

Effect of Trade Openness and Real Exchange Rate on Economic Growth in Tanzania

Abstract

The purpose of this study was to assess the effect of trade openness and real exchange rate on economic growth in Tanzania. Secondary time series data collected annually for consecutive 47 years since 1970 to 2016 were analyzed. The study used the Autoregressive Distributed Lag (ARDL) to assess the long-run and short-run effects of trade openness, real exchange rate, and foreign direct investment on Real Gross Domestic Product. The results from analysis reveal the evidence on one hand that trade openness has a positive significant effect on economic growth in both the short and long-run, but real exchange rate and foreign direct investment have a positive significant effect in the long run on the other. As it was estimated that with trade openness more trade is developed in terms of exports and imports which in turn boosts the economy. The study recommends that, there is the need for country to support the domestic industrial development to produce more goods and services.

Keywords: Trade openness, Foreign Direct Investment, and Economic Growth.

1.0 Introduction

“The world economy had experienced enormous liberalization of world trade, since 1950 first backed by the General Agreement on Tariffs and Trade (GATT) which was established in 1947, and now under the support of the World Trade Organization (WTO) which replaced the GATT in 1995” (Patrão and Neves, 2021). The levels of Tariff in developed countries have decreased vividly and now averaging about 4 percent, despite remaining relatively high while tariff levels in developing countries have also been decreasing, averaging 20 percent. Non-tariff barriers to trade, such as quotas, licenses, and technical specifications, are also being gradually removed, though at a slower pace, than tariffs. The motive behind is that liberalization of trade increases the volume of trade, promote economic growth, and improve well-being of the people.

“It is commonly accepted that open economies grow faster than closed ones. The globalization drive, which accelerated particularly in the 1980s, manifested the situation more clearly. In this context globalization is the unification of numerous economies in which investments, including foreign trade, contribute to economic growth” (Huang, J. et al. 2019). “It was earlier defined by many scholars to reflect a similar broader meaning, for example, it was defined as the continuous process of greater economic interdependence among countries reflected in the increasing amount of cross-border trade in goods and services, the increasing volume of international financial flows, and increasing flows of labour” (Fischer, 2003, Santia & Marques, 2018). In most part of the 20th century, import substitution strategies (ISI) played a dominant role in most developing countries’ development strategies however in Latin America, implementation of ISI strategies, achieved lower growth rates while, for the East Asian countries that passed export promotion policies, experienced a higher economic performance. Through the years, researchers have been forced to use a variety of econometric

tools to define the exact relationship between trade openness and economic growth. There are some issues of concern on the accuracy of the extent to which trade openness and economic growth are related. Although the relationship between them is somehow fragile, there is no substantial evidence that international trade can harm the economic growth and that it may lead to more importation than exportation (Purnama & Yao, 2019).

Trade openness of the world showed an average of 90.62 percent for the year 2015 but the Luxembourg had the highest value of 405.33 percent and Sudan had the lowest value of 19.1 percent. The paybacks of trade openness do not come-by unconsciously, policies, such as measures aimed at encouraging macroeconomic stability and a promising investment environment, must go in hand with trade openness. According to Kim & Lin, 2009, “trade openness contributes to long-run economic growth, with effects varying depending on the level of economic development and the effect of trade liberalization on growth depends on the level of liberalization”. “There is an income threshold above which greater trade openness has beneficial effects on economic growth and below which increased trade openness has detrimental consequences” (Raghutla, 2020).

“The existence of trade openness helps to advance the transfer of new technologies, enabling technological progress and productivity improvement, and these benefits depend on the extent of economic openness. It is evident that in recent years many African countries, have principally focused to achieve high and sustainable economic growth to thrive in a challenging world of trade relations” (Manni, 2012). “In achieving this principled goal, countries have embarked on standard economic policies that allow the lessening and elimination of barriers to trade such as tariffs, and import controls. Trade liberalization of economies is one of many policies that most countries including Tanzania have opted” (URT, 2019).

1.1 Trade openness, the exchange rate with economic growth

“As it has been stated in the introduction part, trade openness underwrites the long-run economic growth, with effects changing depending on the level of economic progress” (Raghutla (2020)). “On the other hand trade liberalization affect economic growth depending on the level of liberalization. The administration of the exchange rate is well-thought-out to be a major policy objective in Tanzania to attain a set of various objectives of economic progress, controlling inflation and maintenance of external competitiveness. Policy debates often emphasize as the empirical literature provides compelling evidence that a faultily managed exchange rate can be a major obstacle to improved economic performance” (Kanaan, 2000). The exchange rate management restructuring was therefore an important element of trade liberalization measures that Tanzania undertook, that ultimately replaced the previous “fixed rate” system with a “freely-floating” regime.

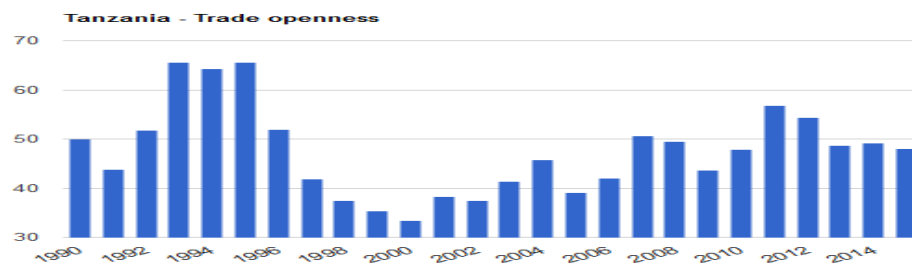
1.2 Trade Liberalization in Tanzania

Towards the end of 1960s, Tanzania adopted a development plan of replacing domestically produced goods for export, based on the idea of “socialism with self-reliance” expressed in the 1967 Arusha Declaration. In Tanzania Trade liberalization suffered from great financial imbalances during the early 1980s, and its external payments situation continued to be unwarranted, with repeated foreign exchange shortages and a substantial reliance on the balance of payments support. It was noticed that the real effective exchange rate increased by about 16 percent from 1980–to 1985, while real exports declined by about 10 percent, each

year. Augment restructuring undertaken since 1995 in Tanzania has resulted in a substantial liberalized trade regime principally based on tariffs. (Keskin & Abdalla, 2020).

“The response of exports to the structure built into the trade liberalization programme has been insufficient in terms of the values of export incomes and the absence of export divergences. Certainly, the available evidence from various pieces of literature indicates that the economic performance has been somewhat unsatisfactory. From 1990 to 2003, the Tanzanian economy recorded a negative current account balance to GDP ratio. The GDP per capita in constant US\$ fell from \$267 in 1990 to \$262 in 1999 before increasing to \$308 in 2003. The trade to GDP ratio also deteriorated steadily from 50% in 1990 to 39% in 1999 before improving to 45% in 2003” (Kazungu, 2009)

“The existing knowledge in the academic and policy circles partly influenced, the government of Tanzania like many other developing countries to adopt a series of trade liberalization procedures” (Keskin and Abdalla, 2020). Trade liberalization has among other things, meant to reduce the role of the government in production and marketing, elimination of orderly prices, elimination of export taxes, relaxation of foreign exchange and import controls and strengthening of the participation of the private sector in the economy. The data provided by the World Bank for Tanzania from 1990 to 2015 show Tanzania’s Trade openness, exports plus imports as percent of GDP whereby the average value for trade openness for Tanzania during that period was 47.46 percent with a minimum of 33.49 percent in 2000 and a maximum of 65.69 percent in 1993. As shown in Figure 1.



Source: World Bank.

Figure 1 Trends of Tanzania’s trade-openness from 1990 – 2015.

Tanzania like many other developing countries suffers from trade limitations and exchange rates, when the annals of trade openness and exchange rate were inadequate and uncoordinated an overview of the nation’s obligations was not possible, and assumptions about economic growth were made in the event proved too much hopeful. The cause was the severe economic recession, which led to a negative growth rate per head over several years, and an economy progressively unable to bear the weight of trade openness.

1.3 Motivation of the study

Internationally, trade openness and exchange rate are the essential keys to the economic growth of the country. Several studies have been conducted on the effect of trade openness on economic growth but there is not a conclusive result and it is still contentious. Some of the researchers found positive, mixed, and negative effects of trade openness on economic progress. For example some authors found that trade openness has strong positive strength for economic growth (Keho, 2017), (Olasode, 2015), and (Nduka K, 2013) but on the contrary

Vlastou, 2010, found that trade openness harms economic growth while (. Trade liberalization on land productivity was found to have mixed results in the coffee, tea, and wheat while liberalization dummies appeared to be negative and significant (Kazungu, 2009) . The evidence from these studies suggest that economic growth is affected positively and negatively or in a mixed way by trade openness and exchange rate (Kazungu, 2009, Vlastou, 2010, and Keho, 2017). However, at a certain level many authors like (Mkubwa, Mtengwa, & Babiker, 2014, and Baboo, 2014) agreed that for the growth of an economy there should be trade openness to improve economic growth. In Tanzania GDP growth rate has remain well from 6-7% over the past few years, even though this growth does not reach the government goal of growth of 8%. At 7%, in 2016, Tanzania's economy expanded rapidly, hitting closer to the top of the fastest-growing economies in Sub-Saharan Africa.

As the government of Tanzania under fifth President John Magufuli tries to remove some restrictions to economic sectors (agriculture and investment) and reduce blockades to exchanging goods and services between nations, this has helped Tanzania's economy to grow. Earlier it was reported that trade to GDP ratio declined consistently from 50% in 1990 to 39% in 1999 before recovering to 45% in 2003. Understanding the impact on rising and falling levels of openness on economic growth is of great concern to most developing countries. This has made it necessary to undertaken empirical analysis of the effect of trade openness and exchange rate on the economic growth of Tanzania. Therefor the intention of this study was to assess the effect of the trade openness and exchange rate on economic growth in Tanzania

2.0 Literature Review

2.1 Theoretical review

2.1.1 Hecksher – Ohlin Trade Theory

“The model assumes that a nation should invest in production and exportation of the product which has relatively sufficient resources. As different goods require different factor proportions, then different countries have different relative factor endowments. Countries will incline to comparative advantages in producing goods that use their abundant factors more intensively. It is argued that identical technology, constant returns to scale, and a given factor-intensity relationship between final products are needed conditions for one country to enter into trade with another country in a way leading to economic growth. The country with sufficient capital will be able to produce comparatively more capital-intensive goods, while the country with sufficient labour will produce relatively more labour-intensive goods”. (Olhin (1993) & Hecksher (1919), 2013)

2.1.2 Classical theory

The theory was developed by Adam Smith in *Wealth of Nations* (1776).”The classical theory of economic growth was a merger of economic work done by Adam Smith, David Ricardo, and Robert Malthus in the eighteenth and nineteenth centuries. The theory states that if the economy has a steady-state GDP any deviation off of that steady state is momentary and will eventually return. This is based on the idea that when there is a growth in GDP, the population will increase. Classical economists believe that involvement in foreign trade could be a strong positive energy for economic prosperity. They contend that it is not possible for a nation to infinitely maintain a positive balance of trade, instead, countries' exchange of goods and services makes productivity gains through the increased division of labour and

specialization. This means that each country should produce and export commodities whose internal opportunity costs are smaller while importing commodities whose internal opportunity costs are higher". In addition, countries should focus on acquiring foreign capital and technology (Nduka, Chukwu, & Kalu, 2013). This theory is supported by Ohlin(1993) & Hecksher (1919) in their Hecksher – Ohlin Trade Theory.

2.1.3 Neo-Classical Theory

The Solow-Swan growth model was developed by T.W. Swan, and Robert Solow. The theory emphasizes on three factors that influence economic growth: labour, capital, and technology. The production function of neoclassical growth theory is used to quantify the growth and equilibrium of an economy and is written as $Y = AF(K, L)$. Whereby "Y" denotes an economy's gross domestic product (GDP), "K" represents its share of capital, "L" defines the amount of unskilled labor in the economy and "A" represents a determinant level of technology. However, due to the relationship between labour and technology, an economy's production function is often re-written as $Y = F(K, AL)$.

2.2 Empirical Literature review

Baboo (2014) adopted "the panel unit root and panel co-integration technique focused on the relationship between trade openness and economic growth in Indian Ocean Rim Countries. The panel study comprised 15 countries over the time-period from 1997 to 2011. The countries involved in the association included Australia, India, Indonesia, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, Bangladesh, Seychelles, Singapore, South Africa, Sri Lanka, Tanzania, and Thailand. He used three openness indicators; Imports plus Exports as a percentage of GDP, Imports as a percentage of GDP, and Exports as a percentage of GDP. He adopted Fully Modified Ordinary Least Square (FMOLS) to approximate the model. In this study the results found that there is a positive relationship between trade openness and economic growth. Among the fifteen countries included in the panel Singapore, Seychelles, Malaysia, and Mauritius are being found to be more open and have the highest growth rate. The study concluded that openness is not an engine of growth but acts as a catalyst for promoting growth through research and development, wider market access, and allowing a reduction in production cost".

Another study focused on the impact of trade openness on economic growth in Nigeria carried out by Olasode and colleague (2015) by using data from the National Bureau of statistics over time from 1981 to 2012. The analysis was done by using the Augmented Dickey-Fuller test of stationarity, and co-integration and the variables used were **Foreign Direct Investment (FDI)**, growth fixed capital formation, trade openness, and Exchange rate for Nigeria. This study also found that there is a positive relationship between real gross domestic product (RGDP), foreign direct investment net flow (FDN), the exchange rate (EXCH), and trade openness (TROP) in Nigeria. It concluded that the estimated parameter for short-run and long-run dynamic of trade openness function exist over the entire period, and shows the future tendency of further stability. The export rises and leads to a growth of the Gross domestic product (GDP).

Furthermore, Bader, (2016), analyzed "the effect of exports and imports on economic growth in the Arab countries for the period from 1995 to 2013. The study used a panel data approach in 17 countries including Jordan, United Arab Emirates, Bahrain, Tunisia, Algeria, Saudi Arabia, Sudan, Oman, Qatar, Kuwait, Lebanon, Egypt, Djibouti, Mauritania, Morocco,

Yemen, and Palestine. The results show that exports and imports have a positive effect on economic growth”. According to Andrews, 2015, who examined “the relationship between export, import, and GDP for Liberia, using historical data from 1970 to 2011, confirmed the existence of bidirectional causation between GDP and imports and uni-directional causation between exports and GDP and exports and imports. The results showed that GDP in Liberia is not determined by exports alone but somewhat a mixture of exports and imports, with the import contributing to a long-run impact”.

Wong, (2015) examined “the impact of openness to international trade and financial development on economic growth in Malaysia. In this study an error correction model was estimated, which showed that openness to international trade has a significant impact on economic growth. Solid evidence revealed that trade openness Granger-causes economic growth only. Also the investigated causal relationship between financial development, trade openness, and economic growth in Japan covering the period 1960-2003 indicated that there was a long-run equilibrium relationship between financial development, trade, and economic growth except between domestic credit (the second measure of financial development), trade, and growth. With reference to causality, economic growth is seen to be Granger-cause trade openness, and therefore supporting the growth-driven trade hypothesis for Japan”.

The study by Zahonogo, (2016) investigated how trade openness affects economic growth in forty-two developing countries, focusing on Sub-Saharan Africa. The study covered the period 1980 to 2012 and used the dynamic growth model. The results showed that there is a trading threshold below which bigger trade openness has advantageous effect on economic growth and above which the trade effect on growth declines. The variables used in the study were economic growth as dependent variable as measured gross domestic product per capita, gross domestic product, a ratio of external debt to export, investment, education, the ratio of external debt to GDP, financial development, inflation rate, trade openness, governance index, population growth rate, external debt services to export. The findings suggested that trade openness may impact growth favorably in the long run, but the effect is not linear. It also confirm that trade openness has a positive and significant effect on economic growth only up to a threshold, above which the effect declines.

In their paper Mkubwa, Mtengwa and Babiker, (2014) considered the impact of trade liberalization on economic growth in Tanzania, using data from the Bank of Tanzania (BOT) for a period from 1970 to 2010, using a simple linear regression model. The dependent variable was real GDP while trade openness was the independent variable. The results of the study established a substantial positive relationship between trade liberalization and the economic growth of Tanzania. The study they recommended that the improvement of the balance of trade by increasing exports levels. The exportation of manufactured goods is greatly commended because manufactured goods make higher prices in the market. Additional industries need to be established to increase production and export capacity in the country. Trade and investment policies need some restructuring to adjust to changing economic atmosphere. The policies should stress on more free trade and the elimination of trade obstacles. This may help the country to attract more trade and investments which encourage economic growth. On top of that the government should improve the agriculture sector which employs about 70% of the total population in the country (URT, 2019). Agriculture is the backbone of the economy however, it performs poorly. Therefore, it needs to be modernized and commercialized to be market-oriented. The rural population can be

given subsidies in terms of agriculture inputs to add value to the produced agricultural commodities. The farmers should be given more access to markets so as improve their income.

Assessment of the impact of trade liberalization on economic growth was also done Kazungu, 2009 who considered trade liberalization and the structure of production in Tanzania. He explored the role of trade and trade liberalization policies in Tanzania's economy. He used both parametric and non-parametric tests, to assess the impact of liberalization policies on the growth rate of exports. His study principally concentrated on the agriculture sector. The study results confirmed the mixed impact of trade liberalization on land productivity in the case of coffee, tea, and wheat, also liberalization dummies seemed to be negative and significant. On some traditional exports, impact was negative and substantial while in other exports the impact was positive but not significant. The presence of diminishing return was contrasts the widely supported opinion that trade liberalization actions would help to promote productivity growth in the comparative advantage sector. Therefore, there is an urgent need for renewed interventions in the agricultural sector to reverse diminishing returns to land.

A number of empirical studies have been conducted on the relationship between trade openness and economic growth in different areas in different parts of the world. However, in Tanzania, only a few empirical studies have been conducted on the on the matter. In addition to that, studies which were conducted in Tanzania mostly focused on the effect of trade liberalization on economic growth with exception of the study by Kazungu, 2009 who investigated Trade Liberalization and the Structure of Production in Tanzania. Furthermore, the literature reveals that most studies have found a positive effect of trade openness on economic growth while few studies have a negative relationship between trade openness and economic growth. This implies that trade openness increases economic growth up to a certain threshold beyond which it has some negative effect on economic growth. Therefore, the contradiction of results has created a debate on the effect of trade openness on economic growth across the world. Therefore, this study will contribute to the existing literature by using time series data from 1970 to 2016 to assess the effect of trade openness on economic growth in Tanzania, by adding another variable of real exchange rate.

3.0 Research Methodology

This study assesses the effect of trade openness and real exchange rate on economic growth in Tanzania over the period of 1970 – 2016. This study adopted the ARDL model used by Abeid (2017). The study used annual secondary time series data of 47 years from 1970 to 2016. This data collected from Bank of Tanzania(BoT) reports and World Bank report. The purpose of using data from 1970-2016 is to incarceration economic and trade growth patterns during different government regimes, industrialization policy, and economic reforms undertaken during these periods. Therefore, firstly, preliminary analysis was done to assess unit root test of data followed by lag selection criteria, testing of co-integration which results in the identification of the model for assessing the effect of explanatory variables to outcome variable and finally we ended with model diagnostic tests to assure its good fit for the study.

3.1 Unit root test

Time-series data were checked for stationarity to know the order of integration for the selection of suitable models which conferring with the order of integration. To achieve this test Augmented Dickey-Fuller (ADF) was used to test the unit root of the exchange rate, Direct foreign Investment, trade openness and real Gross Domestic Product because it is

more powerful than the Dickey-Fuller test (DF) for unit root. The ADF test ensures that the null hypothesis is accepted unless there is strong statistical evidence against it to reject it in favor of the alternate hypothesis. Additionally, (Mahadeva & Robinson, 2004) signifies that regression on non-stationary variables may give unbiased standard errors, consequently, resulting in spurious regression, a regress that seems to give a good fit of the data and statistically significant coefficients explaining the relationship between variables which in reality do not exist. It is from this point of view was imperative to conduct unit root tests correcting for it by differencing variables that are not stationary at levels. The models below are the ADF estimates

$$\Delta X_t = \alpha + \psi X_{t-1} + \sum_{i=1}^k \gamma_i \Delta X_{t-i} + \varepsilon_t$$

This is the augmented model which implies that there is intercept only.

Whereby;

t, is the time index, α is an intercept constant, ψ is the coefficient presenting process root, k is the lag order of the first-difference autoregressive process, ε_t is an independent identically distributes residual term, ΔX_t is the first difference operator, X_{t-1} is one period lagged value of the variable X_t and ΔX_{t-i} is the difference of the lagged dependent variable (Sjo, 2008)

3.2 ARDL Bounds test for Co-integration

The bounds test for co-integration was used to test for the long-run relationship among the variables. The F-statistic was used to test whether the variables are co-integrated or not. It tested the null hypothesis that there is no long-run relationship between the variables against the alternative hypothesis that the variables have a long-run relationship. The guideline was to reject the null hypothesis if the probability value is less than 5% level of significance. Building on Ahmed Monir, 2013 and Türsoy, 2017, the existence of a long-run run relationship led to the estimation of the long-run ARDL model of the short-run dynamics were then calculated by employing the Error Correction Model defined in the equation.

$$\Delta GDP_t = \eta_0 + \sum_{i=1}^k \alpha_i \Delta GDP_{t-1} + \sum_{i=1}^k \theta_i \Delta Open_{t-1} + \sum_{i=1}^k \vartheta_i \Delta EXch_{t-1} + \sum_{i=1}^k \delta_i \Delta Fdi_{t-1} + \nu ECT_t + \varepsilon_{1t} \quad (3.3)$$

Where;

ECT is an Error Correction Term, GDP stands for Gross Domestic Product, OPEN stands for trade openness, EXCH stands for exchange rate and FDI stands for Foreign Direct Investment

3.3 Autoregressive Distributed Lag Model (ARDL).

Autoregressive Distributed Lag Model (ARDL) consists of both distributed lagged variables for the response variable and lagged explanatory variables (Brooks, 2008). It captures the effects of both lagged response variables and lagged explanatory variables. (Nkoro & Uko, 2016) signifies that the model fits better when variables are integrated in order I(0) and I(1) . Also, it is strictly not applicable when variables are integrated into the second-order I(2). In additional, (Nkoro & Uko, 2016) explain that the modeling of ARDL involves estimation of the Error Correction Model (ECM), defined in equations (3.4) and (3.5).

$$\Delta Y_t = \eta_0 + \beta_1 t + \sum_{i=1}^k \alpha_i \Delta Y_{t-1} + \sum_{i=1}^k \theta_i \Delta X_{t-1} + \lambda_1 Y_{t-1} + \lambda_2 X_{t-1} + \phi \omega_t + \varepsilon_{1t} \quad (3.4)$$

$$\Delta Y_t = \eta_0 + \beta_1 t + \sum_{i=1}^k \alpha_i \Delta X_{t-1} + \sum_{i=1}^k \theta_i \Delta Y_{t-1} + \lambda_1 Y_{t-1} + \lambda_2 X_{t-1} + \phi \omega_t + \varepsilon_{2t} \quad (3.5)$$

Where; X and Y are explanatory and response variables respectively, ω_t is a vector of Exogenous variables, ε_1 and ε_2 are random errors with no serial correlation; λ_1 and λ_2 are long-run multiplier α_i and θ_i are short-run dynamics, ϕ is a parameter for exogenous variable, η_0 is a constant (drift term) and k is the maximum lag order of the ARDL model. To reflect the effect of the economic reforms such as trade liberalization and different privatization policies on the economy, this study has concentrated on those policies that have been introduced and reformed since 2005 and how they affect economic growth. Therefore, in this case, the *dummy variable* was introduced. The dummy variable was given the values 0 and 1, 0 was assigned to a period from 1970 to 2004, and 1 was assigned to a period from 2005 to 2016. Therefore, the equation was modified to extend equation (3.5) to include lagged variables for the dependent and independent variables by including the dummy variable in the study, the estimated ECM took the form.

$$\Delta GDP_t = \eta_0 + \sum_{i=1}^k \alpha_i \Delta Open_{t-1} + \sum_{i=1}^k \theta_i \Delta EXch_{t-1} + \sum_{i=1}^k \theta_i \Delta Fdi_{t-1} + \lambda_1 Open_{t-1} + \lambda_2 EXch_{t-1} + \lambda_3 Fdi_{t-1} + \phi Dummy + \varepsilon_{1t} \quad (3.6)$$

3.3.1 Model Specification

This study employed econometric methods by following Hecksher – Ohlin model developed from Hecksher – Ohlin trade theory. The Hecksher – Ohlin model was modified by including trade openness, exchange rate, and foreign direct investment in the relationship with GDP. The basic ARDL model that was used in this took the following general form;

$$GDP = \beta_0 + \beta_1 open + \beta_2 exch + \beta_3 Fdi + \beta_4 Dummy + \varepsilon_t \quad (3.7)$$

Whereby

β_0 : The constant term, β_1 : coefficient of variable (open), β_2 : coefficient of variable (Real exchange rate), β_3 coefficient of variable (foreign direct investment), t , the time trend, and ε : The random error term assumed to be normal, identically and independently distributed.

3.4 Granger Causality Test

This test was employed to determine the the causal relationship between variables. This means that, if the value of explanatory variables granger causes the value of a response variable, then the value of the past explanatory variables should significantly help predict the value of the response variable's future (Kumar, 2004). The mathematical equation for Granger is presented as follows;

$$\Delta \begin{bmatrix} GDP_t \\ Open_t \\ Exch_t \\ Fdi_t \end{bmatrix} = \begin{bmatrix} n_1 \\ n_2 \\ n_3 \\ n_4 \end{bmatrix} + \sum_{i=1}^p \Delta \begin{bmatrix} \alpha_{1i} \theta_{1i} \vartheta_{1i} \varphi_{1i} \\ \alpha_{2i} \theta_{2i} \vartheta_{2i} \varphi_{2i} \\ \alpha_{3i} \theta_{3i} \vartheta_{3i} \varphi_{3i} \\ \alpha_{4i} \theta_{4i} \vartheta_{4i} \varphi_{4i} \end{bmatrix} \times \begin{bmatrix} GDP_{t-1} \\ Open_{t-1} \\ Exch_{t-1} \\ Fdi_{t-1} \end{bmatrix} + \begin{bmatrix} n_1 \\ n_2 \\ n_3 \\ n_4 \end{bmatrix} [ECT_{t-1}] + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \quad (3.14)$$

Whereby, Δ is a lag operator, ECT_{t-1} is a lagged error correction term derived from a long run co-integration, ε_{1t} , ε_{2t} , ε_{3t} , ε_{4t} , and ε_{5t} are white noise, serially uncorrelated and p is the number of lags.

4.0 Results and Discussions

4.1 Unit root test

the Augmented Dick Fuller test(ADF) was used in testing stationarity of the data. This test uses the hypothesis which are Null hypothesis state that “the data has unit root” while the alternatives hypothesis state that “the data has no unit root”. At 10%, 5% and 1% level of significance the decision was made. If the probability value is greater than the proposed level of significant, the null hypothesis is accepted otherwise the alternative is selected.

Table 1. Unit root tests (Stationarity test)

Variable	Description	At Level, I(0)		At Level 1, I(1)	
		t-Stat	Prob.	t-Stat	Prob.
LNGDP	ADF Test	-1.3732	0.5867*	-8.6307	0.0000***
	5% level	-2.9297		-3.5155	
LNFDI	ADF Test	-4.2972	0.0013**		
	5% level	-2.9266			
LNEXCH	ADF Test	-0.5650	0.8981	-4.9411	0.0012***
	5% level	-2.9281		-3.5155	
LNOPEN	ADF Test	-4.3720	0.0013**		
	5% level	-2.9434			

Source: Author's compilation from *Eviews 10* Output

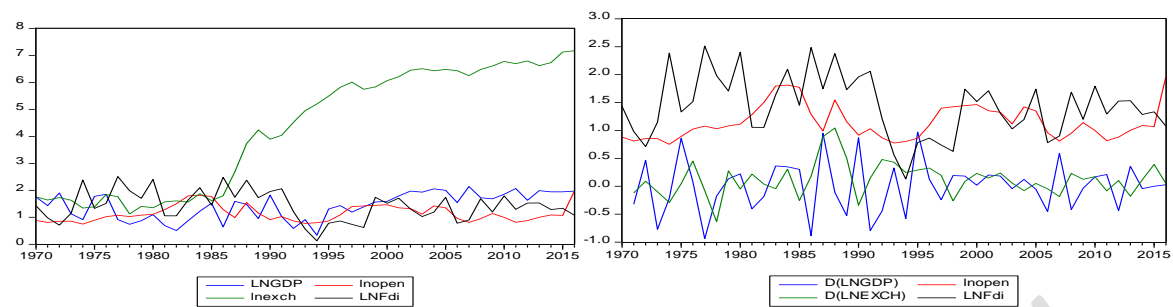
* The probability is not significant, the variable is not stationary at level, I(0)

** The probability is significant, the variable is stationary at level, I(0)

*** The probability is significant, the variable is stationary at level 1, I(1)

When the test statistics are more than 5% critical value, the null hypothesis is rejected which is indicating stationarity for the data and, if test statistics are less than 5% critical value, the null hypothesis is accepted. The augmented Dick-Fuller test was used to test stationarity of the data with null hypothesis against alternative hypothesis at level as well as at first difference. At a 5% level of significance, the null hypothesis is rejected when the probability value is less than 0.05 significance level. As tabulated in Table 1 the LNFDI and LNOPEN

were integrated at level $I(0)$ whereas LNGDP, LNEXP, and LNEXCH were stationary at level $I(1)$.



Source: *Eviews 10* output:

Figure 2 Line Graph for Non-Stationary vs stationary

4.2 ARDL long run Form Bounds test for Co-integration

Table 2 ARDL Bound tests

Test statistic	Value	P-Value.	I(0)	I(1)
F-statistic	5.3785	0.05	2.79	3.67
K	3			

Source: *Authors compilation from Eviews 10* Output.

The study used a bounds test for co-integration in testing long run relationship among the variables. It was used to test the null hypothesis that there is no long-run relationship between the variables against the alternative hypothesis that the variables have a long-run relationship. The null hypothesis was accepted when the calculated F-Statistics if the bounds test is greater than the upper bound $I(1)$ critical value at a 5% level of significance. As reported in Table 2 the F-statistic (5.378) was greater than the upper critical value bound (3.67). Therefore, there is long run relationship among the variables.

4.3 ARDL Error Correction Model.

Table 3 ARDL Model for short-run

Variable	ECM Regression			
	coefficient	Std. Error	t-Statistic	Prob.
D(LNOPEN)	0.41800	0.2181	1.9163	0.0652
D(LNFDI)	0.15616	0.0985	1.5851	0.1268
D(LNFDI(-1))	0.37430	0.1210	3.0938	0.0043
DUMMY	0.2870	0.1089	2.6363	0.0133
CointEq(-1)*	-0.8850	0.1599	-5.5318	0.0000
<i>R-squared</i>				0.685433
<i>Adjusted R-squared</i>				0.544420
<i>Akaike info criterion</i>				0.9480

Source: Authors compilation from *Eviews10* Output:

Table 3 reports ECM for ARDL. The co-integrating equation (CointEq (-1)) has a negative coefficient and is very significant (-0.885 , $p\text{-value} < 0.001$). Implying that, the variables converged with the speed of 88.5% towards the long-run equilibrium if there was instability of the economy in the short run. However, trade openness, Foreign Direct Investment when lagged by one, and dummy variables were found to be statistically significant at 5% and 10% level of significant. This indicating that, they have effect economic growth in the short run. Also, It is found that in the short run one unit increase (appreciation) of trade openness leads to increase growth by 0.418 units, one unit increase of FDI lagged by one would lead to increase growth by 0.3743 units, and also dummy variable which captures the effects of new changes that were introduced in the economy since 1995 like the establishment of a cash budget, introduction of BOT ACT 1995 and the establishment of Tanzania revenue authority was significant with the positive coefficient which means that these new changes in the economy play a big role in increasing growth.

Table 4 ARDL Long Run Coefficients

Variable	Levels Equation			
	coefficient	Std. Error	t-Statistic	Prob.
LNOPEN	0.3357	0.3357	1.0584	0.0986
LNEXCH	0.0993	0.0513	1.9333	0.0630
LNFDI	0.1301	0.2708	-0.4805	0.0345
C	0.6737	0.5236	1.2867	0.2084

Source: Authors compilation from *Eviews10* Output:

The effect of trade openness on economic growth

Trade openness revealed a positive significant effect on economic growth in Tanzania in both the long run and short run. Its coefficient was 0.335 with 0.09 probability in long run and 0.418 with 0.06 probability in the short run. This means that a one-unit increase in trade openness leads to an increase in economic growth by 34% in long run and 42% in the short run. (Sakyi, 2010) Found a positive and statistically significant in both the short run and the long run in Ghana using an ARDL bounds test. This positive relationship implies that as long as trade openness increases it is very helpful to the economy domestic production and exportation also will be increasing by the fact that the trade openness will encourage domestic industries to produce more which will lead to exporting more than imports. Due to the increased level of openness, production will increase, which will lead to a more rapid increase in trade openness and thus will lead to economic growth, (Yeboha, 2012). This finding coincides with the classical economists' belief that participation in foreign trade could be a strong positive force for economic growth.

The effect of real exchange rate on economic growth

The real exchange rate seems to have a small positive about 9% significant effect on economic growth in the long run. The one-unit increase in real exchange rate increases economic growth by 0.09 units. This positive relationship indicates that, if the exchange rate

increases in the economy, therefore for 1TZS increase in the exchange rate, increase the economic growth rate by 0.09, it will lead to increase economic growth in the country keeping other variables constant. This line with Nelson et al (2016) found that an increase in trade openness by a naira will raise the exchange rate by 32% on average holding all other variables constant. (Devereux & Engel, 2003), moreover, an increase in the exchange rate will increase the value of a local currency and also lowers importation which will eventually encourage domestic production. In Tanzania, we suffer but not much in the exchange rate, for instance, the exchange rate of USD to TZS is about 2,082Tsh this value is high and it leads to a decrease in the value of money. If we compare our neighbor country Kenya their currency is high compared to Tanzania's currency which is why their economic growth is good and healthy.

The effect of the foreign direct investment on economic growth

Foreign Direct Investment (FDI) has a positive and statistically significant on economic growth. this indicating that a one percent increase in FDI would associated with increase by 0.13 economic growth. The study is in line with (De Mello Jr, 1997) who found that FDI has positively affect economic growth. This was resulted due to favorable area for investment and leads to creation employment, domestic private investment which leading to effect growth positively.

4.4 Diagnostic tests

4.4.1 Serial Correlation

The test checks if the residuals are correlated or not. The purpose is to validate the efficiency of the model, the null hypothesis which says that “there is no serial correlation” against the alternative hypothesis, which says that “there is serial correlation”. Breusch-Godfrey serial correlation LM tests were used to test for serial correlation. The result did not give strong evidence to reject the null hypothesis since, the probability for the Breusch-Godfrey serial correlation LM test (0.23) reported in Table 5 were both statistically insignificant, hence justifying the absence of serial correlation.

Table 5 Breusch-Godfrey Serial Correlation LM test

F-statistic	0.028316	Prob. F(1,28)	0.8676
Obs*R-squared	0.043442	Prob. Chi-Square(1)	0.8349

Source: Authors compilation from Eviews 10 Output

4.3.2 Heteroskedasticity

Glejser test and Autoregressive Conditionally Heteroskedasticity (ARCH) test were used. Glejser regressed the absolute value of residuals on the explanatory variables, (Garson, 2012) whereas the ARCH test regressed the squared residuals on the lagged squared residuals and a constant. The tests were used to test the null hypothesis that the residuals are not Heteroskedasticity against the alternative hypothesis that residuals are Heteroskedasticity.

Table 6 Glejser and ARCH tests for ARDL model

Glejser			
F-statistic	1.759902	Prob. F(13,29)	0.1005
Obs*R-squared	18.96317	Prob. Chi-Square(13)	0.1242

Scaled explained SS	10.56968	Prob. Chi-Square(13)	0.6468
ARCH			
F-statistic	0.575098	Prob. F(1,40)	0.4527
Obs*R-squared	0.595294	Prob. Chi-Square(1)	0.4404

Source: Authors compilation from *Eviews 10 Output*

Glejser test which regresses the absolute residuals on the original regressors and the autoregressive Conditional Heteroskedasticity (ARCH) test that regresses the squared residuals on the lagged squared residuals and a constant were used to test the null hypothesis that the residuals are homoscedastic (residuals are not Heteroskedasticity) at 5% level of significance. The guideline was to reject the null hypothesis if the Chi-Square probability for Obs*R-Squared is less than 0.05. The calculated probabilities (0.1242 for the Glejser test and 0.4404 for the ARCH test) as displayed in Table 6 did not give enough evidence to reject the null hypothesis. Therefore, concluded that the residuals were homoscedastic.

4.4.2 Normality

Eviews output for Jarque-Bera statistic shown in Figure 3 proves that the residuals were normally distributed. At a 5% level of significance, the Jarque-Bera statistic was 0.9952 with its corresponding probability of 0.6079. The guideline was to reject the null hypothesis “residuals are normally distributed” if the probability of the calculated Jarque-Bera statistic is less than 0.05. Since 0.6079 is greater than 0.05, the null hypothesis was not rejected, giving evidence for residuals to be normally distributed.

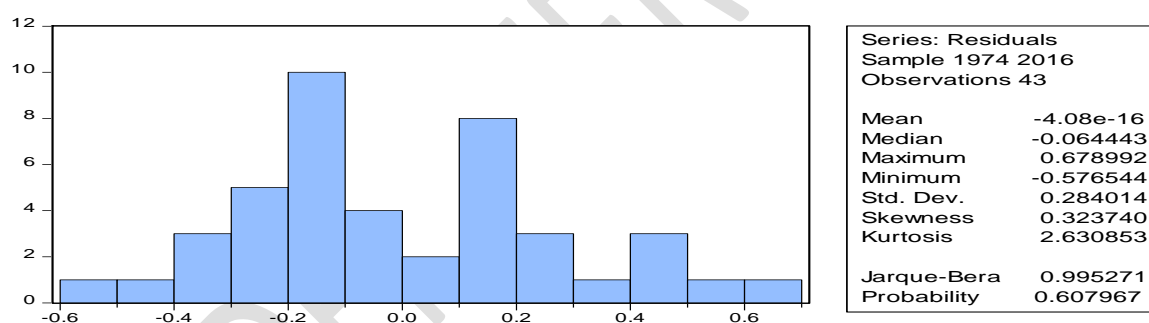


Figure 3 Jarque-Bera Normality test

Source: Authors compilation from *Eviews 10 Output*

4.4.3 Multicollinearity

Multicollinearity was tested by Variance Inflation Factors (VIF). VIF is used to measure Multicollinearity such that the value of VIF below 10 is desired (Garson, 2012). The results reported in appendix I(a) indicate that Multicollinearity was not a problem in the model since the VIF values were within the required limit (the value of VIF below 10 is desirable).

4.5 CUSUM tests

The study used CUSUM and CUSUM of squares tests in testing the stability of the model at a 5% level of significance. Figure 4. CUSUM which are the plots of recursive residuals and cumulative sum recursive residuals respectively are within the boundary of the critical region.

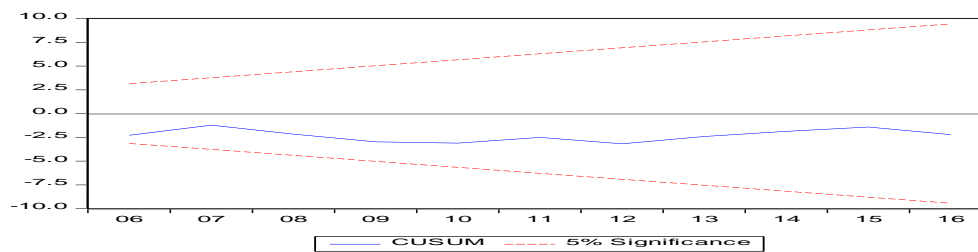


Figure 4 CUSUM test for Autoregressive model

4.5.1 Ramsey Tests for Model Specification

Ramsey Regression Equation Specification Error Test (RESET) test is a general specification test for the linear regression model. Additionally, precisely, it tests whether non-linear combinations of the fitted values help explain the response variable. Ramsey was used to testing model specifications.

Table 7 Ramsey RESET test for ARDL model

	Value	Df	Probability
	3.77		
F-Statistic	6	(1,28)	0.0620

Source: Authors compilation from Eviews 10 Output

Table 7 reports the Ramsey RESET test, a test for functional form misspecification. The F-Statistic (1, 28) = 3.7796 with a probability 0.0620 is shown. At a 5% level of significance, the result does not give evidence to reject the null hypothesis that the model is correctly specified (coefficient of squared fitted value is not different from zero), hence confirming that the model was well specified.

4.5.2 Granger Causality

Table 8 the F-Statistic was used to test the null hypothesis that variables do not Granger cause each other against the alternative hypothesis that there is granger causality at least in one direction. The decision rule used was to reject the null hypothesis if the F-statistic probability is less than the critical value probability at a 10% level of significance. As shown in Table 8 there was uni-directional causality between LNOPEN and LNGDP at a 10% significance level, meaning that trade openness is attributed to GDP growth. On another hand there is bi-directional causality between LNEXCH and LNGDP at a 10% significance level, meaning that **foreign direct investment (FDI)** is attributed to the level of the exchange rate, similarly to the exchange rate the changes in exchange rate affects **foreign direct investment**. This result is similar to (Bader, 2016) which used a panel data approach. Also 2005, Wong Hock found Strong evidence that openness to international trade Granger-causes economic growth. Also, a unidirectional relationship between trade openness and economic growth was found (Olufemi, 2004) in Nigeria by using panel data and suggesting that Nigeria should increase the exportation in the country.

Table 8 Pairwise Granger Causality Tests

Null Hypothesis	Observation	F-Statistics	Prob
-----------------	-------------	--------------	------

LNOPEN does not Granger Cause LNGDP	45	2.01099	0.1472
LNGDP does not Granger Cause LNOPEN		2.55146	0.0906
LNEXCH does not Granger Cause LNGDP	45	3.24385	0.0495
LNGDP does not Granger Cause LNEXCH		2.97446	0.0625
LNFDI does not Granger Cause LNGDP	45	0.30948	0.7356
LNGDP does not Granger Cause LNFDI		0.58870	0.6815
LNEXCH does not Granger Cause LNOPEN	45	0.17306	0.8417
LNOPEN does not Granger Cause LNEXCH		0.38719	0.6815
LNFDI does not Granger Cause LNOPEN	45	0.37492	0.6897
LNOPEN does not Granger Cause LNFDI		0.92891	0.4033
LNFDI does not Granger Cause LNEXCH	45	0.52332	0.5965
LNEXCH does not Granger Cause LNFDI		1.77735	0.1822

Source: *Authors compilation from Eviews 10 Output:*

5.0 CONCLUSION AND RECOMMENDATION

The study has assessed the determinants of economic growth in Tanzania from 1970 to 2016, specifically ascertained if there is an effect of trade openness, real exchange rate, and direction causality of trade openness on economic growth. On one hand, It was discovered that trade openness has a positive effect on economic growth in both the short and long run, while the real exchange rate has a positive effect on economic growth over a long period. Finally, the study findings revealed that there is one-way direction causality on the gross domestic product to trade openness. On another hand, foreign direct investment was found to have positive and no significance without one period lag in the short-run but has positive significance in long run. Therefore, the government should encourage trade openness which will result in domestic production and local trade increase to raise the level of exportation. This means ‘*Tanzania ya Viwanda*’ (Industrialized Tanzania) shall be realized with such a clear focus. This can be achieved by creating a favorable environment for investments to both national and international investors. Also, the Bank of Tanzania should control the real exchange rate which has a positive influence on economic growth in the long run due to its impact on the competition of domestic products.

References

- (2018). Retrieved from education/finance/international-finance: <https://www.dummies.com/education/finance/international-finance/what-are-real-exchange-rates/>
- Agnor, P. R., & Montiel, P. J. (2004). *Development Macroeconomics. Fourth Edition*, Princeton.
- Ahmed Monir, e. a. (2013). Price-Wage Spiral in Bangladesh: Evidence from ARDL Bound Testing Approach. *International Journal of Applied Economics*, 10(2), 77–103.
- Ali, & Abhullah. (2015). *The Impact of Trade Openness on the Economic Growth*. Pakistan.
- Andrews, A. P. (2015). “Exports, Imports, and Economic Growth in Liberia: Evidence from. *Journal of Management Policy and Practice*., 16(3), 95.
- Baboo, M. N. (2014). the relationship between openness and economic growth. *Journal of Economics and Development Studies*, 407-427.
- Bader, S. H. (2016). effect of exports and imports on economic growth in the Arab countries. *Journal of Economics Bibliography*, 101-107.
- Bigsten, A., & Danielsson , A. (1999). *Is Tanzania an Emerging Economy? A Report for the OECD Project ‘Emerging Africa’*. Sweden: OECD.
- Brooks, C. (2008). *Introductory Econometrics for Finance. Finance (Second)*. New York.
- De Mello Jr, L. R. (1997). Foreign direct investment in developing countries and growth: A selective survey. *The Journal of Development Studies*, 34 (1), 1-34.
- Devereux, M. B., & Engel, C. (2003). “Monetary Policy in the Open Economy Price Setting and Exchange Rate Flexibility”. *Review of Economic Studies*, 70-84.
- Domar, E. (1946). "Capital Expansion, Rate of Growth, and Employment". *Econometrica*, 14 (2): 137–147.
- Fiestas, I. (2005). The effects of trade liberalization on growth, poverty, and inequality. *The Economic Journal*.
- Fischer, S. (2003). Globalization and Its Challenges. *American Economic Review*, 93 (2): 1-30.
- Garson, G. D. (2012). *Testing Statistical Assumptions*. 274 Glenn Drive Asheboro: NC 27205 USA: Statistical Associates Publishing.
- Georgios, K. (2003). "Trade Openness and Economic Growth, can we Estimate the Precise Effects?“. *Applied Econometrics and International Development*, Vol. 3-1.
- Harrod. (1939). An Essay in Dynamic Theory. *The Economic Journal*, 49 (193): 14–33.
- Hassan, S.T., Xia, E., Huang, J. *et al*. Natural resources, globalization, and economic growth: evidence from Pakistan. *Environ Sci Pollut Res* **26**, 15527–15534 (2019). <https://doi.org/10.1007/s11356-019-04890-z> (on globalization)

Herath, S. (2010). *The Size of the Government and Economic Growth*. Vienna: WU Vienna University of Economics and Business.

Iheonu, C. O. (2016). Investment, Output and Real Interest Rate in Nigeria: An ARDL Analysis. *Journal of Economics and Allied Research (JEAR)*, 72–92.

Isola, W. A., & Alani, R. A. (2012). Human Capital Development and Economic Growth: Empirical Evidence from Nigeria. *Asian Economic and Financial Review*, 2(7), 813–827.

Kanaan, O. (2000). “Tanzania’s Experience with Trade Liberalization”. *Journal on Finance and Development: IMF*, 32(2).

Kapunda, S. M., & Topera, J. S. (2013). Public Expenditure Composition and Economic Growth in Tanzania: Socio-economic Policy Implications. *Asian-African Journal of Economics and Econometrics*, 13(1), 61–70.

Kazungu, K. (2009). Trade Liberalization and the Structure of Production in Tanzania.

Keho, Y. (2017). The impact of trade openness on economic growth: The case of Cote d’Ivoire.

Keskin, İ. & Abdalla, M. J. (2020). The Structural Adjustment Program (Sap) and The Policy Transformation in Tanzania. *Academic Review of Humanities and Social Sciences*, 3 (1), 1-15. Retrieved from <https://dergipark.org.tr/en/pub/arhuss/issue/54943/607555>

Khim, V. (2004). Which Lag Length Selection Criteria Should We Employ? *Economics Bulletin*, Vol. 3, (33) 1–9.

Kim, & Lin. (2009). Trade and growth at different stages of economic development. *Journal International Trade Economic Development*, 1211-1224.

Kumar, N. P. (2004). Temporal Causality and the Dynamics of Exports, Human Capital and Real Income in China. *International Journal of Applied Economics*, 1(1), 24–45.

Mahadeva, L., & Robinson, P. (2004). Unit Root Testing to Help Model Building (No. 22). *Handbooks in Central Banking*. London.

Manni, U. H. (2012). Effect of Trade Liberalization on Economic Growth of Developing Countries: A Case of Bangladesh Economy. *Journal of Business, Economics and Finance Universiti Brunei Darussalam: Brunei*.

Mkubwa, H. M., Mtengwa, A. B., & Babiker, A. S. (2014). *The Impact of Trade Liberalization on Economic Growth in Tanzania*. Dar es salaam: International Journal of Academic Research in Business and Social Sciences.

Muganda, A. (2004). *Tanzania’s Economic Reforms and Lessons Learned*. Washington DC:: International Bank for Reconstruction and Development.

Nduka, E. K., Chukwu, J. O., & Kalu, I. K. (2013). Trade Openness and Economic growth A Comparative Analysis of the Pre and Post Structural Adjustment Programme (Sap) period in Nigeria. *Asian Journal of Business and Economics*, 3(3): 1-12.

Nduka, K. (2013). “Openness and Economic Growth in Nigeria. *A Journal of Education*.

Nkoro, E., & Uko, A. K. (2016). Autoregressive Distributed Lag (ARDL) Cointegration Technique: Application and Interpretation. *Journal of Statistical and Econometric Methods*, 5(4), 63–91.

Olasode, S. O. (2015). Trade Openness And Economic growth. *International Journal of Economics*, 3(5): 1-820.

Olhin(1993), & Hecksher (1919). (2013). as cited in Nduka et al. "Trade Openness and Economic Growth: A Comparative Analysis of the Pre and Post Structural Adjustment. *Asian Journal of Business and Economics*, Volume 3, No.3.4 Quarter IV, 1-12.

Olufemi, M. (2004). Trade Openness and Economic Growth in Nigeria: Further Evidence on the Causality Issue. *South African Journal of Economic and Management Sciences*, 7(2): 299-315.

Pennings, Paul., Hans , K., & Jan , K. (2006). Doing research in political science. *political science*. 2nd ed, 158.

Purnama, P.D. and Yao, M.H., 2019. The Relationship between International Trade and Economic Growth. *International Journal of Applied Business Research*, 1(02), pp.112-123

Raghutla, C. (2020). The effect of trade openness on economic growth: Some empirical evidence from emerging market economies. *Journal of Public Affairs*, 20(3), e2081.

Sakyi, D. (2010). Trade openness, foreign aid, and economic growth in post liberalization Ghana. *Journal of Economics and International Finance*, 3(3): 146-156.

Santiago, R., Fuinhas, J. A., & Marques, A. C. (2018). *The impact of globalization and economic freedom on economic growth: the case of the Latin America and Caribbean countries*. *Economic Change and Restructuring*. doi:10.1007/s10644-018-9239-4

Santos, P. A. (2002). Trade Liberalisation and Export Performance in Selected. *Journal of Development Studies*, 39(1), 140–164.

Sjo. (2008). Testing for Unit Roots and Cointegration. *The economic journal*, 1-26.

Solow, R. (1956). A Contribution of the Theory of Economic Growth. *Quarterly Journal of Economics*, 70(1), 65-94.

ten Have, H., Patrão Neves, M. (2021). WTO. In: Dictionary of Global Bioethics. Springer, Cham. https://doi.org/10.1007/978-3-030-54161-3_17

Türsoy, T. (2017). Causality between Stock Prices and Exchange Rates in Turkey: Empirical Evidence from the ARDL Bounds Test and a Combined Cointegration Approach. *International Journal of Financial Studies*, 5(1), 1–10.

URT. (2005). *The United Republic of Tanzania National Strategy for Growth and Reduction of Poverty (NSGRP)*. Dar Es Salam - Tanzania.: Vice President's Office.

URT. (2010). *United Republic of Tanzania Summary of the National Strategy for Growth and Reduction of Poverty*. Dar Es Salam - Tanzania.: Ministry of Finance and Economic Affairs.

URT. (2011). *Tanzania Mainland's 50 Years of Independence*. . Dar es salaam- Tanzania: Bank of Tanzania.

URT. (2019). *The Economic Survey 2018: Ministry of Finance and Planning DODOMA – TANZANIA*, August 2019.

Vlastou, I. (2010). Forcing Africa to open up to trade: is it worth it? *The Journal of Developing Areas*, 25-39.

Wong, H. (2015). Impact of international trade and financial development on economic growth. *The economic journal*, 92-107.

Yeboha. (2012). “Effects of Trade Openness on Economic Growth: The Case of African Countries. *Southern Agricultural Economics Association*, 1-24.

Zahonogo. (2016). “Trade and Economic Growth in Developing Countries: Evidence from Sub-Saharan Africa. *Pam Journal of African Trade*, 41–56.

APPENDICIES

Appendix I

(a) Multicollinearity

Variance Inflation Factors

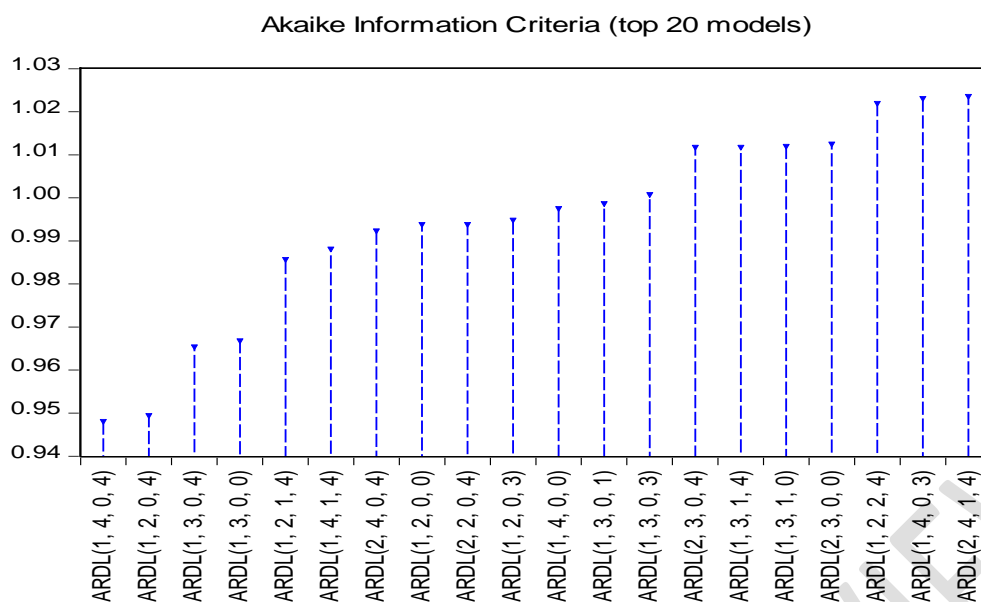
Date: 10/03/18 Time: 19:58

Sample: 1970 2016

Included observations: 43

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LNGDP(-1)	0.034523	28.07360	3.112271
LNOPEN	0.062407	33.71534	2.106117
LNOPEN(-1)	0.148175	76.04986	4.285965
LNOPEN(-2)	0.173405	88.38518	5.131313
LNOPEN(-3)	0.182526	92.21129	5.565879
LNOPEN(-4)	0.114255	57.49908	3.529422
LNEXCH	0.002741	25.33240	4.728048
LNFDI	0.017546	15.84912	1.958114
LNFDI(-1)	0.015200	13.75083	1.689789
LNFDI(-2)	0.013056	11.66843	1.512531
LNFDI(-3)	0.012617	11.20189	1.482561
LNFDI(-4)	0.014038	12.42749	1.648648
DUMMY	0.030440	3.126807	2.254209
C	0.202901	74.68333	NA

(b) Model selection summary



Appendix II. Q-Statistics Serial Correlation test for ARDL Model

Date: 10/04/18 Time: 14:40

Sample: 1970 2016

Included observations: 43

Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*
		1 -0.014	-0.014	0.0085	0.926
		2 -0.096	-0.097	0.4474	0.800
		3 -0.137	-0.141	1.3584	0.715
		4 0.015	-0.001	1.3689	0.850
		5 -0.035	-0.064	1.4322	0.921
		6 -0.058	-0.082	1.6101	0.952
		7 -0.087	-0.103	2.0146	0.959
		8 0.139	0.109	3.0827	0.929
		9 0.020	-0.012	3.1057	0.960
		10 -0.107	-0.119	3.7818	0.957
		11 -0.080	-0.061	4.1675	0.965
		12 0.086	0.054	4.6286	0.969
		13 -0.115	-0.171	5.4807	0.963
		14 0.072	0.067	5.8297	0.971
		15 0.135	0.162	7.0896	0.955
		16 -0.108	-0.191	7.9242	0.951
		17 -0.206	-0.233	11.084	0.852
		18 -0.021	0.027	11.117	0.889
		19 0.021	-0.035	11.153	0.919
		20 0.258	0.161	16.732	0.670

*Probabilities may not be valid for this equation specification.