaptation, Kenya*

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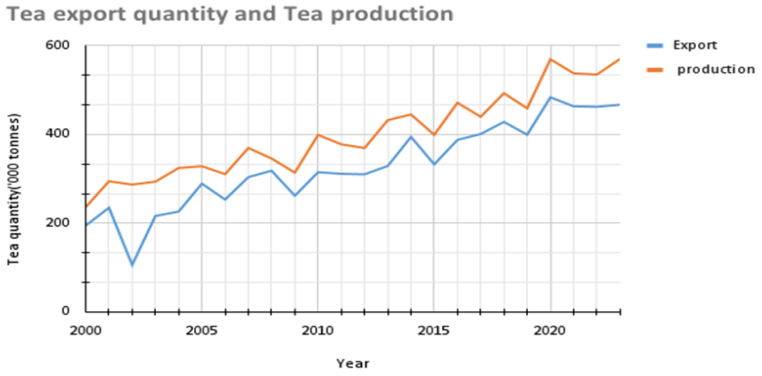
INTRODUCTION

The tea sector in Kenya provides foundation to both global tea markets and national economic development (Koros et al., 2023). Since its introduction in 1903 and commercial production began in 1924 the industry has flourished by earning reputation for producing top-quality black tea (Momanyi, 2021). Kenyan tea production receives its advantage from volcanic-rich soil in areas like Kericho, Nandi, Nyeri and portions of Murang'a because these regions have optimal climatic conditions which produce top-notch tea while making Kenya the global leader in black tea exports and ranking second in tea output after China. The tea production in Kenya reached 522.92 million kilograms in 2023 which had an essential impact on national economic stability. Total foreign exchange revenue from tea exports reaches 23% while contributes 4% to agricultural GDP and 2% to national GDP (Tea Board of Kenya, 2023)

More than 13% of the total population receives its main source of income from the farm sector which directly supports 834,129 farmers who work on agricultural farming (Koros et al., 2023). The sector demonstrates its economic significance by continuously supporting sustainable developments through funding local community programs and agricultural training programs for climate change adaptation (Tea Board of Kenya, 2023). The growth of Kenya's tea exports has been extraordinary since 2000 as it began at USD 450 million yet expanded to USD 1.5 billion in 2022 according to preliminary projections, it will reach USD 1.6 billion in 2023 (Tea Board of Kenya, 2023). The recent growth of tea exports originated from consistent market demand between three key regions: the United Kingdom, Pakistan and Egypt which together contributed to 48% of total tea export volumes during 2022 (FAO, 2023). Pakistan stands as Kenya's biggest single export market where black tea objects to strong consumer tastes to take up 28% of all Kenyan exports.

These new developing markets have significantly contributed to this expansion; between 2018 and 2022 the Kenyan tea export volume to China experienced a 62% increase that elevated total random sales to USD 120 million annually while UAE import numbers rose by 35% during this period (Tea Board of Kenya, 2023). Russian and Saudi Arabian customers have become important purchasing markets for black tea exports following 2020 established strategic trade arrangements along with promotional marketing strategies.

As a primary sector in Kenya, the tea industry exists in the midst of substantial business obstacles. The tea industry of Kenya remains unstable due to global demand patterns and climate effects on farming output while market conditions continuously change (Momanyi, 2021).Major Asian producers including India and Sri Lanka compete intensely with the sector because they have scale benefits in their operations. The tea industry in Kenya shows a constant rise in domestic production rates but export volumes maintain unstable patterns because of market forces together with trade dependences and pricing limitations. The widening gap between production and exports, as depicted by Fig. 1-1, suggests untapped potential for market expansion but also highlights the need for strategic interventions to boost competitiveness.

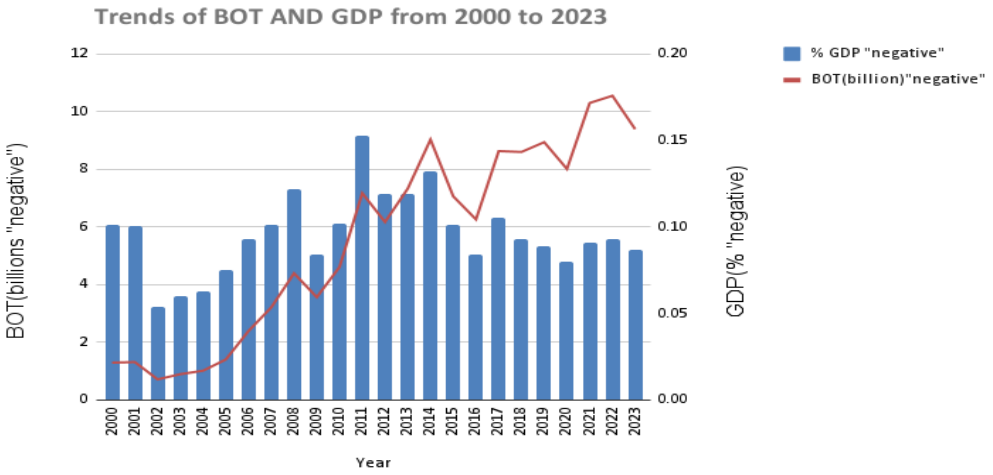


Source: Authors' compilation

Figure 1-1: Kenya's Tea export quantity and production

Kenya's reliance on 72% of its tea exports to the top 10 markets in 2022 puts the sector more at risk of external shocks. Supply chain disruption from geopolitical tensions such as Russia-Ukraine war and the COVID-19 pandemic have heightened vulnerabilities through higher shipping expenses and delayed payment (Kumar et al. 2023). Regionally, the East African Community (EAC) absorbed 22% of Kenya's tea exports in 2022, demonstrating its significance as a trading bloc (Lwesya, 2022). On the other hand, exports to the European Union (EU) have stagnated at USD 300 million annually since 2020 because of strict phytosanitary regulations and competition from lower-priced Asian teas (Tea Board of Kenya, 2023).

While efforts at diversification, such as those under the African Continental Free Trade Area (AfCFTA), seek to increase market penetration to West Africa and high-value markets such as the UAE and Germany (Njeru et al. 2023), there are still challenges. As depicted in Figure 1-2, Kenya's balance of trade (BOT) has remained in deficit between 2000 and 2023, largely due to rising imports of manufacturing goods, textiles, petroleum products, fertilizers, and food grains (CBK 2023).



Source: Authors' compilation

Figure 1-2: Flipped trends of BOT alongside GDP performance. (CBK 2023)

Nonetheless, agricultural exports, particularly tea, which contributes more than 20% of all exports, have been instrumental in reducing the trade deficit from 13.22% of GDP in 2014 to 8.74% in 2023. In spite of this positive role, tea price volatility, climatic yield volatility, and exposure to external markets continue to define Kenya's trade performance. Diversifying export markets and enhancing tea export competitiveness are critical in maintaining the trade balance and reducing exposure to external shocks. Due to these challenges, this study employs an augmented gravity model to investigate the factors influencing Kenya's tea exports and their implications for trade balance.

LITERATURE REVIEW

Numerous studies have looked into the elements that influence tea export revenues and how they affect a country's trade balance. This review summarizes major study findings, highlighting influential factors, methodology, and identified research gaps.

King'oo (2015) studied and revealed that Kenyan tea firms' export market share performance was influenced by various market strategies, with value-added products and product quality being key factors. The study recommended government support for differentiation methods and further research into alternative sector-based approaches.

Matuga, A.O. et.al (2021) studied how management of value chain influences the performance of a firm in Kenya's tea industry. Research analyzed the relationship between product diversification innovation and process management as per Porter's Value Chain and Resource Based View (RBV) Theory. The researchers gathered data through stratified random sampling from 310 respondents at 155 firms using 229 usable questionnaires which they processed with SPSS. The research data revealed that firm performance received beneficial and statistically significant improvements because of implementing these three management techniques. Value chain management systems should become part of the tea industry's subsector in Kenya according to the study's recommendations.

Kiptarus (2022) found that exchange rate volatility negatively impacts Kenyan trade exports, particularly during economic and political changes in 1994 and 2012 with the help of ARCH/GARCH models. They recommend implication of stable exchange rates, futures, and options for export protection and pricing stability.

Mesagan et al. (2022) found the persistent relationships between exchange rates, trade, and output across eight African nations from 1970 to 2019. Moreover, it was concluded that appreciation and depreciation positively impacted South Africa's trade volume and output, while depreciation negatively affected Angola. The study suggested that policies should be tailored to each nation's unique market behaviour.

Kahure (2023) studied the connection between Kenyan tea production along with balance of payments and exchange rates throughout 1996 to 2018. The research based its findings from econometric evaluation that higher tea production strengthened exports and boosted trade balance while promoting stable macroeconomic conditions. A set of recommendations proposed to grow tea production while enhancing export facilities.

Njeru S. M. et al. (2023) examined regional factors affecting trade between South Africa and Kenya, revealing that South African companies have more advantages due to lowered Kenyan investments and growing domestic consumption. They suggested implementing technical export capabilities and improving resource utilization.

Gikunju, C. K. (2024) evaluated the strategic implementation effects on the Mount Kenya tea industry. The bulk marketing of semi-processed tea causes decreased rewards for farmers while leading to their dissatisfaction. The analysis focused on value addition, cost reduction, technological innovation, and marketing implementation strategies. The research determined that these approaches transformed

performance at 84.1% levels. Implementing advanced technology together with effective marketing strategies along with global connection creation will enhance competitiveness and farmer income levels according to study results.

Muzammil M. et.al. (2024) examined the link between Exchange Rate (ER) fluctuations and developing economies' trade balance dynamics by conducting bilateral analysis of Pakistan. Data analysis demonstrates that positive and negative exchange rate modifications demonstrate a symmetric relation to trade deficits although both create substantial impacts on the panel across short-term and long-term periods. Country-specific asymmetries exist primarily in India together with China. The study demonstrates that stable exchange rate policy functions as a protection method against lasting ER movement impacts which helps authorities make better trading choices.

DEY, S. (2024) assessed Bangladesh's tea production vulnerability to climate change, revealing a decline in export volumes and domestic consumption due to high moisture levels, rainwater and carbon dioxide emissions, and temperature effects. The study also highlighted the impact of demographic changes on domestic demand and trade deficits, emphasizing the need for technological advancements and international trade benefits.

This research study addresses multiple research gaps associated with volatile exchange rates and businesses impacted by climate changes together with concentrated market risks. The research enhances previous investigations through statistical assessments of trade-dependent risks and agricultural operational inefficiencies in combination with the structural factors that impede currency depreciation benefits. The augmented gravity model analyzes the complete interplay between factors which influence Kenya's trade balance during the 2000-2023 periods.

METHODOLOGY

1.1 Augmented Gravity Model

To examine the factors behind tea exports from Kenya, the study utilizes a gravity model, a widely used method in the literature for evaluating drivers of bilateral trade flows. The gravity model, originally introduced by Tinbergen (1962), which was further developed by Anderson (2012), is based on Newton's law of universal gravitation. This principle posits that the gravitational attraction between two objects is proportional to their masses and inversely proportional to the square of the distance between them (Mathur et al., 2025) as shown in Eq. 1.

$$X_{ij} = Y_i^{\beta_i} y_j^{\beta_j} D_{ij}^{\beta_3} \quad (1)$$

Given that, X_{ij} represents the exports from country i to another country$j$, subsequently, y_i and y_j represents the GDP of countries i and j respectively. Consequently, D_{ij}denotes the geographical distance between countries i and$j$.

In this study, we employ an adapted version of the gravity model as proposed by (Hatab et al., 2010), this variation, serves as the foundation for our analysis and forms Eq.2 below.

$$X_{ij} = \beta_0 (Y_i)^{\beta 1} (Y_j)^{\beta 2} (D_{ij})^{\beta 3} (A_{ij})^{\beta 4} (U_{ij}) \quad (2)$$

Given that, Y_i represents the GDP of the origin country i, Y_j denotes the GDP of destination country j whereas D_{ij} represents the physical distances between country i and j. A_{ij} On the other hand denotes other factors which might affect trade flows among the two trading partners i and j while U_{ij} denotes the error term.

1.2 Specification Model

According to the gravity model bilateral trade flows increase as the economic masses (GDP) of both exporting and importing countries rise and declining trade costs including geographical separation affect the flows negatively (Tinbergen, 1962). Empirical investigations of agricultural trade agree with these established principles through analysis of tea as an agricultural commodity. According to (Kareem et al. 2020) both exporter and importer GDP coefficients show direct positive statistical relationships since larger economies handle more production and attract increased consumer demand.

1.3 Data Sources

The employment of panel data analysis resolves various biases which appear in single-time analysis methods including the problems of heterogeneity and model specification. The merger of time-based data with country-based data enhances model variables while eliminating statistical dependencies and permits analysis of unmeasured partnership effects between countries including cultural similarities and trade history (e.g., cultural ties, historical trade patterns) that basic models cannot detect. (Yotov et al., 2016) along with other recent studies highlight gravity models achieve their best performance when analyzing tea trade due to variables which shape agricultural commodity movements including annual production variations and currency rate fluctuations.

1.4 Sample and Data Collection

The dataset consists of 20 countries selected based on their significance as Kenya's tea trading partners and the availability of data as shown in (Table 3-1). Annual observations cover the years 2000 to 2023, resulting in 480 observations (N = 24, T = 20). The selected countries include traditional markets, regional partners, emerging markets and other countries. The data were analyzed using IBM SPSS Statistics (Version 27)

Category	Countries
Traditional Markets	UK, Pakistan, Egypt, UAE, USA.
Regional Partners	Uganda, Tanzania, Rwanda (EAC), Sudan, Somalia.
Emerging Markets	China, India, Russia, Saudi Arabia.
Others	Germany, Poland, Iran, South Africa, Japan, Australia.

Source: Authors' compilation

Table 3-1 Kenya's Trading partners

The dependent variable in the study is Kenya's bilateral tea export values (USD), which is sourced from UN Comtrade (HS Code: 0902) and verified against the Kenya National Bureau of Statistics. The independent variables include economic mass, trade costs, institutional factors, and commodity-specific variables. Economic mass is represented by Kenya's GDP and the GDP of the partner country (in constant USD) as well as the GDP per capita of the importing country, all sourced from the World Bank's World Development Indicators (World Bank, 2023) and (International Monetary Fund, 2023)

Trade costs are measured by the distance (in kilometers) between Nairobi and the capitals of the partner countries, sourced from the GeoDist Database (CEPII, 2023), and tariff rates from the (World Integrated Trade Solution, 2023).

Commodity-specific variables comprise Kenya's annual tea production (in metric tons) from the Tea Board of Kenya, (2023), the global tea price index from the (International Tea Committee, 2023), and real exchange rates. The real exchange rate is calculated as given by Eq. 3. With data sourced from the Central Bank of Kenya (CBK) and the respective partners central banks.

$$RER = NER(P^*/P) \quad (3)$$

The real exchange rate (RER) is defined as the bilateral nominal exchange rate (NER) adjusted by the relative consumer price indexes, where P* represents the consumer price index of the foreign country, and P represents domestic consumer price index of Kenya for this case (Obstfeld & Rogoff, 1996). UNCTAD database was used to source the nominal exchange rates and consumer price indexes.

All monetary variables (GDP, exports) are deflated to 2015 USD using World Bank inflation indices. Distance and population are log-transformed to normalize skewed distributions. Missing values, which constitute less than 5% of the dataset, are addressed through linear interpolation for GDP/population and multiple imputations for trade flows. Sensitivity analyses confirm the robustness of these imputation methods.

1.5 Estimation methods

There are several methods available for estimating linear panel models, Which include pooled ordinary least squares (POLS), fixed effects (FE), and random effects (RE) (Gujarati et al. 2003). We adopted pooled estimation based on the fact that it is among the most straight forward models, which functions given by Eq. 4.

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \quad (4)$$

The index i represents the cross-sectional unit, while t denotes time, and the error term follows a normal distribution with constant variance and a mean of zero. One major issue with the pooled model is its failure to account for cross-country heterogeneity. Leading to limitation in predicting specific country impacts and assuming homogeneity across nations

Fixed effects model on the other hand, incorporates both entity-specific and time effects through a variable intercept for each cross-sectional unit and time period, while holding the slope coefficients fixed. The model is expressed as given by Eq. 5.

$$Y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it} \quad (5)$$

When estimating trade flow between a predefined set of countries, the fixed effects model is often seen as more effective. An F-test is employed to determine the superiority of the fixed-effects model over the pooled regression model. Rejection of the null hypothesis indicates the presence of significant fixed effects, confirming that the fixed-effects specification provides a better fit for the data than the pooled OLS model. The F-statistic can be calculated using as shown by Eq. 6.

$$F = \frac{(R^2_{FE} - R^2_{CC})/(N-1)}{(1-R^2_{FE})/(NT-N-K)} \approx F(N-1, NT-N-K) \quad (6)$$

Where R^2_{FE} and R^2_{CC} represent the coefficients of determination for the fixed effect model and the common constant model (pooled OLS), respectively. Conversely, the random effect model operates on assumption that each group has its own unique error term. As a result, the random effect model can be formulated as given by Eq. 7.

$$Y_{it} = \alpha_i + \beta X_{it} + (V_i + \varepsilon_{it}) \quad (7)$$

The null hypothesis (H_0) states that there are no significant random effects, making Pooled Ordinary Least Squares (POLS) appropriate. The alternative hypothesis (H_1) suggests that random effects exist, indicating that the Random Effects (RE) estimator is preferred. If the LM test rejects H_0 ($p<0.05$), the Random Effects model is selected over Pooled OLS.

RESULTS AND DISCUSSIONS

1.6 Major importers of Kenyan tea

Pakistan dominates the global Kenyan tea market, accounting for 36.6% of imports. Egypt, a neighbour and regional trading centre, accounts for 20.6%. The United Kingdom, a historical trade partner, is the third-largest importer at 16.6%. The United Arab Emirates and Sudan contribute 6.7% and 6.1% respectively. Emerging importers include Russia, Poland, and India, while the USA, China, Germany, among others maintaining minimal imports due to their tea production and preferences.

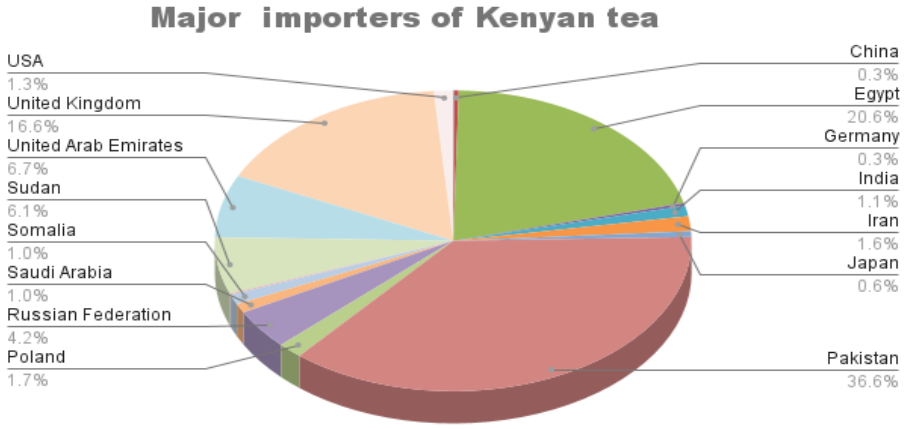


Figure 4-3 Major Importers of Kenyan tea

Kenya's tea sales are primarily sourced from Somalia, Saudi Arabia, Iran, and Japan, with Pakistan playing a significant role in the trade. This dependence on key markets poses potential stability risks due to economic or geopolitical developments in these regions.

1.7 Relationships between Kenya's tea sector and its overall economy

The correlation analysis presented by table 4-2 highlights significant relationships between Kenya's tea sector and its overall economy. Higher tea production volumes create positive correlations that produce significant expansion in exports that leads to substantial increases in GDP growth rates. The cultivation of additional land creates better tea production which drives economic expansion.

The GDP growth accelerates in response to currency depreciation which results in an elevated USD/KES exchange rate because it strengthens export capabilities for Kenyan products. The research related to agricultural exports and economic growth development (Wimanda, 2014) supports these findings.

Table 4-2 Correlation Analysis of Kenya's Tea Export and Economic Indicators

Variable	Export Quantity ('000t)	Global Tea Price (USD)	Tea Production ('000t)	Area ('000 Ha)	Average Yield (kg/ha)	BOT (USD billion)	Tariff Rates (%)	Real GDP	Exchange Rate(USD/KES)
Export Quantity ('000t)	1.000	0.693**	0.950**	0.897**	-0.054	-0.905**	-0.122	0.935**	0.797**
Global Tea Price (USD)	0.693**	1.000	0.626**	0.804**	-0.352	-0.793**	-0.276	0.755**	0.481*
Tea Production ('000t)	0.950**	0.626**	1.000	0.903**	0.068	-0.891**	-0.052	0.939**	0.859**
Area ('000 Ha)	0.897**	0.804**	0.903**	1.000	-0.281	-0.954**	-0.086	0.957**	0.823**
Average Yield (kg/ha)	-0.054	-0.352	0.068	-0.281	1.000	0.278	-0.148	-0.242	-0.124
BOT (USD billion)	-0.905**	-0.793**	-0.891**	-0.954**	0.278	1.000	0.036	-0.966**	-0.803**
Tariff Rates (%)	-0.122	-0.276	-0.052	-0.086	-0.148	0.036	1.000	-0.009	0.212
Real GDP	0.935**	0.755**	0.939**	0.957**	-0.242	-0.966**	-0.009	1.000	0.847**
Exchange Rate(USD/KES)	0.797**	0.481*	0.859**	0.823**	-0.124	-0.803**	0.212	0.847**	1.000

N	24	24	24	24	24	24	24	24	24

Note: Significance levels at 0.01%, 0.05%, and 0.1%, denoted by, ***, **, and * respectively.

Moderate correlations indicate that global tea prices influence export volumes and GDP, while exchange rate variations significantly impact tea production, further improving Kenya's tea competitiveness in the global market. However, weak correlations suggest that increases in average yield have minimal effects on total production and exports, indicating that the growth of Kenya's tea industry is primarily driven by land expansion rather than improved efficiency. This observation is consistent with studies highlighting the need for enhanced agricultural practices to improve productivity (Wambua et al., 2021).

On the other hand, negative correlations emphasize the complex dynamics between tea exports and the trade balance. An increase in tea exports improves the trade balance by reducing deficits, which positively influences GDP and the exchange rate. Expanding tea planting also enhances the trade balance by boosting exports. However, tariff rates show weak relationships with trade variables, implying limited influence on the sector's performance. These findings emphasize the importance of maintaining a stable trade balance for economic stability and leveraging global tea prices and currency depreciation to enhance export competitiveness (Keho, 2021).

1.8 Regression analysis of tea exports and balance of trade

The regression analysis identifies key factors influencing the balance of trade (BOT) in the tea industry, with the quantity of tea exports and global tea prices showing significant adverse effects (Table 4-3).

The export of an additional 1,000 tonnes of tea leads to an estimated $0.018 billion USD decrease in BOT. A rise in export volumes generates additional revenue but strategically affects competitive market conditions by creating price falls according to (Rey et al. 2023). The model demonstrates that increased tea market prices at $1 will reduce BOT by $2.088 billion USD. Scientific research indicates that price-sensitive world markets minimize their tea consumption when global prices increase thus creating disproportionally large setbacks for exporters. Analysis of worldwide trade exports shows that price elasticity greatly determines export results according to (Tripathi et al. 2023).

Table 4-3 Regression Analysis of Tea Exports and Balance of Trade

Variable	Coefficient (B)	Std. Error	Standardized Beta	t-value
Export quantity (’000t)	-0.018***	0.005	-0.527	-3.411
Global tea price (USD)	-2.088**	0.801	-0.299	-2.606
Average yield (kg/ha)	0.001	0.001	0.110	1.359
Tariff rates (%)	-0.056	0.097	-0.049	-0.577
Exchange rate (USD/KES)	-0.040	0.025	-0.215	-1.609
Constant	5.439	4.267	—	1.275

Note: Significance levels at 0.01%, 0.05%, and 0.1%, denoted by, ***, **, and * respectively

Results from the analysis indicate that average tea yield as well as tariff rates and exchange rates fail to produce statistically meaningful effects on BOT. This unexpected finding supports existing economic research which shows that these factors bring about their effects indirectly or under specific circumstances. Ministerial trade agreements can reduce tariff rates while exchange rate fluctuations may become less important due to other macroeconomic adaptations according to (Kahn, 2022).

1.9 Factors influencing tea export quantity

The Pooled OLS regression analysis investigates how various economic factors influence tea export quantity (Table 4-4). The results highlight that the importing country's GDP and the exchange rate are key determinants with statistically significant impacts. An increase of 1% in the importing country's GDP corresponds to a 4.9% rise in tea export quantity. This highlights the critical role of economic growth in destination markets in driving demand for exports (Nguyen, 2023).

In contrast, a rise in the exchange rate, indicating depreciation of the exporting country's currency, is associated with a 2.9% decline in export volume. While currency depreciation is typically expected to boost export competitiveness, the negative relationship observed here might stem from structural challenges or exchange rate volatility (Handoyo et al., 2023) . Conversely, the exporting country's GDP, global tea prices, and tariff rates do not exhibit statistically significant effects on tea export quantity, as indicated by their high p-values.

Table 4-4 Regression Analysis of Economic Variables and Tea Export Quantity

Variable	Coefficient (B)	Standard. Error	t-value	p-value
Constant	2.136***	0.193	11.047	<0.001
Log (exporter GDP)	0.024	0.038	0.638	0.524
Log (importer GDP)	**0.049***	0.006	7.617	**<0.001**
Log tea price	-0.020	0.102	-0.194	0.846
Log exchange rate	**-0.029***	0.004	-6.418	**<0.001**
Log tariff rate	-0.001	0.036	-0.026	0.979

Note: Significance levels at 0.01%, 0.05%, and 0.1%, denoted by, ***, **, and * respectively.

These findings suggest that external demand conditions and currency stability play a key role in export performance than domestic economic factors or trade-related price variables (Akhuand & Abbas, 2023).

1.10 Fixed effects

Table 4-5 estimates the regression analysis shows that **log exchange Rate** and **log importer GDP** are the most significant predictors of export quantity.

Table 4-5: Type III Fixed Effects Test

Export Quantity	Df1	Df2	F	Sig.
Intercept	1	247.690	133.325	.<.001
Log exchange Rate	1	423.612	44.178	<.001
Log tea price	1	249.899	.019	.892
Log tariff rate	1	170.458	.000	.990
Log importer GDP	1	415.232	58.023	<.001
Log exporter GDP	1	215.000	.226	.635

1.10.1 Estimates of Fixed effects

The fixed effects estimates (Table 4-7) reveal that exchange rate and importer GDP are the most significant predictors of export quantity. The model's robustness is highlighted by its superior fit compared to pooled OLS, as evidenced by lower AIC and BIC values (Table 4.6).

Table 4.6: Table of fixed effects information criteria values

Information Criteria	
-2 Restricted Log Likelihood	-60.721
Akaike's Information Criterion (AIC)	-12.721
Hurvich and Tsai's Criterion (AICC)	-10.031
Bozdogan's Criterion (CAIC)	110.995
Schwarz's Bayesian Criterion (BIC)	86.995

Note: Dependent Variable: Export Quantity.

Exchange rate has an estimate of **-0.0278** with a **p-value < .001,** indicating a statistically significant **negative effect** as the exchange rate increases, export quantities decrease. On the other hand, importer GDP has shown a strong positive and significant effect as the GDP of the importing country raises, so does the quantity of exports.

Table 4-7: Fixed Effects Estimates for Export Quantity

Variable	Estimate	Standard. Error	df	t-value	p-value
Intercept	2.198***	0.190	247.690	11.547	**<.001**
Exchange Rate	-0.028***	0.004	423.612	-6.647	**<.001**
Log tea price	-0.014	0.102	249.899	-0.136	0.892
Log tariff rate	<0.001	0.036	170.458	0.012	0.990
Log importer GDP	0.046***	0.006	415.232	7.617	**<.001**
Log exporter GDP	0.019	0.040	215.000	0.475	0.635

Note: Significance levels at 0.01%, 0.05%, and 0.1%, denoted by, ***, **, and * respectively.

The intercept is also statistically significant, representing the expected export quantity when all other variables are zero. In contrast, the coefficients for log tea price, log tariff rate, and log exporter GDP are not statistically significant, indicating that these factors do not have a meaningful influence on export quantities in this model.

CONCLUSION AND FUTURE SCOPE

1.11 Conclusion

Kenya's tea industry is a pillar of the national economy, earning 23% of foreign exchange and sustaining more than 6.5 million people. The industry is subject to structural problems that undermine its long-term sustainability and global competitiveness. This research utilizes the gravity model to study the determinants influencing Kenyan tea exports and their impact on trade balance. The results identify three key concerns: market concentration, exchange rate volatility, and yield inefficiency. More than 72% of Kenya's tea exports go to: Pakistan, Egypt, The United Kingdom, The United Arab Emirates, and Sudan, making them susceptible to geopolitical and demand shocks. Exchange rate depreciation, theoretically good for export competitiveness, has ironically lowered export volumes because of increased input costs and lagged price adjustments in global markets. In addition, with a 12% increase in land under cultivation since 2010, yields continue to stagnate at 1,500–2,000 kg/ha, falling behind international standards. Climate change, traditional farming methods, and low levels of technological uptake compound these inefficiencies, limiting Kenya's capacity to expand production sustainably. These issues combined put pressure on Kenya's trade balance, with tea exports playing only a limited role in reducing the ongoing trade deficit. Closing these structural deficiencies requires an integrated approach that balances short-term economic benefits with longer-term resilience.

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