THE CAUSAL RELATIONSHIP BETWEEN TRADE OPENNESS AND ECONOMIC GROWTH IN TANZANIA

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Abstract

This paper analyses the relationship between trade openness and economic growth in Tanzania; and uncovers the direction of causality between trade openness and economic growth. The analysis uses the Vector Autoregressive Model, which is a time series model suitable in capturing dynamic interrelationship among variables. Data involved yearly time series data covering the period of 1970 to 2021 using the causality test. The analysis was informed by the Heckscher-Ohlin theory, which suggests that by capitalizing on abundant factors of production and produce goods which have comparative advantage, trade can lead to economic growth. It was found that trade openness, lagged to one period, positively and significantly affects economic growth in Tanzania. The growth rate of GDP lagged to two periods depicts a significant positive influence on GDP

growth rate. Also, the gross national savings, measured as a percentage of GDP lagged to two periods, is statistically significant and negatively related to the GDP growth rates. In addition, the findings showed a negative and statistically significant relationship between inflation lagged to two periods and the GDP growth rate. The causality test rejected the null hypothesis of no evidence of Granger causality between trade openness and economic growth. However, the test could not account for the magnitude of causality. It is recommended that the country foster trade liberalization by pursuing policies that promote trade such as reducing tariffs, streamlining custom procedures, and eliminating non-tariff barriers to trade. It is also important to encourage Foreign Direct Investment, to invest in infrastructure development, to ensure optimal savings, and control inflation to promote economic growth.

Keywords*:* Vector Autoregressive; Economic Growth; Trade Openness; Granger Causality Wald Test

1. Introduction

The idea that international trade is the engine of growth goes back at least to Adam Smith; the existence of gains from trade is a long-established principle in economic theory. As a consequence, many economists support the claim that more openness to trade promotes exports, advances growth and engenders development. The major macroeconomic policy objective in any economy has been to achieve a rapid economic growth. With this objective in mind, it usually informs policy and decision-makers in formulating trade and investment policies that aim at achieving the goal of economic growth. The accomplishment of this overarching goal of economic growth would enable a country to address the long-standing issue of

poverty, which has been a pervasive problem in Africa, specifically Tanzania, for centuries. Tanzania has been implementing a series of economic reforms, including trade liberalization, in a bid to foster economic growth. The theoretical underpinnings and belief in undertaking these reforms have been motivated by the fact that trade liberalization is expected to foster economic growth. Nevertheless, empirical evidence has demonstrated mixed outcomes when examining the connection between trade and economic growth (Chaudhuri et al., 2008; Chandra et al., 2010; Du, 2010). Some empirical studies have recognized the favourable correlation between trade and economic growth (Dollar and Kraay, 2003) while other studies, particularly the study by Easterly (2008), have shown that trade has no association with economic growth as it tends to lead to income divergence rather than convergence in some African countries. Another issue regarding the relationship between trade and economic growth has revolved around the direction of causality. The debate surrounding the direction of causality has been ongoing, with certain studies affirming a complex causality that is contingent upon various factors (Dollar and Kraay, 2003), while other studies found just a unidirectional causality (Saaed and Hassain, 2015; Bakari and Mabrouki, 2017).

Traditional economists have offered insights that trade patterns among countries are determined by comparative advantage whereby countries that differ in comparative advantage can benefit from trade. This insight stresses the importance of specialization in the sense that specialization is the main channel through which trade spurs the overall growth rate. Specializing in the production of a good that each country can produce at a relatively lower cost increases output and consumption in each country, hence increasing overall welfare. However, higher welfare is not synonymous with higher growth of Gross

Domestic Product Dyan and Sheiner (2018). Consequently, some economists argue that the main reason why openness to trade is good for the economy has little to do with the traditional theory of static gains from trade. In addition, the endogenous growth theory and new trade theory have established a strong linkage between trade openness and long-term economic growth by demonstrating how investment decisions by profit-maximizing firms drive innovations and accelerate economic growth through internal technological advances. The main channels through which trade can accelerate growth as revealed by these models are said to be endogenous and dynamic.

Countries that have made market liberalization reforms, as advocated by the Washington Consensus, have experienced mixed economic outcomes. The consensus aimed to reduce barriers to trade and investment based on the belief that protectionism created economic distortions (Williamson, 2009). However, the results of these reforms have challenged the widely held support for trade liberalization (World Bank, 2005). In recent negotiations among World Trade Organization (WTO) members, efforts were made to decrease tariffs for agricultural, industrial and service products. However, developed countries expressed resistance to these measures due to concerns about potential competition from foreign markets (Dao, 2014).

There is a large cross-country literature looking at the relationships between indicators of trade performance or policy with growth (Dollar and Kraay, 2003; Rodrígues, 2007; Welch and Wacziarg, 2008; Dao, 2014; Tahir and Ali, 2014; Huchet-Bourdon et al., 2018; Altaee and Al-Jafari, 2018). However, the results are uninformative for individual countries, as they only provide what happens on averages; and one cannot disentangle the effects of trade or trade policy from other factors that may occur concurrently. Besides the early multicountry studies, few

such studies exist today that have focused on individual countries regarding the effects of trade openness on economic growth; and those that exist have mainly focused on developed economies. There is thus a need to establish for a poor and low-income country – small open economy like Tanzania, the causal relationship between trade openness and economic growth.

Although the relationship between trade openness and economic growth has highly been debated in the growth and development literature, this issue is still far from being resolved until today. For example, empirical literature on growth-openness connection ranges from cross country to country specific studies. It has been found that although cross country studies encounter problems in identifying or defining a measure of openness, both cross country and case studies vehemently confirmed a positive impact of trade openness on growth. However, it is also important to note that there are other studies which have doubted and criticized the robustness of this effect (Frankel and Romer, 2011; Silajdzic and Mehic, 2018; Eris and Ulasan, 2013; Semančíková, 2016).

A paper by Frankel and Romer (2011), which was based on a panel data regression analysis, aimed at examining the causal relationship between trade and growth, found evidence of a positive relationship between trade and economic growth. This evidence suggests that trade can be a good driver of economic growth. In addition, a paper by Silajdzic and Mehic (2018) provided a comprehensive review of empirical evidence on the impact of trade openness on economic growth. The researcher found a substantial body of evidence supporting a positive relationship between trade openness and economic growth; indicating that trade can be a significant driver of economic development. On the other hand, a paper by Eris and Ulasan (2013) examined the interaction between trade openness and

long-run economic growth by making use of the Bayesian model averaging techniques to systematically account for uncertainty in the model. The study found robust inclusion of varying proxies of trade openness and none of the proxies were connected with economic growth robustly. Similarly, Semančíková (2016) conducted a study to examine the link among trade, trade openness and macroeconomic performance using descriptive and comparative analysis of significant empirical studies. The result of the study indicated a positive effect of trade and trade openness on macroeconomic variables particularly growth.

Another study by Bagnai et al. (2016) applied the post-Keynesian balance-of-payments constrained growth approach with a focus on the contribution of South-South trade to analyse the increasing growth in the economy of Sub-Saharan Africa countries. In this study, the panel co-integration method of estimation was adopted which focused on twenty (20) low-income and lower-middle-income Sub-Saharan African countries using annual data from 1990 to 2008. The study concluded that there had been relaxation in constraints of balance-of-payments of Sub-Saharan Africa. However, some recent studies present contrasting evidence (Tekin, 2012; Menyah and Wolde-Rufael, 2014; Malefane and Odhiambo, 2021; Moyo and Khobai, 2018). The study by Tekin (2012) in particular analyzed data in twenty-seven (27) least developed countries of Sub-Saharan Africa and found that trade openness has negative effect on economic growth except for Burkina-Faso and Zambia. On the other hand, other studies have shown that the relationship runs from economic growth to trade openness (Awokuse, 2008; Chaudhry et al., 2010; Idris, Yusop and Habibukkah, 2016). More so, very recent empirical underpinnings on the same aspect have noted that the relationship between trade openness and economic growth has

manifested itself in the short-run and long-run dynamics. Studies by Chaudhry et al. (2010), Dritsakis and Stamatiou (2016) and Keho (2017) all have been able to capture both short-run and long-run relationships between trade openness and economic growth. However, in the short-run, these studies showed that trade openness has a negative effect on economic growth (Malefane and Odhiambo (2021).

In general, based on our empirical investigation and findings, the relationship between trade openness and economic growth has mixed results, and some studies have been inconclusive. In addition, there is still a lack of understanding regarding the short-run and long-run dynamics. Specifically, some studies have found a positive long-term association between trade openness and economic growth while some are contrary to these findings. However, evidence from low-income countries suggests that trade openness may have a negative impact on long-term economic growth. It is worth noting that most studies in this area have been based on multi-country data including both developing and developed countries in their analysis. The present work focuses specifically on the case of Tanzania as a developing economy.

2. Methodology and Modelling

2.1. Model Specification

In order to model trade openness and economic growth, the following Vector Autoregressive (VAR) Model is specified.

$$gdp\_g_t = c + \beta_1 open_{t-1} + \beta_2 open_{t-2} + \beta_3 gnat\_sav_{t-1} + \beta_3 gnat\_sav_{t-2} +$$

$$\beta_4 infl_{t-1} + \beta_5 infl_{t-2} + \beta_6 work\_pop_{t-1} + \beta_7 work\_pop_{t-2} +$$

$$\beta_8 grs\_capfom_{t-1} + \beta_8 grs\_capfom_{t-2} + \beta_9 \text{sec}\_enrl_{t-1} + \beta_{10} \text{sec}\_enrl_{t-2} + \varepsilon_t$$

Where gdp_g_t is the growth rate of gross domestic product,

$open$ is trade openness,
$gnat\_sav$ is gross national saving as a percentage of gross domestic product,
$inlf$ is inflation,
$work\_pop$ is labour force participation rate,
grs_capfom is gross capital formation,
sec$_enrl$ is secondary school enrollment,
c is a $k * 1$ constants (intercepts),
$\beta_1, \beta_2, \ldots \beta_{10}$ are $k * k$ matrices of coefficients for the lagged values of the variables, and
ε_t is a $k * 1$ vector of error terms for each equation.

The paper employs the Vector Autoregressive (VAR) Model which was proposed by Lütkepohl (2013). The VAR model is the most appropriate estimation model as it has the power to estimate the dynamic relationships between multiple time series variables. In addition, the model allows for Impulse Response Function (IRF) analysis, which is the examination of the effects of one variable on all other variables in the system. This allows the understanding of transmission mechanism regarding shocks on the variables and how the shocks affect the system as a whole.

2.2. Conceptual Framework

The conceptual framework for the causal relationship between trade openness and economic growth explains the potential pathways through which trade openness can affect economic growth; and explores the direction of causality between these two variables. The framework encompasses trade openness, which refers to the extent to which a country engages herself in international trade mainly through imports and exports. The framework also encompasses trade openness, which is influenced by tariffs, quotas and other trade agreements. The other component is the economic growth, which represents the

sustained increase in a country's production of goods and services over a specified period of time. Basically, a higher GDP growth normally reflects improved living standards, employment opportunities and expansion of the overall economy.

In this conceptual framework, several components are considered as channels through which trade can affect growth. These include resource allocation whereby it allows countries to specialize in the production of goods and services, which have a comparative advantage; technological diffusion whereby international trade facilitates the transfer of knowledge, technology, and innovation which, in turn, increase productivity. The other channels are market access and competition and Foreign Direct Investment (FDI). Furthermore, the framework recognizes the potential of endogeneity and reverse causality whereby economic growth can drive trade openness and, similarly, trade openness can trigger economic growth. Furthermore, the role of institutional and policy factors cannot be overlooked as they play a crucial role in shaping the relationship between trade openness and economic growth.

2.3. Variable Description

Table 1 depicts descriptions and measurement of variables.

Table 1: Variable Description and Measurement

Variable	Description	Variable Measurement
gdp_g_t	Growth rate of Gross Domestic Product	Continuous, Dependent Variable
$open_t$	The trade openness Index calculated as the ratio of the country's trade to Gross Domestic Product.	Continuous, Independent Variable
$gnat\_sav_t$	Gross National Saving measured as a percentage of Gross Domestic Product	Continuous, Independent variable
$work\_pop_t$	Labour force participation rate	Continuous, independent Variable
$inlf_t$	Inflation rate	Continuous, Independent variable
sec $\_enrl_t$	Secondary School enrolment rate	Continuous, Independent variable
grs_capfom_t	Gross Capital Formation	Continuous, Independent variable

3. Results and Discussion

3.1. Descriptive Statistics Analysis

Table 2 shows the analysis of descriptive statistics.

Table 2: Descriptive Statistics Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
$year$	52	1995.5	15.1	1970	2021
gdp_g_t	52	4.4	2.3	-2.4	7.7
$open_t$	52	31.6	10.7	10.7	56.6
$\text{sec\_}enrl_t$	49	10.8	10.7	2.7	34
$work\_pop_t$	52	51.55	.9	49.8	53.3
grs_capfom_t	52	1.010e+13	1.732e+13	4.332e +09	6.512e +13
$inlf_t$	52	15.3	11.1	2.4	36.1
$gnat\_sav_t$	42	20.0	9.1	4.8	37.8

Source: Study Findings

A summary of descriptive statistics has been provided in Table 2. Data for the variables used in the analysis range from the period of 1970 to 2021 involving 52 observations with the exception of two variables, which are secondary school enrolment rate with 49 observations, and the gross national savings, which has 42 observations. Inflation rate ranges from a minimum of 2.4% to 36.1% with a relatively high deviation from the mean of 11.1, however, with a mean value of 15.3. The gross capital formation, measured as a percentage of GDP over the entire period, has a minimum value of 4,332,105,768 and a maximum value of 65,122,300,000,000 with a mean of 1.010e+13; and a dispersion of 1.732e+13 from the mean. On the other hand, labour force participation rate (a key measure of the proportion of the working population that is either employed or actively seeking employment) has a minimum value of 49.8% and a maximum value of 53.3%, with a mean value of 51.55%

and a dispersion of 0.9% from the mean. Secondary School enrolment rate has been observed to have a minimum value of 2.7% and a maximum value of 34% with mean of 10.814 and a standard deviation of 10.7. Trade openness index has a maximum value of 56.6 and a minimum value of 10.7 with a relatively higher dispersion of 10.7 from the mean, and the mean value of 31.6. More so, the GDP growth rate has been found to range from minus 2.4% to 7.7%, with a mean value of 4.40 and dispersion of 2.353 from the mean. In a nutshell, this descriptive statistical analysis was conducted to gain insights into the characteristics of the data set and identify potential issues or anomalies of the data set.

3.2. Optimal Lags Selection (Akaike Information Criteria)

Wooldridge (2015) suggested that with annual data there should be optimal lags which should be selected appropriately. The ideal lags selection should typically be as small as 1 or 2 lags. Small lags selection is necessarily appropriate as the degree of freedom would not be compromised. As regards to this paper, the ideal number of lags were decided for each variable. Specifically, we did not include too many lags to prevent consuming the degrees of freedom as well as avoiding the problem of multicollinearity, which would impact the findings thereby negatively affecting the precision of the coefficients estimates. In the same vein, we avoided including too few lags to avoid the problem of specification error, which could otherwise happen; hence the specific variable lag length was selected by the use of Akaike Information Criterion (AIC), which gives the lowest value as shown in Table 3.

Table 3: Optimal Lags Selection with AIC

Variable	lag	LL	LR	df	p-value	FPE	AIC
gdp_g_t	0	-109.854				5.93596	4.6189
	1	-99.0646	21.578*	1	0.000	3.94795*	4.21103*
	2	-98.3931	1.3429	1	0.247	4.00282	4.22471
	3	-97.1136	2.5591	1	0.110	3.95736	4.21307
	4	-97.079	.06915	1	0.793	4.12132	4.25329
$open_t$	0	-183.483				127.605	7.68681
	1	-136.119	94.728	1	0.000	18.4884	5.75497
	2	-132.491	7.256*	1	0.007	16.5727*	5.64547*
	3	-132.209	.56525	1	0.452	17.0794	5.67536
	4	-130.98	2.458	1	0.117	16.9235	5.66582
$gnat\_sav_t$	0	-135.919				78.9181	7.20628
	1	-98.745	74.348*	1	0.000	11.7586*	5.30237*
	2	-98.7058	.07846	1	0.779	12.3714	5.35294
	3	-98.5983	.21496	1	0.643	12.9723	5.39991
	4	-98.3798	.43699	1	0.509	13.5272	5.44104
$work\_pop$	0	-68.6952				1.06833	2.90397
	1	22.1329	181.66	1	0.000	.025306	-.83887
	2	53.1641	62.062	1	0.000	.007242	-2.09017
	3	55.9155	5.5028*	1	0.019	.006734*	-2.16314*
	4	56.2363	.64161	1	0.423	.00693	-2.13484
$inlf_t$	0	-183.758				129.071	7.69824
	1	-154.743	58.029*	1	0.000	40.171	6.53097
	2	-153.594	2.2995	1	0.129	39.9257*	6.52473*
	3	-153.475	.23758	1	0.626	41.4282	6.56145
	4	-153.334	.28207	1	0.595	42.9537	6.59724
sec $\_enrl_t$	0	-152.174				102.927	7.47189

Variable	lag	LL	LR	df	p-value	FPE	AIC
	1	-75.3683	153.61	1	0.000	2.55044	3.77407
	2	-62.7192	25.298	1	0/000	1.44513	3.20581
	3	-57.6364	10.166*	1	0.001	1.18459*	3.00665*
	4	-57.5512	.17037	1	0.689	1.23939	3.05128

Source: Study Findings

The Akaike Information Criteria as used in Table 3 serves as a valuable tool for guiding us about the ability to identify the most appropriate model for our data. The Akaike Information Criteria enabled us to strike a balance between model accuracy and complexity. However, due to its limitations, it was chosen alongside other model selection criteria and carefully interpreted.

3.3. Stationarity Test with Optimal Lags

Data analysis involved subjecting the series of observations with a unit root test to determine the stationarity condition of each variable. In doing so, a number of lags were employed to determine the order of integration. The unit root test was conducted by the use of Augmented Dickey Fuller test with results of unit root test presented in Table 4. The null hypothesis was specified such that the series of the variables used in the model had a unit root against the alternative hypothesis; which posits that the series of variables were stationary. However, by examining the p-values of our unit root test, the null hypothesis was accepted; that the observations had a unit root in all the variables used in the paper since the p-values were not statistically significant.

Table 4: Unit Root Test with Optimal Lags

Variable	No. of Obs	No. of lags	Test Statistics	Dickey-Fuller critical value 1%	5%	10%	P-value
gdp_g_t	50	1	-2.561	-3.580	-2.930	-2.600	0.1013
$open_t$	49	2	-1.645	-3.587	-2.933	-2.601	0.4599
sec $\_enrl_t$	41	3	-2.214	-3.594	-2.936	-2.602	0.2013
$work\_pop_t$	48	3	-1.579	-3.58	-2.93	-2.600	0.4943
grs_capfom_t	48	3	3.654	-3.594	-2.936	-2.602	1.0000
$inlf_t$	49	2	-1.280	-3.587	-2.933	-2.601	0.6381

Source: **Study Findings**

3.4. First Difference Optimal Lags Determination (Akaike Information Criteria)

In part 3.3 of this paper, it has been shown that none of the variables used in the paper qualifies for stationarity condition. As a rule of thumb, we had to conduct the first difference optimal lag selection by employing the Akaike Information Criteria for all variables since they were not stationary in the first place. Again, as Wooldridge (2015) suggested, with time series data, the number of lags should be as small as 1 or 2 lags. These lags are said to be appropriate in order not to lose the degree of freedom and to avoid the problem of multicollinearity, which would compromise the efficiency of parameter estimates. Table 5 provides the first differenced optimal lag determination with the use of AIC whereby it was found that inflation and trade openness had optimal lag of 1, the variable GDP growth rate had optimal lag of 2 while two variables i.e., labour force participation rate and secondary school enrolment rate had optimal lag of 4. Table 5 is illustrative.

Table 5:First Difference Optimal Lag Determination with AIC

Variable	lag	LL	LR	df	p-value	FPE	AIC
$d.gdp\_g_t$	0	-102.738				4.83799	4.41437
	1	-99.548	6.3793	1	0.012	4.40776	4.32119
	2	-97.0848	4.9265*	1	0.026	4.14218*	4.25893*
	3	-97.0249	.11965	1	0.729	4.31229	4.29893
	4	-96.8179	.41414	1	0.520	4.46204	4.33267
$d.open_t$	0	-134.574				18.7506	5.7691
	1	-131.897	5.3544*	1	0.021	17.4598*	5.69773*

	2	-131.176	1.4409	1	0.230	17.671	5.70963
	3	-130.651	1.0495	1	0.306	18.0363	5.72985
	4	-130.2	.90193	1	0.342	18.4699	5.75321
$d.gnat\_sav$	0	-97.0693				11.7421*	5.30104*
	1	-97.0661	.00625	1	0.937	12.3933	5.35493
	2	-96.744	.6442	1	0.422	12.8591	5.39157
	3	-96.7061	.07586	1	0.783	13.5521	5.44357
	4	-96.7009	.01043	1	0.919	14.3125	5.49735
$d.$ $work\_pop_t$	0	21.2056				.024781	-.859813
	1	52.1069	61.803	1	0.000	.006943	-2.13221
	2	53.7838	3.3538	1	0.067	.006747	-2.16101
	3	53.8824	.19711	1	0.657	.007012	-2.12265
	4	58.0357	8.3066*	1	0.004	.006134*	-2.25684*
$d.inlf_t$	0	-152.813				40.7455	6.54522
	1	-150.708	4.2092*	1	0.040	38.8763*	6.49821*
	2	-150.218	.98041	1	0.322	39.7338	6.51991
	3	-150.213	.00993	1	0.921	41.4622	6.56225
	4	-149.919	.58848	1	0.443	42.7432	6.59228
$d.sec\ \_enrl$	0	-75.251				2.92251	3.91031
	1	-60.0484	30.405	1	0.000	1.41084	3.18197
	2	-57.6842	4.7284	1	0.030	1.31579	3.11201
	3	-57.1755	1.0175	1	0.313	1.34993	3.1372
	4	-53.3266	7.6978*	1	0.006	1.16725*	2.99111*

Source: Study Findings

3.5. First Difference Unit Root Test with Optimal Lags

The mechanism behind unit root test is such that de-trending the series of variables does not sufficiently transform the series into a stationarity condition. This would, however, require further transformation of the series into period-to-period or season-to season differences. This is because the statistics of the change in the series between periods or between seasons would make the series constant (stationary). Such behaviour of a series is known as a difference-stationary. The unit root test conducted in part 3.3 revealed that none of the variables used in this paper was stationary as all were found to possess a unit root. In this section, the variables which were not stationary in the first place were differenced once to eliminate the unit root bias. The presence of unit root in a series would result into spurious regression. The results in Table 6 show that we reject the null hypothesis in that the variables had a unit root at 5% level of significance for four variables with the exception of two variables, which are gross capital formation as a percentage of GDP and labour force participation rate.

Table 6: First Difference Unit Root Test with Optimal Lags

Variable	No. of Obs	No. of lags	Test Statistics	Dickey-Fuller critical value 1%	5%	10%	P-value
d. gdp_g_t	48	2	-5.211	-3.594	-2.936	-2.602	0.0000
d. $open_t$	48	2	-3.216	-3.594	-2.936	-2.602	0.0191
d. sec$_enrl_t$	37	4	-3.229	-3.668	-2.966	-2.616	0.0184
d. $work\_pop_t$	46	4	-2.310	-3.607	-2.941	-2.605	0.1687
d. grs_capfom_t	47	3	-0.424	-3.600	-2.938	-2.604	0.9060
d. $inlf_t$	49	1	-6.091	-3.587	-2.933	-2.601	0.0000

Source: Study Findings

3.6. Vector Auto Regression (VAR) Estimation

The estimation of the relationship between trade openness and economic growth in Tanzania was conducted using Vector Auto regression (VAR) Model. This model, as pointed out, is useful in estimating and analysing relationships between multiple time series variables. In a Vector Autoregressive Model, each variable is modelled as a linear function of its own past values and the past values of the other variables in the system hence it is a suitable model for analysing dynamic relationships. The results of the VAR model are presented in Table 7. It can be seen that the growth rate of GDP lagged to two years have positive influence on the current value of GDP growth. However, the GDP growth lagged by one year tends to be insignificant in affecting the current year growth as compared to a GDP growth lagged to two years period where a 1% increase in GDP in previous two years leads to 1.4% increase in the current year's GDP.

The reason behind the observed relationship could be linked to the multiplier effect whereby when GDP increases in one period, it may lead to an increase in consumption, investment spending and employment in subsequent periods, which can further lead to an increase in GDP. This relationship between the current and past GDP growth represents what is known as the *"path dependence"* whereby accumulation of physical and human capital, technological progress and other factors contribute to further growth of the economy. In addition, this finding is consistent with the findings by Samarasinghe (2022), whereby the study found a positive correlation between lagged values of GDP and current values of GDP in Sri-Lanka. This relationship could also mean that countries that experienced higher growth rates in the past tend to continue to have higher growth in subsequent periods. This situation reflects the existence of dynamic processes and self-reinforcing mechanism that shape a long-term growth path. Furthermore, the relationship between future growth and its past performance can be linked with the issue of expectation of economic agents. Under normal circumstances, the expectations of future economic performance are often based on the past economic growth. When the economy has been sustained by good economic performance over several years, it is more likely that the confidence of investors and consumers in the economy would increase; and they are likely to increase their respective investment and consumption.

This paper has further found that the lagged value of gross national savings, measured as a percentage of GDP (lagged up to two period), is statistically significant and negatively related to the current growth rates of GDP in Tanzania. This is another remarkable finding of this paper and such relationship can be linked with what is economically termed "*Investment Lag"* whereby the investment made in two previous years may not be sufficient enough to support the growth of the economy in the current period of time. In addition, the negative relationship between gross national saving, measured as a percentage of GDP, and the current growth of GDP might have been influenced by policy changes such as government spending policies and/or taxation policies, which might influence the availability of resources for investment and hence affect the relationship between savings and growth. Again, this finding is compatible to the finding by Mountford and Uhling (2009), who found evidence that higher government savings, which is regarded as a proxy for the overall savings in the economy, have a negative effect on the output.

The key finding of this paper is the relationship between trade openness and economic growth in Tanzania for the period 1970-2021. The paper has discovered that trade openness lagged to one year positively and significantly affects economic growth in Tanzania. A 1% increase in trade openness lagged to one period leads to 0.17% increase in economic growth in the current period. Intuitively, this finding would actually mean that the effects of increased trade openness are not realized immediately but rather, it takes some time for the effects to materialize. This is to affirm the notion that the economy may not realize the benefits of increased trade openness until one period, usually a year, after a policy change or intervention. Further explanation to this economic scenario is that it allows countries and economies to specialize in the production of goods and services which are relatively better to produce (at lower opportunity cost). This may further lead to greater efficiency, lower costs and ultimately higher output. This finding is consistent with the results obtained by Fajgelbaum and Khandelwal (2016) in their paper which found a positive relationship between trade openness and overall economic welfare. Furthermore, the paper found a negative and statistically significant relationship between inflation lagged to two period and current economic growth in Tanzania whereby a 1% increase in inflation lagged to two periods would lead to a 0.2% decrease in the current GDP growth.

Several reasons could be attributed to this economic relationship; one of them being reduced purchasing power of individuals and businesses thereby making it more difficult for them to spend and invest. Since there would be lower consumer and investment spending, the economy is likely to slow down. Moreso, high inflation is in most cases likely to cause uncertainty about the future economic conditions, thus making it more difficult for businesses and individuals to plan for the future and make investment decisions precisely. Higher borrowing costs could also be another explanation for the negative relationship between inflation and economic growth whereby as lenders demand higher interest rates to compensate for the loss of purchasing power caused by inflation, they trigger decreased borrowing by investors, which could eventually reduce economic growth. This specific finding is consistent with the paper by Perotti (2005) in which he finds evidence that higher inflation rates negatively affect economic growth. Table 7 presents results of Vector Autoregression (VAR) estimation.

Table 7: Vector Autoregression Estimation Results

Variable	Coefficient	Std. err	t	p>|t|	[95% conf. interval]
gdp_g					
gdp_g L.	.0370063	.191782	0.19	0.849	-.3588124 .432825
L2.	.415586	.198268	2.10	0.047	.0063809 .824791

open L.	.1701834	.0785056	2.17	0.040	.0081559 .332211
L2.	-.090489	.0758353	-1.19	0.244	-.2470055 .0660274
gnat_sav L.	.0937428	.1054568	0.89	0.383	-.1239093 .311395
L2	-.3177141	.1171151	-2.71	0.012	-.5594278 -.0760003
Infl L.	.1085918	.0880654	1.23	0.229	-.0731663 .2903499
L2	-.2257773	.0927559	-2.43	0.023	-.417216 -.0343385
sec-enrol L.	-.2428454	.1717576	-1.41	0.170	-.5973356 .1116448
L2.	.3007979	.177922	1.69	0.104	-.0664152 .6680109
_cons	5.765411	1.719565	3.35	0.003	2.216404 9.314419
open					
gdp_g L.	-.6487693	.4542041	-1.43	0.166	-1.5862 .2886618
L2.	1.123201	.469565	2.39	0.025	.1540669 2.092336
open L.	1.08747	.1859275	5.85	0.000	.7037341 1.471205
L2.	-.3074726	.1796035	-1.71	0.100	-.678156 .0632108
gnat_sav L.	-.0104916	.249757	-0.04	0.967	-.5259647 .5049815
L2	.2492187	.2773678	0.90	0.378	-.3232404 .8216778
Infl L.	.2461486	.2085684	1.18	0.249	-.1843154 .6766126
L2	-.2600261	.219677	-1.18	0.248	-.7134171 .1933649
sec-enrol L.	.2213177	.4067794	0.54	0.591	-.6182337 1.060869
L2.	-.4625817	.4213789	-1.10	0.283	-1.332265 .4071017
_cons	3.611524	4.072505	0.89	0.384	-4.793714 12.01676
gnat_sav					
gdp_g L.	.3754701	.3470354	1.08	0.290	-.3407758 1.091716
L2.	1.03716	.358772	2.89	0.008	.2966906 1.777628
open L.	.1633286	.1420582	1.15	0.262	-.1298651 .4565224
L2.	-.2431589	.1372263	-1.77	0.089	-.5263802 .0400624
gnat_sav L.	.5768549	.1908273	3.02	0.006	.1830068 .970703
L2	.0223306	.2119234	0.11	0.917	-.4150577 .459719
Infl L.	-.003771	.159357	-0.02	0.981	-.3326677 .3251258
L2	.0416131	.1678446	0.25	0.806	-.3048011 .3880273
sec-enrol L.	-.1944004	.3108005	-0.63	0.538	-.8358611 .4470603
L2.	.4544062	.3219553	1.41	0.171	-.2100768 1.118889

_cons	1.443191	3.111605	0.46	0.647	-4.978845 7.865228
infl					
gdp_g L.	-1.140266	.4872208	-2.34	0.028	-2.14584 -.1346918
L2.	-.0374549	.5036984	-0.07	0.941	-1.077037 1.002127
open L.	.2505431	.1994428	1.26	0.221	-.1610866 .6621729
L2.	-.2889798	.1926591	-1.50	0.147	-.6866087 .1086491
gnat_sav L.	.4406129	.2679122	1.64	0.113	-.1123307 .9935565
L2	-.4184594	.2975301	-1.41	0.172	-1.032531 .1956126
Infl L.	.9725519	.2237295	4.35	0.000	.5107969 1.434307
L2	-.1758805	.2356456	-0.75	0.463	-.6622292 .3104682
sec-enrol L.	.1412301	.4363488	0.32	0.749	-.7593495 1.04181
L2.	-.164843	.4520096	-0.36	0.719	-1.097745 .7680589
_cons	8.610965	4.368542	1.97	0.060	-.4052616 17.62719
sec_enrol					
gdp_g L.	-.1272231	.1538181	-0.83	0.416	-.4446879 .1902418
L2.	.3493675	.1590201	2.20	0.038	.0211661 .6775689
open L.	.0755997	.0629651	1.20	0.242	-.0543539 .2055533
L2.	-.0114848	.0608235	-0.19	0.852	-.1370183 .1140486
gnat_sav L.	.0454099	.0845812	0.54	0.596	-.1291572 .219977
L2	-.1385	.0939318	-1.47	0.153	-.3323657 .0553656
Infl L.	.125524	.0706325	1.78	0.088	-.0202544 .2713024
L2	-.1595201	.0743945	-2.14	0.042	-.3130628 -.0059773
sec-enrol L.	1.364772	.1377575	9.91	0.000	1.080455 1.64909
L2.	-.3753392	.1427017	-2.63	0.015	-.669861 -.0808173
_cons	.1677947	1.379171	0.12	0.904	-2.678674 3.014263

Source: Study Findings

3.7. Output of Vector Autoregressive Model: Granger Causality Test

Further analysis involved evaluation of the output of Vector Autoregressive Model by looking at the causality test using the Wald test. The granger causality test is based on the idea that one time series is useful in forecasting another time series variable; or one time series Granger-cause another time series. Furthermore, the test statistics involved was a chi-square with the degree of freedom equal to the number of additional variables in the model. The null hypothesis was specified as there was no evidence of Granger causality between trade openness and economic growth against the alternative hypothesis of evidence of granger causality between trade

openness and economic growth. Table 8 summarizes the results of Granger causality Wald tests.

Table 8: Granger Causality Wald Tests

Equation	Excluded	F	df	df_r	Prob > F
gdp_g	open	3.3075	2	24	0.0539
gdp_g	gnat_sav	5.6436	2	24	0.0098
gdp_g	infl	5.8136	2	24	0.0087
gdp_g	sec_enrol	1.5895	2	24	0.2248
gdp_g	ALL	2.2358	8	24	0.061
open	gdp_g	2.895	2	24	0.0748
open	gnat_sav	0.96737	2	24	0.3944
open	infl	0.73102	2	24	0.4918
open	sec_enrol	1.7518	2	24	0.1949
open	ALL	1.9647	8	24	0.096
gnat_sav	gdp_g	8.4788	2	24	0.0016
gnat_sav	open	1.8745	2	24	0.1752
gnat_sav	infl	0.15101	2	24	0.8607
gnat_sav	sec_enrol	3.3644	2	24	0.0515
gnat_sav	ALL	3.0056	8	24	0.0174
infl	gdp_g	3.7855	2	24	0.0372
infl	open	1.1291	2	24	0.3399
infl	gnat_sav	1.3708	2	24	0.2731
infl	sec_enrol	0.0686	2	24	0.9339
infl	ALL	1.5418	8	24	0.1952
sec_enrol	gdp_g	2.4649	2	24	0.1063
sec_enrol	open	2.1939	2	24	0.1333
sec_enrol	gnat_sav	1.5779	2	24	0.2271
sec_enrol	infl	2.3904	2	24	0.1131
sec_enrol	ALL	1.8296	8	24	0.1205

Source: Study Findings

Table 8 provides evidence of granger-causality as provided by the Wald test which found evidence of granger causality between trade openness and economic growth since the p-values were significant at 10% level of significance (P-values =0.0539 and 0.0748). This led to the rejection of the null hypothesis of no evidence of granger causality between trade openness and economic growth. In addition, the test assumes that the series is stationary and the relationship between series is a linear one. Granger-causality test revealed a bi-directional (two-way) causality between trade openness and economic growth. This means that there is a causal relationship that operates in both directions between trade openness and economic growth. Similar conclusions were drawn by the study done by Keho (2017) in which he found a bidirectional causality between trade openness and economic growth in Cote d'voire.

3.8. Evaluating the Output of Vector Autoregressive Model: Impulse Response Function

This paper also involved the analysis of the Impulse Response Function (IRF) which specifically examined the dynamic relationships between the variables used in the analysis. Our analysis of the impulse response function involved examination of a one-time shock of one variable to another variable(s) of interest while holding other variables constant. In this case, a one-time shock was introduced to one of the variables in the model to find the path taken by other variables over time. Figure 1 provides an appropriate depiction of the impulse response function as an evaluation of our Vector Autoregressive model. The horizontal axis of our impulse response function is in the unit of time hence the impulse-response graph shows the effect of a shock over eight (8) years period. The vertical axis gives the unit of the variable in the VAR. The impulse variable is trade openness; and the response variable is the rate of the growth Gross Domestic Product.

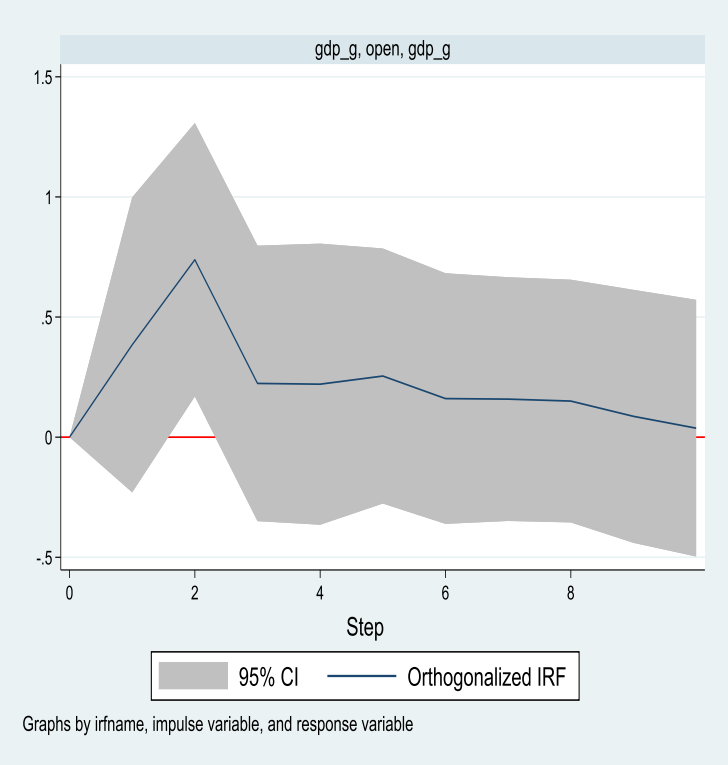

Figure 1: Impulse Response Function
Source: Study Findings

The basic question is how the rate of growth of GDP responds to a one standard deviation shock to trade openness. From Figure 1 above, it is revealed that between period zero (0) and period two (2), the rate of growth of GDP initially increased but after period two (2), the rate of growth of GDP started to decrease. However, there is a sharp decline between period two (2) and period three (3) compared to the other periods in the remaining path up to period eight (8). It can thus be concluded from Figure 1 that the response of the rate of growth of GDP to a one (1) standard deviation shock in trade openness is an increase in GDP growth rate in the short run; and a decrease of GDP growth rate in the long run. Since the graph lies above zero, it can confidently be stated that the response from the impulse is actually a positive response.

4. Additional Tests Appropriate for VAR Model

4.1. Serial Correlation Test/Long Memory in the Data

The conducted analysis raised a concern about the problem of serial correlation/long memory in the data as the variables used were the time series in nature. Basically, when a variable and its lagged version of itself as variable in time T and same variable in time $T-1$ are correlated with one another over periods of time, bias may occur in the variance of estimated coefficients, leading to unreliable hypothesis testing. However, with the problem of serial correlation and/or long memory in the data, the t-statistics would actually appear to be more significant than they really are. The serial correlation test was, therefore, conducted using the VARLMAr test which checks for presence of long memory in a VAR model while specifying the null hypothesis that there is no long memory in the residuals of the VAR model. The VARLMAr results are presented in Table 9, whereby the null hypothesis was accepted; that there is no long memory.

Table 9: VARLMAr Test for Presence of Long Memory in the Model

lag	chi2	df	Prob > chi2
1	29.3457	25	0.24972
2	27.5945	25	0.32686

H_0: no long memory in the residuals of VAR
Source: Study Findings

4.2. Stability Test

This paper further conducted the stability test, which is a test suitable to examine whether the relationship between two or more variables in a time series system is stable over time. This is because stability is an important assumption for many time series models whereby its violation could result into incorrect inferences and forecasts. In affirming the stability of the model, the vary stable graph was employed to plot the maximum eigenvalues of the VAR model comparison matrix against the number of lags. The comparison matrix was derived from the coefficient matrix of the VAR model together with its eigenvalues. Since the maximum eigen values shown in Figure 2 are consistently below one (lie within the unit

circle), our system was considered to be stable.

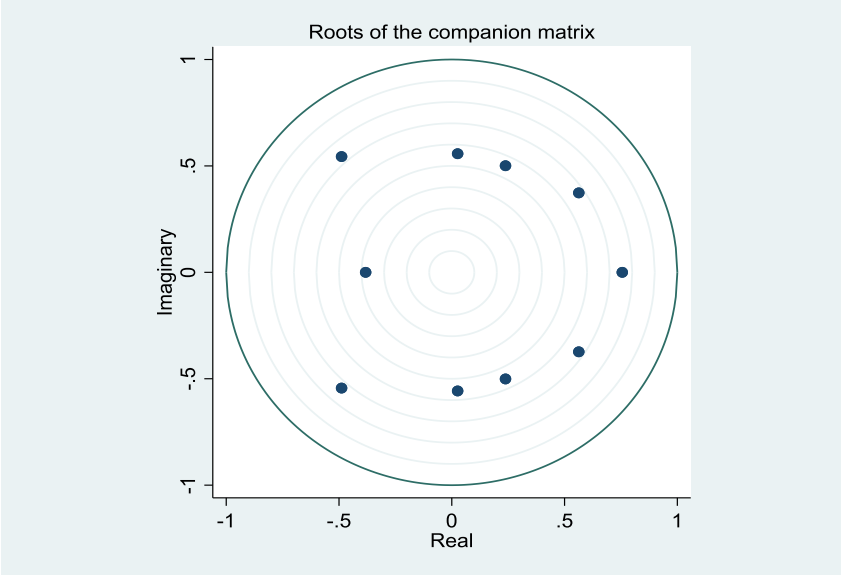

Figure 2: Stability Test
Source: Study Findings

5. Conclusion

Based on the findings, the paper draws a number of conclusions; first, when a country's trade becomes more open, it positively contributes to the country's economic growth. Second, the country's past economic growth performance has a positive effect on the current economic growth performance. Third, higher savings as a percentage of GDP may have dampening effect on economic growth in Tanzania; and as inflation increases, the country's economic growth tends to decrease. Fourth, changes in trade openness can cause changes in economic growth in Tanzania and vice versa. Theoretically, the findings of this paper concur with the Heckscher-Ohlin theory, which suggests that by capitalizing on abundant factors of production and producing goods which have comparative advantage, a country's trade can lead to economic growth.

However, it is important to acknowledge some limitations of this study in the sense that time series uses historical data which are prone to inability to make generalization. This is so because time series data are based only on a specific time period; and this may lead to limited generalization to other contexts of time period.

6. Policy Implications and Recommendations

The important finding which is the gist of this paper is that trade openness positively and significantly affects economic growth in Tanzania. This has the implication that trade can be an important driver of economic growth. The paper recommends that the country should pursue policies, plans and strategies which foster trade liberalization such as reducing tariffs, streamlining custom procedures, eliminating non-tariff barriers to trade, encouraging Foreign Direct Investment (FDI) and promoting export. It is equally important to consider trade facilitation, education and skills development, trade finance, strengthened regulatory

environment, regional integration, stakeholder engagement and development of infrastructure.

7. Areas for Future Studies

There are still further areas which may warrant further investigation as regards the context of trade openness and economic growth. Some of the potential areas include exploring non-linear effects by gauging the potential non-linear relationships between trade openness and economic growth; and to investigate whether there are thresholds or tipping points beyond which trade openness may have diminishing effects on growth in the context of developing countries.

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