

## USING A VECTOR AUTOREGRESSIVE APPROACH ON ANALYSING THE IMPACT OF REGIONAL TRADE ON TANZANIA ECONOMIC GROWTH

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### Abstract

The study focuses on examining the impact that regional trade has on Tanzania's economic growth, using data collected from 1960 to 2021. It also examines the causal relationship between merchandise imports and exports and their effects on Tanzania's GDP growth rate. To establish the causal relationship between merchandise imports and merchandise exports and their impact on GDP growth, a non-experimental research design was employed. The analysis was performed by employing Engle Granger Cointegration, as it helps in ascertaining whether the variable exhibits long-run relationships. A Vector Auto-Regressive (VAR) model was also utilised, incorporating important macroeconomic variables such as merchandise import and merchandise export. The model's impulse responses are consistent with the gravity theory of trade. The findings indicate a positive relationship between the rates of merchandise import and export and the growth rate of GDP. Additionally, the lagged growth rate of GDP has an initial positive impact on GDP growth in the current year. The model's impulse responses are consistent with the gravity theory of economics. The findings show a direct correlation between merchandise import and export rates and GDP growth rates. The study therefore recommends that Tanzania's government should prioritise policy measures that promote exports and foster favourable conditions for imports, as these dynamics contribute to the country's GDP growth.

**Keywords:** Engle granger cointegration test, merchandize exports, merchandize import, pairwise causality test, Vector Auto-Regressive.

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### Introduction

Tanzania, a lower-middle-income country with a largely agricultural-based economy, is looking for ways to boost its economy and fight poverty (Turuka, 2020). International trade becomes a crucial instrument in today's connected globe, giving nations the chance to widen their markets and gain access to commodities and services that are not easily accessible domestically. Consumers

profit from trade because it makes goods and services more accessible and encourages innovation, specialization, and lower worldwide costs (Margareth, 2023). According to the World Bank, open trade policies support inclusive economic growth (Selwyn & Leyden, 2022; Utouh, 2024)

Regional trade agreements, which are contracts between two or more countries, set down trade laws. They include lowering or removing tariffs and other trade barriers; these agreements seek to enhance economic integration within a particular region (Lopez & Carvajal, 2020). They address a range of trade and investment-related policy topics. These accords' primary objective is to ease regional trade in products, services, people, and capital (ElGanainy, 2023). Additionally, regional trade agreements promote specialization within the area, enabling businesses that might not be globally competitive to nonetheless conduct direct business with nearby businesses. Overall, through promoting regional trade, these accords aid in the growth and development of the member nations (Parliament & Agency, 2023).

The net exports figure in international commerce displays the difference between an exporting nation's exports and imports. An increase in exports over imports indicates a trade surplus, whereas an increase in imports over exports indicates a trade deficit ( (Ehikioya, B. I., Omankhanlen, A. E., Osuma, G. O., & Inua, O. I., 2020; Arriola, C., Cadestin, C., Kowalski, P., & Van Tongeren, F., 2022). Trade surpluses typically support economic expansion; however, trade deficits could be detrimental. Long-term economic growth and export levels are inversely correlated, while import levels are inversely correlated. Reduced trade barriers and participation in international trade have a positive influence on both short- and long-term economic growth (Usman & Bashir, 2022). This bolsters the theory of trade-led growth in Tanzania. Tanzania's trade-to-GDP ratio is 29.8%, and its trade balance is negative, showing how important trade is to the country's economy (Utouh, 2024).

In today's interconnected world, international trade is a crucial instrument, allowing nations to expand their markets and obtain access to goods and services that are not readily available domestically (Loff, 2010). Consumers benefit from international trade because it makes goods and services more accessible, promotes innovation and specialisation, and lowers global prices (Parliament & Agency, 2023).

According to the World Bank, liberal trade policies facilitate inclusive economic development ( Marx, Otteburn, Hegde, Gao, Van der Loo & Deciancio, Peixoto, 2018). Regional agreements, which are contracts between two or more countries, establish commercial laws. These agreements, which include lowering or removing tariffs and other trade barriers, seek to enhance economic integration within a particular region, and they address a range of trade and investment policy-related topics. The primary objective of these accords is to facilitate regional trade in goods, services, people, and capital (Usman, 2023). In addition, regional trade agreements encourage specialisation within the region, allowing firms that may not be globally competitive to conduct direct business with regional firms. These accords contribute to the overall growth and advancement of the member countries by fostering regional trade (Agbetsiafa, 2014). .

Tanzania actively participates in a variety of regional trade agreements, including the SADC and the East African Community (EAC) and the EAC-COMESA-SADC Tripartite Framework

(Varshini & Manonmani, 2018). Regional trade agreements have the potential to increase trade, draw in investment, foster economic growth, and enhance social welfare when properly drafted and put into practice (Nicita, 2021). This study's goal is to examine, using a time series model, the impact of Tanzania's merchandise exports and imports with its neighbours on the GDP of those nations. The study focuses on examining the impact of regional trade over the past 20 years using data from the World Bank for the years 2002–2022. The study is particularly concerned with the connection between Tanzania's GDP and regional trade in goods imports and exports. The study uses a time series model to gain insight into the dynamics between regional commerce and Tanzania's economic growth, illuminating the effects of trade, particularly within the region, on the nation's economic growth.

To comprehend the connection between regional trade and Tanzania's economic progress, this study utilised a time series model to examine the impact of Tanzania's exports and imports of goods from neighbouring countries on the nation's GDP. Policymakers, economists, and other stakeholders will understand how regional trade affects economic growth in order to develop effective trade policies, regional integration plans, and decision-making procedures. The results of this study will contribute to the body of knowledge by shedding light on the precise role that regional trade, particularly in the merchandise sector, plays in determining Tanzania's economic growth trajectory. In the end, the study may help policymakers develop methods that support equitable and sustainable economic growth through regional trade cooperation.

The study comprises several sections: an introduction, a literature review, the methodology, the findings, the conclusions, and the recommendations. The introduction section briefly describes the research topic and its importance. The literature review critically analyses existing research on regional trade and its impact on Tanzania's economic development, while the research strategy and data analysis methods are described in the methodology. The findings present the empirical results. The key conclusions and recommendations provide concrete advice for decision-makers and other stakeholders. Combining these sections makes it easier to comprehend how regional commerce has impacted Tanzania's economic expansion.

### **Empirical Literature Review**

(Okoro, A. S., Ujunwa, A., Umar, F., & Ukemenam, A., 2020) undertook an in-depth study that looked into the influence of both regional and non-regional trade on the rate of economic growth. The analysis employed yearly data collected from ECOWAS member states from 2007 to 2017. The data was categorised into local-trade, which pertains to trade among ECOWAS members, and non-local-trade, which refers to trade amongst ECOWAS member states and the rest of the world.

They employed the dynamic system GMM (Generalized Method of Moments) to estimate the models, incorporating controlled variables like the exchange rate, the rate of unemployment, the growth rate of the population, and the formation of gross capital. The outcomes indicate that regional trade agreements (RTAs) could be a more feasible alternative in comparison to global trade. This is because the ECOWAS regional trade coefficient has a statistically significant positive effect on growth forecasting, whereas the non-regional trade coefficient has a statistically

insignificant negative effect on growth prediction. The controlled variables exhibited mixed results: population increase, unemployment, and the depreciation of the exchange rate impeded economic expansion, while gross capital formation fostered the growth of the economy.

The study's findings indicate that regional trade agreements (RTAs) have a greater effect and may be a more effective strategy for stimulating economic growth in the ECOWAS region compared to global trade.

(Gammadigbe, 2021) argues that Regional Trade Agreements (RTAs) aim to promote economic growth in member nations by means of enhanced commerce, scale economies, technology, and knowledge transfer. The study looks at how regional trade integration (RTI) affects income convergence and economic growth in Africa's main Regional Economic Communities (RECs) using panel data covering the years 1979 to 2018. According to the study, panel fixed-effects estimation and instrumental variable analysis demonstrate that RTI fosters economic expansion in Africa. On the other hand, it encourages income divergence, which is a reflection of how the benefits reaped from regional integration are distributed in favour of the continent's most advanced countries.

Chen, S., Zhang, H., & Wang, S., (2022) set out to examine how the openness of trade affects economic growth in China's regions. The methodology employed in the research entailed the construction of trade shares to mitigate the issue of endogeneity. As per the investigation, the level of openness in trade has a beneficial effect on the growth of regional economies in China. The report concludes that trade openness is an essential determinant of local economic expansion in China and suggests that policymakers continue to encourage trade liberalisation policies.

Kamau, (2010) studied the influence of economic integration on growth through the formulation of an economic integration index based on the average Most Favoured Nations (MFN) tariffs and the degree of regional collaboration within the COMESA, EAC, and SADC regions. The study utilised data from the World Bank's World Development Indicators, spanning from 1990 to 2014. The methodology employed was the system GMM estimation technique. The findings of the research exhibit a positive correlation between economic integration and economic growth. Both economic integration and trade, individually and collectively, demonstrate a significant and positive impact on growth. The study suggests, among other policies, the implementation of non-discriminatory trade liberalisation alongside preferential liberalisation in both goods and services as a means to achieve a substantial and consistent positive influence on growth.

(Gonese, D., Tsegaye, A., Khumalo, S. A., & Kapingura, F. M., 2023) investigated the effectiveness of certain policies for trade integration in SADC, specifically the regime encompassed by trade liberalisation, in promoting economic expansion and decreasing poverty within the area. The study employed different sources of data, including the World Bank, the United Nations, and the International Monetary Fund. The study employed a mix of subjective and objective strategies in its exploration procedure. The outcomes indicate that regional integration in southern Africa has not been successful in reducing poverty and advancing economic growth. He further recommends that SADC member nations direct their attention towards implementing policies that foster productive competitiveness and supply-side interventions to reinforce the Free

Trade Agreements (FTAs) and, hence, contribute to economic progress. The study also recognised the prospective limitations and adverse impacts of the FTAs and put forth potential remedies to address them.

Agbetsiafa, (2014) conducted the study to examine the causal correlation between regional integration, trade openness, and economic growth in the UEMOA nations. The research utilised annual time series data from 1995 to 2017 for eight UEMOA countries. The inquiry utilised the ARDL bounds testing method for cointegration and analysed the data using the Granger causality test. The results of the research disclosed that there exists a long-term association between regional integration, trade openness, and economic growth in the UEMOA countries. Additionally, the investigation disclosed that territorial incorporation and commercial accessibility possess an affirmative and noteworthy influence on the financial expansion of the UEMOA nations. The study concluded that regional integration and trade openness play a critical role in promoting economic growth in the UEMOA countries. Therefore, the study recommends that policymakers in the UEMOA countries should continue to foster regional integration and trade openness to enhance economic growth.

Pearlman, (2009) examined the geopolitics, regional trade, and economic growth spillovers in India and South Asia. The analysis employs data derived from the International Monetary Fund (IMF) and the World Investment Report 2017. According to projections, China and the US will be India's main rivals in terms of investment appeal during the next two years. Provided that India and China continue to endure the current economic growth rate, they will function as growth poles for the world economy. The exchange of goods and services, comprising exports and imports of technology, confers high opportunities for resource exploitation and a high degree of technical edge. Also, the investigation anticipated the potential for economic growth in India and South Asia through regional economic cooperation and international trade.

The study by (Usman & Bashir, 2022) Using data from 2000 to 2021, they examined the relationship between economic growth and imports from China. A vector auto-regression (VAR) model was used to perform additional analysis. This model includes key macroeconomic fundamentals like the bank rate, the rate of inflation, and the exchange rate between the US dollar and the Chinese Yuan. The model's impulse responses, in line with the findings and economic theory, indicated that the rate of GDP growth initially had a positive impact on imports for the first three quarters before changing to a negative impact. In contrast, the rate of import growth is negatively correlated with the rate of GDP growth.

## **Theoretical Framework**

### **The Gravity Model**

According to the gravity model, which was developed by economists Jan Tinbergen and P.J. Verdoorn in the early 1960s, the degree of trade connections between countries is influenced by their disparate economic sizes and geographic distances (Capoani, 2023). More specifically, larger economies tend to engage in more trade, while geographic proximity can lower transportation costs and encourage trade. (Kabir, M., Singh, S., & Ferrantino, M. J., 2019)The present study intends to

utilise the gravity model to examine regional trade and evaluate the possible ramifications of heightened trade with neighbouring nations on Tanzania's economic advancement.

### **The Comparative Advantage Theory**

The theory of comparative advantage, as initially suggested by economist David Ricardo back in 1817, argues that nations should specialise in producing commodities and services that carry lower opportunity costs compared to their respective trading partners (Capoani, 2023). This theory emphasises the significance of leveraging comparative advantages to bolster trade and economic expansion (Selwyn & Leyden, 2022). Based on the theory, Tanzania will engage in trade with its neighbouring countries by exporting goods that it is relatively more efficient at producing and importing goods that it is relatively less efficient at producing compared to its trading partners. Thus, the current investigation aims to evaluate the potential economic growth benefits of regional trade for Tanzania.

The combination of the gravity model and comparative advantage theory is a fantastic way to get a full understanding of how regional trade impacts Tanzania's economic growth. The gravity model is great for examining trade flows based on economic size and distance, while the comparative advantage theory highlights the importance of specialization and trade based on relative efficiencies. Our study aims to offer valuable insights into the potential economic growth implications of regional trade for Tanzania by analyzing regional trade patterns within this theoretical framework. We hope to provide a friendly and helpful perspective on this topic.

### **Data Collection and Analysis**

The study employed a non-experimental research design to analyze data sets obtained from the global pennies tables spanning the years 1960 to 2021. This method is especially valuable in situations where carrying out experiments is not feasible or ethical, such as when relationship between merchandise exports, imports, and growth rate in a real-world context. The utilization of a non-experimental research approach in this study allows for an accurate evaluation of the effect of merchandise exports and imports on the growth of domestic products in Tanzania. The use of a non-experimental research approach in this study enables a precise assessment of the influence of goods exports and imports on the growth of local products in Tanzania. The analysis focused on Tanzania, employing data from the World Bank due to its cost-effectiveness and suitability for the study, especially when the dataset is obtained by reputable (Tile, A., Lihawa, R. M., Sesabo, J. K., Utouh, H. M. L., & Rwechumgura, F. A., 2023; Tile, A., Utouh, H. M. L., Sesabo, J. K., 2024; Johnston, 2014). Consequently, the findings of the research can be extrapolated to comparable contexts in other sub-Saharan African nations. In addition, the non-experimental research design effectively tackles several drawbacks of experimental research designs, such as the limited control over extraneous variables and the inability to change variables of interest. The dataset includes the actual Gross Domestic Product (GDP) measured in millions of US dollars, the value of imported goods by the reporting economy in current US dollars, and the value of exported goods by the reporting economy in current US dollars. The dataset is annually updated,

encompassing the time period from 1960 to 2021. The time series data is utilized to analyze the causal link between the GDP in terms of millions of US dollars and the merchandise imports and exports by the reporting economy, measured in current US dollars. The study used STATA 17 in all analyses, and the study's computation and drawing of the figures were done using the said software.

**Model Estimation**

**The Vector Autoregressive Model (VAR)**

For multivariate time series analysis, the Vector Autoregressive model (VAR) is a well-liked, adaptable, and simple technique. It is employed to investigate how the regressor factors affect the regress and variables (Utouh & Tile, 2023). The dynamic multivariate autoregressive model naturally leads to the univariate autoregressive model. Research has established that the VAR model excels at forecasting simultaneous equations based on complex theory models and time series models, as well as time series for the economic and financial dynamics behaviour. Because they can be modified and made dependent on the potential future courses of certain model variables, forecasts derived from VAR models are incredibly flexible (Manasseh, C. O., Abada, F. C., Okiche, E. L., Okanya, O., Nwakoby, I. C., Offu, P., Ogbuagu, A. R., Okafor, C. O., Obidike, P. C., & Nwonye, N. G., 2022; Utouh & Tile, (2023).

The following is the specification of the vector autoregressive model.

$$GDP_t = f(MEXP_t, MIPT_t) + v_t \dots \dots \dots (1)$$

Whereas  $v_t$  represent the stochastic term.

Equation 1.1 is created by applying the Cobb Douglass log linear to the original equation to produce a linear equation.

$$GDP_t = \delta_0 (GDP_{t-1})^{\delta_1} (MEXP_t)^{\delta_2} (MIPT_t)^{\delta_3} (v_t)^{\epsilon_t} \dots \dots \dots (2)$$

$$\ln GDP_t = \ln \delta_0 + \delta_1 \ln GDP_{t-1} + \delta_2 \ln MEXP_t + \delta_3 \ln MIPT_t + \epsilon_t \dots \dots \dots (3)$$

Therefore, Vector autoregressive model become.

$$\ln GDP_t = \ln \delta_0 + \delta_1 \ln GDP_{t-1} + \delta_2 \ln MEXP_t + \delta_3 \ln MIPT_t + \epsilon_t \dots \dots \dots (4)$$

The coefficients of the explanatory variables in equation 1.3 correspond to the long-term elasticities of the explained variable.

**Tests and Selection Order Criterion**

**The Augmented Dickey-Fuller (ADF) Test**

This study checked the presence of unit roots by employing the augmented Dickey-Fuller (ADF) test, as proposed by Dickey and Fuller, 1981. To prevent erroneous regression estimations, the stationarity test is essential for time series variables, or observations. As a result, the estimator that is most widely utilised in this research for ascertaining stationarity is the Augmented Dickey Fuller (Bashir & Natacha, 2020; Utouh & A.Tile, 2023).

Consider the ADF Test that.

$$\Delta Y_t = \sigma_1 + \lambda Y_{t-1} + \sum_{i=1}^n \beta_i \Delta Y_{t-i} + \epsilon_i \dots \dots \dots (5)$$

We analyse the hypotheses presented in equation 1.4, as depicted below,

$H_0: \lambda = 0$  this assumption leads to the conclusion that the series is not stationary  
 $H_0: \lambda < 0$  this alternative hypothesis assumes that the series exhibits stationarity

### Selection Order Criteria

Since the  $p$  is always unknown, it must be estimated using VAR estimation of the variables at their respective levels. The  $p$  can be ascertained using a variety of lag length criteria, including the Hannan Quinn (HQ) Information Criterion, Final Prediction Error (FPE), Schwarz Information Criterion (SC), and Akaike's Information Criterion (AIC) (Utouh & Tile, 2023).

### Engle Granger Cointegration Test

The cointegration test is conducted subsequent to verifying the stationarity of the series in order to evaluate the presence of a long-run relationship between variables. We conducted the cointegration test for this study using the Engle Granger Cointegration Test, which uses maximum likelihood to test the long-term relationship across multivariate vector autoregressive (VAR) models.

Engle (1987) developed a two-step residuals-based procedure for testing for cointegrating relationships into an estimated model. It is necessary to test each of the variables individually, whether stationary or non-stationary, using a unit root test.

The Engle granger procedure is applicable only if both variables are non-stationary. If either or both  $X_t$  and  $Y_t$  are non-stationary on  $I(2)$  then the procedure can be followed by using the first difference of the  $I(2)$  variable.

$$\text{Estimate } Y_t = \beta_1 + \beta_2 X_t + \mu_t \dots \dots \dots (6)$$

$$\text{Test residual } \mu_t = Y_t - \beta_1 + \beta_2 X_t \text{ test } \mu_t \dots \dots \dots (7)$$

Test  $H_0: P=0$  against  $P < 1$

$$\Delta \hat{\mu}_t = P\mu_{t-1} + \varepsilon_t \dots \dots \dots (8)$$

$$\Delta \hat{\mu}_t = P\mu_{t-1} + \delta_2 \Delta \mu_{t-1} + \varepsilon_t \dots \dots \dots (9)$$

$$\Delta \hat{\mu}_t = P\mu_{t-1} + \delta_1 \Delta \mu_t + \delta_2 \Delta \mu_t + \varepsilon_t \dots \dots \dots (10)$$

### Decision

Accept the null hypothesis  $H_0$  if the test statistic  $V_t$  indicates no stationarity. Stop the analysis if the variable  $y_t, x_t$  is not cointegrated.

Reject  $H_0$  if  $V_t$  is stationary, then proceed to step two if  $y_t, x_t$  is cointegrated.

### Step 2

Estimate ECM by estimating one of the following using OLS.

$$\Delta \hat{Y}_t = \delta_1 + \delta_2 \Delta X_t + \psi \mu_t + \varepsilon_t \dots \dots \dots (11)$$

$$\Delta \hat{Y}_t = \delta_{20} \Delta X_t + \delta_{11} \Delta Y_{t-1} + \delta_{21} \Delta X_{t-1} + \psi \mu_t + \varepsilon_t \dots \dots \dots (12)$$



**Pairwise Wise Granger Causality**

The presence of long-term equilibrium relationships between variables is confirmed using the cointegration test. An ECM, or long-run equilibrium relationship, is employed when there is a cointegration relationship. The difference variable is employed to analyse the short-term correlation in the absence of a cointegration relationship, (Utouh & Tile, 2023:Usman, 2023).

The Granger causality test, on the other hand, can be used to determine whether one variable influences the prediction of another. Conventional Granger causality testing techniques should guarantee that time series data are stable and that the integration procedure is transparent.

Granger causality testing is not very effective in determining the causation of long-term period data, nevertheless, if the time series integration process is distinct or ambiguous (Farhan Ahmed, Muhammad Owais, 2015:Utouh & Tile, 2023).

**Table 1: List of Variables and their Expected Direction of Effect on Economic Growth**

Type of variable	Description	Expected sign
Dependent	GDP growth(annual%)	continuous
Independent	Merchandise exports to low- and middle-income economies within region (% of total merchandise exports)	Continuous +/-
Independent	Merchandise imports from low- and middle-income economies within region (% of total merchandise imports)	Continuous +/-

**Discussion of Findings**

**Descriptive Statistics**

**Table 2: Descriptive Statistics**

Variable	Mean	Standard deviation	Minimum	Maximum
Merchandise imports	10.01987	7.081517	0.329844	25.78579
Merchandise exports	17.17344	12.50598	0.114516	40.17055
GDP	5.133391	1.985997	0.584322	7.672155

Table 2 shows the mean value for merchandise imports, which is 10.01987. The standard deviation is 7.081517, indicating a considerable degree of variability around the mean. The range between this variable's least (0.329844) and maximum (25.78579) values emphasises its range even more. On the other hand, the mean for merchandise exports is greater at 17.17344, and the standard deviation is higher at 12.50598, indicating a higher degree of variability. The distribution of values, which ranges from 0.114516 to 40.17055, is wider than that of merchandise imports. The GDP shows a rather constant economic performance, with an annual mean of 5.133391 and a standard

deviation of 1.985997. The GDP figures represent the spectrum of economic output and range from 0.584322 to 7.672155.

Figure 1 demonstrates that in order to test for stationarity, the variables must encompass constants and drift in order to achieve stationarity. The presentation of the variables in Figure 1 signifies this. Moreover, these figures for merchandise export, merchandise import, and GDP indicate that these variables may not exhibit stationarity and so require further analysis using the Augmented Dickey Fuller test. This test will provide a numerical interpretation of the variables' status in relation to stationarity (unit root).

**Figure 1: Time Series Plot of Variables to Analyse Trends.**



### Stationarity

To avoid inaccurate results, it is definitely necessary to perform a pre-test for the statistical characteristics of the variables, including a non-stationarity test for time series data. Table 1 displays the results of the unit root test for the variables used in this study

The results of the unit root test show that every variable is integrated of order one, or I (1).

**Table 3: The Augmented Dickey-Fuller Test Results for the Unit Root Test**

Variables	Level			First Differences		
	None	Consta nt	Constant and Drift	None	Consta nt	Constant and Drift
GDP	-2.652 (0.0827)	-2.652 (0.0827)	-1.697** (0.0063)	-2.983 (0.4103)	-2.983 (0.4103)	-1.701** (0.0464)
Merchandize export	-2.922 (0.8070)	-2.922 (0.8070)	-1.672 (0.2021)	-2.923 (0.7851)	-2.923 (0.7851)	-0.725** (0.0087)
Merchandize import	-2.922 (0.1796)	-2.922 (0.1796)	-1.672** (0.0133)	-2.923 (0.2204)	-2.923 (0.2204)	-1.673** (0.0175)

Notes: Number in parentheses are the p values at 5% level of significance. \*\* indicate significance at 5% level.

**Selection of the Order for the Vector Autoregressive Model.**

The selection of the number of lags for causality tests is crucial since Granger causality and vector autoregression analysis rely on lagged variables (Benjamin Chun-Kit Tong, 2017:Utouh & A.Tile, 2023). The research required a practical test to determine the appropriate number of lags for the STATA command of vector autoregression selection order criteria in order to determine the lag-order selection statistics (varsoc) for the final prediction error (FPE), Akaike's information criterion (AIC), Schwartz's Bayesian information criterion (SBIC), and Hannan and Quinn information criterion (HQIC). According to the specifications of Schwartz's Bayesian information criterion (SBIC), the causality link test should ideally employ four lags to get accurate guesstimates. The study employed the Granger causality model's four-lag version of the dependent variable.

**Table 4: Selection of the Order for the Vector Autoregressive Model**

\* Indicates lag order selected by the criterion

Where LR: Sequential Modified LR Test Statistic (each test at 5% level), FPE: Final Prediction

Lags	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-233.753				4435.6	16.911	16.9546	17.0537
1	-189.981	87.544*	9	0.0000	372.227*	14.4272*	14.6018*	14.9982*
2	-185.641	8.6799	9	0.467	533.222	14.7601	15.0655	15.7592
3	-180.795	9.6931	9	0.376	766.568	15.0568	15.4931	16.4841
4	-176.16	9.2703	9	0.413	1194.83	15.3685	15.9358	17.2241

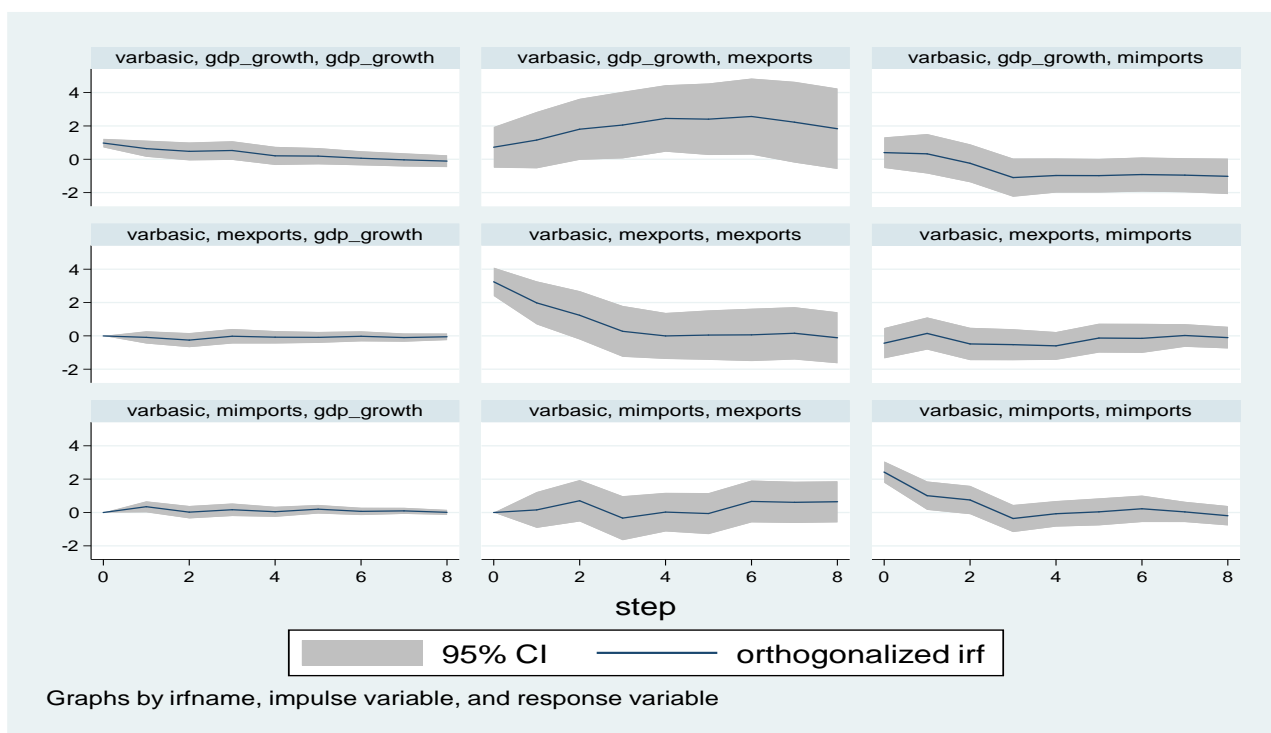
Error, AIC: Akaike Information Criterion, SBIC: Schwarz Bayesian Information Criterion, and

HICQ: Hannan Quinn Information Criterion.

Table 4's results indicate that order 1 is the most practical and optimal lag. This is because order 1 has the highest chance of producing the best estimation, as reflected by its four stars at LR, FPE, AIC, and HQIC, indicating that it is the best according to all those criteria. For this study, estimates have been made based on order 1's optimal lag.

The results shown in Table 4 are emphasized in Figure 2, where column 1 indicates that lag one is the ideal lag order. Such movements are indicative of differences in the way the variables change under various integration scenarios.

**Figure 2: Impulse and Response Variable**



**Table 5 Engle Granger Cointegration Test**

GDP Growth	Coefficients
Resid	
L1.	-0.40411** (0.160043)
Merchandise exports	
LD.	-0.0192 (0.068115)
Merchandise imports	
LD.	0.058916 (0.077986)
Constant	0.097633 (0.292694)

Note \*\*\* p<0.01, \*\* p<0.5, \*p<0.1

$H_0 =$  No cointegration between dependent variable and independent variables

$H_1 =$  There is cointegration between dependent variable and independent variables

From Table 4, the test statistic for residual coefficients is less than the critical values at the 5% level of significance. Hence, we reject the null hypothesis of no cointegration, indicating that both merchandise exports and merchandise imports cause GDP growth in Tanzania.

**Empirical Result**

Results in Table 6 show that the lagged variable of GDP, that is, the GDP of a previous year, increases current GDP growth in Tanzania. That is, there is a positive relationship between the previous GDP and current GDP, that is, the GDP of the previous year increases the DGP of the current year by 63%, holding other things constant. But also, the result shows merchandise imports have a positive relationship with GDP in Tanzania; that is, one unit increase in merchandise imports in the country increases the GDP by 35% per year.

**Table 6: Vector Autoregressive Output**

	(1)	(2)	(3)
L.GDP	GDP	Merchandise import	merchandise export
	0.637356** (0.134098)	0.359792** (0.141942)	-0.03998 (0.120079)
Merchandise import	-0.21815 (0.088874)	0.786065 (0.094072)	0.059348 (0.079582)
Merchandise export	0.170193** (0.067274)	-0.14831 (0.071209)	0.64949 (0.06024)
STRENGTH OF INSTRUMENTS			
AIC			1.40093
HQIC			1.581876
SBIC			1.956022
FPE			0.000818
Log likelihood			-9.71442
Number of observations			31

Note \*\*\* p<0.01, \*\* p<0.5, \*p<0.1

Since merchandise imports and exports are positively correlated, one unit change in merchandise exports increases GDP by 17% in Tanzania. The VAR analysis highlights how lagged values affect Tanzania's economic performance and trade dynamics, particularly in merchandise exports and imports with low- and middle-income nations within the region. These findings support the

gravitation hypothesis, which contends that variables like economic size and trading partner closeness affect trade flows. In this case, the lagged values of the growth rate serve as an indicator of Tanzania's economic size and performance, affecting its merchandise exports and imports. The findings also support the comparative advantage theory, as they imply that Tanzania has a comparative advantage in exporting certain goods to low- and middle-income nations within the region. Tanzania may use these insights to develop policies and plans that capitalize on its strengths and boost its regional trade competitiveness.

### Analysis of Pairwise Granger Causality Test

The findings of the Granger causality test presented in Table 7 indicate that there is a causal relationship between merchandise exports and the economic growth rate of Tanzania. Specifically, an increase in merchandise exports to these countries leads to subsequent economic growth. Similarly, the results reveal that merchandise imports from countries within the same income bracket also have a causal influence on Tanzania's economic growth. Furthermore, the analysis finds evidence that economic growth (GDP) has a causal relationship with changes in either merchandise exports or imports, as indicated by the Granger causality test. These findings suggest the significance of developing trade and exchange rate policies that give priority to and support merchandise exports to low- and middle-income countries, as they have a significant impact on stimulating economic growth (GDP growth).

**Table 7: Pairwise Granger Causality Test**  
**Pairwise Correlations**

Variables	(1)	(2)	(3)
(1) GDP growth	1.000		
(2) Merchandize imports	0.145** (0.430)	1.000	
(3) Merchandize exports	0.449** (0.010)	0.474** (0.000)	1.000

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

This finding aligns with the gravity model, which stipulates that nearby countries within the region are likely to be important trading partners due to their geographical proximity. Furthermore, the results also highlight the importance of comparative advantage, as Tanzania's merchandise exports to these countries are contributing to economic growth, indicating that Tanzania has a comparative advantage in producing and exporting certain goods to this specific market. Therefore, these findings reinforce the relevance and applicability of both the gravity model and comparative advantage theory in understanding and explaining Tanzania's trade patterns and their impact on economic growth.

## Diagnostic Tests

### Autocorrelation

The evidence from the LM test supports the interpretation that there is no significant residual autocorrelation in the model at lag order 1. This conclusion is based on the chi-square statistics and corresponding p-values, where both lag orders have probabilities greater than the conventional significance level of 0.05. Thus, we have no strong evidence to suggest the presence of autocorrelation in the residuals, indicating that the model adequately captures the temporal dynamics of the data without any systematic pattern of dependence over these lag orders.

**Table 8: Lagrange-Multiplier Test**

lag	1
Chi2	8.6795
Df	9
P-value	0.46737

### Discussion of Findings

The pairwise Granger causality test shows that merchandise imports cause GDP growth in Tanzania; that is, an increase in imports increases GDP growth in Tanzania. These results are in line with those of (Chen, S., Zhang, H., & Wang, S., 2022; Zhang, Y., Wu, Y., Yan, J., & Peng, T., 2022), who used annual data from 1980 to 2005 to examine the haphazard link between Bhutan's GDP, imports, and exports. To account for the random characteristics of the variables, the Granger causality test and co-integration models are used. According to the co-integration study, the connection is in long-run equilibrium. There is a causative relationship between the variables under investigation, according to the Granger causality test results. The causal relationship is one-way, going from GDP to imports and exports only. Here, Bhutan's export-led growth is supported by actual evidence.

Furthermore, a pairwise Granger causality test shows that merchandise exports cause GDP growth in Tanzania; that is, an increase in imports increases GDP growth in Tanzania. These results are in line with (Tile, A., Utouh, H. M. L., Sesabo, J. K., 2024; Varshini & Manonmani, 2018), who studied how the World Trade Organisation affected the link between imports, exports, and economic growth from 1995 to 2016. The study employed the Johansen Co-integration Technique for long-term relationships and the Granger Causality Test to determine the short-term association between the variables. The study employed the Augmented Dickey Fuller (ADF) test to verify the stationarity of the variables. At both the first and second level difference levels, the variables were stationary. There was enough data to conclude that there was a long-term correlation between economic growth and imports, as well as exports. The findings show that both an export-led and a growth-led import approach drove India's economic expansion.

However, the results do not align with those of (Usman & Bashir, 2022) who used data from 2000 to 2021. Their study examined the relationship between economic growth and imports from China. A Vector Auto-Regression (VAR) model was used to perform additional analysis. This model includes key macroeconomic variables such as the bank rate, the inflation rate, and the

exchange rate between the US dollar and the Chinese Yuan. The model's impulse responses, in line with the findings and economic theory, indicated that the GDP growth rate initially had a positive impact on imports for the first three quarters before changing to a negative impact. On the other hand, the GDP growth rate had a negative correlation with the import growth rate.

## Conclusion

The results of the VAR model show that the proportions of goods exported and imported to and from low- and middle-income nations in the area, as well as Tanzania's own lagged values, heavily influence its economic development. This highlights the interdependence between economic growth and regional trade dynamics.

The Granger causality test reveals a causal relationship between merchandise exports to low- and middle-income countries within the region and Tanzania's economic growth. Similarly, merchandise imports from countries have a causal influence on economic growth. These findings suggest that regional trade, particularly with low- and middle-income countries, plays a crucial role in driving Tanzania's economic growth.

The government should focus on export diversification by promoting the development of a wider range of export products; investment in trade infrastructure is crucial for facilitating efficient trade flows; trade facilitation mechanisms need to be strengthened to simplify procedures and reduce barriers; active engagement in regional economic partnerships can provide access to larger markets; promoting trade financing and credit access for businesses involved in regional trade is essential; and improving data collection and analysis, ensuring policy coordination, and fostering regional cooperation are important for informed decision-making and effective implementation.

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