The Impact of Industry and Trade on Economic Growth in Tanzania: Autoregressive Distributed Lag (ARDL) Analysis.

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Abstract

This paper examines the impact of industry and trade on economic growth in Tanzania utilizing the autoregressive distributed lag (ARDL) model. Augmented Dicker Fuller (ADF) and cointegration Bound test are employed to determine the unit root and cointegration amongst the variables respectively. Under ARDL model the study estimate the long run and short results as well as error correction term (ECM). Unit root results show that some variables are stationary at level and some is non-stationary at level. At first difference all the variables are stationary. Thus, with results ARDL analysis is inevitable in the study. Cointegration bound test finds the long run relationship amongst the variables means variables are cointegrated. In long run results the study find that industry has positive impact on economic growth whereas trade has negative impact on economic growth in Tanzania. Conversely, in short run all the variables have positive impact on economic growth under period of study. Error correction term has a proper sign and statistically significant that is variables are converging towards the equilibrium at the speed of 16 percent per annum to restore the equilibrium. Therefore, these results alarming the government to take some actions regarding the long run results in trade so as to improve the contribution on economic growth. This is quite possible due to fact that all these sectors are cointegrated so any government interventions will improve the sectors concurrently and ultimately stimulate the economic growth in Tanzania.

Key words: Industry, Trade, Economic Growth, Autoregressive Distributed Lag (ARDL), Augmented Dicker Fuller.

Jel Classification Codes: F1, F43

1.0 Introduction

Tanzania is among of the East African Community (EAC) countries. In fact, Tanzania ranks among the leading stars of the 'African growth miracle' since experiencing the average growth rate of 5 to 7 percent annual growth of gross domestic product (GDP) before the COVID 19 pandemic (Page, 2016). This has been supported by the World Bank in Tanzania report of seventh April, 2022. The report asserted that following two decades of sustained growth, Tanzania managed to reach an important milestone in July 2020, when it formally graduated from low-income country to lower-middle income country status (World Bank, 2022). All these prospects cannot exclude the contributions of the industry and trade sectors in economic growth in Tanzania.

This impressive annual growth rate of gross domestic product is activated with key economic drives like industry, trade, tourism just to mention a few. It is clear that improving these economic sectors like industry and trade another factor remain constant pulls up the economic growth of the respective country (World Bank, 2022). It is of interest to note that

industry and trade are compatible economic sectors. Improving industry activities triggers the increase in trade activities as well and in conversely increasing in trade volumes will influence the increase in production in industrial sector so as to fill in the trade demands (Baya and Jangu, 2017). These sectorial interactions in turn expected to pull up the economic growth of the country.

Industry provides the spill over effect in economic growth in a direct way like increasing level of output over time and well as in an indirect way by increasing the consumption level and in turn tends to stimulate the economic growth through consumption multiplier effect (Jorgenson and Striroh 2000). For instance, a formal manufacturingin Tanzania has grown up tremendously in the last decade between 2000 and 2010. This witnessed the increase in manufacturing value added (MVA) more than doubled in real terms from US$894 million to US$1,992 million (UNIDO 2012 cited in Page, 2016). The industry sector particularly manufacturing has continued to outpace overall gross domestic product growth since 2010 onwards.

In line to that, also trade activities influence the economic growth of the country by different ways that is direct or indirect. The direct way is through facilitating the export earnings that can be used to finance the development activities and eventually the economic growth. Again, indirect way is through importation of goods and services (Afonso, 2001; Chen 2009). Trade influences the economic growth through importing capital goods and then capital goods are used in production process. Increasing production using imported capital goods in agriculture, industry, tourism, services and construction sectors definitely expected to improve the economic growth of the country like Tanzania. The current status of trade in Tanzania has a total export of 3, 669, 212.44 in thousands of US$ and total imports of 8, 553, 677.02 in thousands of US$ leading to a negative trade balance of 4, 884,464.59 in thousands of US$ (Tanzania Trade Statistics, 2022). Therefore, it is crucial to understand that through indirect ways that is importing of goods or services a trade can influence the economic growth positively as stipulated in the statement above even though a trade general is experiencing negative balance of payments.

Thus, this study intends to examine the impact of industry and trade on economic growth in Tanzania since these are among of the key derivers of the economic growth in the country. Furthermore, based on the data given above gives the motive to undertake the study so as to

see if the sectors have significant contributions on economic growth as stipulated by various sources like World Bank in Tanzania and Tanzania Trade Statistics.

2.0 Literature review

Theoretical and empirical literatures on key economic drivers on economic growth are still giving conflicting results. Some empirical literatures support the hypothesis that industry, trade, construction, services sectors just to mention a few have positive influence on economic growth whereas other literatures do not support the hypothesis. With these conflicting results the present study finds it imperative to undertake this study in Tanzania in order to add in the board of literature.

Sultan (2008) examined trade, industry and economic growth in Bangladesh. The study investigated to what extent the trade and industry value added contributed to the economic growth of Bangladesh. The study employed time series analysis to determine the contributions of the trade and industry on economic growth in Bangladesh. The empirical findings found that growth rate of industry value added contributed significantly as compared the growth rate of trade in increasing the growth rate of gross domestic product of Bangladesh. Furthermore, the findings reveled that there was a cointegration and long run relationship between industry and gross domestic product of Bangladesh. In case of causality the results revealed that trade can not granger cause only the industry on GDP of Bangladesh. Thus, this study supports the hypothesis that trade and industry influences the economic growth of Bangladesh. However, industry seems to be more powerful than trade in improving economic growth in Bangladesh. Again, Kilavuz and Topcu (2012) investigated the manufacturing and exports on economic growth in developing countries using panel regression analysis and confirmed that manufacturing and exports in the respective developing countries had positive impact on economic growth. Indeed, these findings are important for this study since they give some insights to investigate the similar in Tanzania. Tanzania also using the industry and trade as among of the key economic drivers as such it important to check its validity in the economy. Tanzania is implementing open economy strategy through trade liberalization. With trade liberalization it is expected to improve the manufacturing and trade at large and ultimately improves the economic growth as whole.

Apart from Bangladesh and developing countries studies, also Ndiaya and Lv (2018) studied the impact of industrialization on economic growth in Senegal. They employed time series analysis and found that industrial output had positive impact on economic growth in respective country. Similarly, industrial output had long run relationship with economic growth. Thus, these findings stimulate the study to be taken in Tanzania as well so as to see if it will bring similar or different results.

Empirical evidences on trade as key determinant of economic growth have supported by many literatures (Shiva and Agapi (2004); Busse and Koniger (2012); Mkubwa et.al (2014); Bastola and Sapkota (2015)) just to mention a few. Trade and foreign direct investment found to be significant determinants of economic growth in developing countries (Shiva and Agapi (2004). Furthermore, Busse and Koniger (2012) asserted that trade had positive and significant impact on economic growth. Thus, all these findings supporting the role of trade on economic growth in the respective countries. Similarly, Mkubwa et.al (2014) analyzed the impact of trade liberalization on economic growth in Tanzania using time series analysis from 1970 to 2010. The sample was analyzed before trade liberalization and after trade liberalization. Empirical findings supported the hypothesis that trade openness had significant impact on economic growth in Tanzania. Surprisingly, trade openness had more significant impact during the closed economy than the open economy. This is of interest to know why the results behave contrary to the hypothesis.

Again, Bastola and Sapkota (2015) they analyzed the causality between trade and economic growth in a Least Developed Economy evidence from Nepal. The study utilized data from 1965 to 2011 employing the autoregressive distributed lag (ARDL) approach. Empirical findings found a long run relationship amongst the variables as well as unidirectional causality from export to gross domestic product both in long run and short run. That implied the trade improved the economic growth in Nepal under period of study. Imports had negative impact on economic growth in Nepal similar to Mkubwa et.al (2014) in Tanzania. In fact, effect of trade on economic growth in developing countries providing mixed results particularly the imports seem to be negatively associated with economic growth in the respective countries.

Farahane and Heshmati (2020) examined the trade and economic growth focusing on theories and evidence from the Southern African Development Community. The study employed panel data from 2005 to 2017. Empirical findings found that export expansion stimulated the

economic growth whereas economic integration had insignificant impact on economic growth in SADC'S countries. Again, trade openness found to be jeopardizing the economic growth in SADC. Thus, different approaches provide similar results that trade openness and imports affect the economic growth negatively to the respective countries under study. Therefore, taking study in Tanzania is imperative so that we can check the validity of the trade hypothesis if it supported or otherwise.

Furthermore, Nguyen (2020) investigated the impact of foreign direct investment and international trade on economic growth in Vietnam. The study used time series analysis from 2000 to 2018. The trade variable was disaggregated and examined the export and import separately. The empirical findings revealed that FDI and export improves the economic growth of Vietnam significantly whereas import had negative contribution on economic growth. In the present study trade examined as trade values as whole in the analysis so as to see what is the impact as a sector in Tanzania.

Elfaki et.al (2021) they examined the impact of industrialization, trade openness, financial development, and energy consumption on economic growth in Indonesia over the period 1984 to 2018. The study utilized the autoregressive distributed lag (ARDL) model to estimate the long run and short run amongst the variables. The empirical findings suggested the presence of cointegration amongst the variables as well as industrialization, energy consumption and financial development had positive influence on economic growth in long run. Trade openness indicated negative influence on economic growth in Indonesia. Conclusively, the findings supported the industry, energy consumption and financial development as key economic drivers than trade in Indonesia. These findings real shed light to take study in Tanzania as well to see if the said key economic drivers are significant or otherwise.

3.0 Research Methodology

The present study utilizes the time series analysis particularly autoregressive distributed lag (ARDL) model similar to other previous studies like Bastola and Sapkota (2015) and Elfaki et.al (2021) since this technique is superior than normal time series because this taking in account the issues of small sample size and well as when variables are in different order of integrations say one is stationary at level and other is non-stationary at level as the case in

these variables under study. The study employed data from Ivan statistic data base from 1970 to 2020. The selection of years involved in the study based on the availability of data.

3.1 Unit root Test

Since the present study employing time series data, normally the time series data have the problem of non-stationarity and stationarity. Thus, formulating a model while variables are in different order of integrations then resulted into spurious regression output. To avoid this problem the study employed Augment Dicker fuller (ADF) test to test for unit root in this paper.

3.2 Cointegration Test

Having establish that variables are integrated in the same order of integration then the study performed the cointegration test. This is important in time series variables since it determine the long run relationship amongst the variables. Long run relationship amongst the variables helps in policy interventions or policy formulations. The appropriate cointegration test under autoregressive distributed lag (ARDL) model is Bound test that was formulated by Pesaran et .al (2001). The normal cointegration test for multiple regression analysis that is Johansen cointegration test cannot be applied when the dependent variable entered as independent variable in a lag form. The bound test decision criteria are as follows: if the computed F statistic is lower than upper bound should not reject the null hypothesis and if the computed F statistic is higher than upper bound then null hypothesis should be rejected. When the computed F statistic fall within the lower and upper bound then decision is inconclusive.

3.3 Model Specification

In order to examine the impact of the industry and trade on economic growth in Tanzania. The present study formulated the mathematical model as follows:

Economic growth = F (Industry, Trade) ……..……(1)

F stands for function of, economic growth is dependent variable and industry and trade values are independent variables. GDP values are in million US$ similar to Industry and trade values are in million US$ respectively.

In fact, model (1) above cannot be estimated up until is transformed into econometrics model. The study transformed the model above into econometrics model as shown below:

$$GDP_t = \alpha + \beta_1 IND_t + \beta_2 TRD_t + \varepsilon_t \quad \text{……(2)}$$

Where,

GDP_t = Gross Domestic Product as dependent variable in million US$,

α = constant,

IND_t = industry values in million US$ and

TRD_t = trade values in million US$

and ε_t = an error term.

IND and TRD are independent variables and β_1 and β_2 are coefficients of changes and the expected coefficients are positive

In order to minimize the problems of outliers and to adhere to linearity of the variables under study, the present study instituted the natural logarithms to all variables as such makes the double log model analysis.

$$LNGDP_t = \alpha + \beta_1 LNIND_t + \beta_2 LNTRD_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Where,

$LNGDP_t$ = Natural Logarithms of Gross Domestic Product

$LNIND_t$ = Natural Logarithms of Industry values

$LNTRD_t$ = Natural Logarithms of Trade

β (1to 2) = Coefficients of changes of the independent variables

α = constant

ε_t = error term

It is important to note that model (3) above presenting the long run coefficients under ARDL model. Having establish the long run coefficients, the study performs the short run coefficients and error term as shown the model below: Error term incorporated in short run model indicates the degree of adjustment of the variables towards the equilibrium after economic shocks experienced in the economy.

$$\Delta LNGDP_t = \alpha + \beta_1 \Delta LNIND_t + \beta_2 \Delta LNTRD_t + \beta_3 \varepsilon_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots(4)$$

In order to perform the short run ARDL model the study employs the automatic selection of the AIC criterion in the E-views 10 soft ware. The maximum lag included in this study is four lags as per software and that is a standard lag in ARDL model.

The symbol of delta (Δ) in model 4 above stands for change.

ε_{t-1} is error correction term

β_3 is a coefficient of change of the error correction term and expected to have a negative sign.

All other variables remain the same as described in model 3 above.

4.0 Analysis and Discussions of findings

This section presents the regression analysis and discussion of findings particularly unit root, co integration, long run and short run results.

4.1 Unit Roots Results

Unit root results at level shows two variables are stationary in without constant and trend and one is non-stationary at all categories whereas all variables are stationary at first difference in all categories. In this context, it is imperative to use the ARDL model so as to produce the robust results in this study. See the table below for more clarifications. Using this ARDL model means all the findings in the present study are not spurious since it employed an appropriate modelling.

Table 1: Unit root results

AT LEVEL				
Coefficients				
Variables	Without constant and trend	With constant	With constant and trend	Order of integration
LNGDP	1.869740	-0.664126	-1.818669	I(1)
LNIND	3.949812	-0.131538	-1.333153	I(0)
LNTRD	3.478949	-1.307929	-2.065373	I(0)
FIRST DIFFERENCE				
Coefficients				
Variables	Without constant and trend	With constant	With constant and trend	Order of integration
LNGDP	-3.820155	-4.610635	-4.561355	I(0)
LNIND	-4.318125	-5.244641	-5.203887	I(0)
LNTRD	-4.515780	-5.358640	-5.340337	I(0)

Source: Researcher's computation, 2022 Without constant and trend: Test critical values: 1%, 5% and 10%, with constant: Test critical values: 1%, 5% and 10%, with constant and trend: Test critical values: 1%, 5% and 10%. Notes: If variables are integrated of order one I(1) means variables are non stationary. If variables are integrated of order zero I(0) means variables are stationary

4.2 Cointegration -Bound Test results

The findings reveal a presence of cointegration amongst the variables since the computed F-statistic is higher than lower bound and exceed the upper bound at five percent level of significance as such null hypothesis of no cointegration is rejected means variables are cointegrated. Now this implies that industry and trade sectors have long run relationship with gross domestic product in Tanzania. This finding is crucial for a respective country since it shed the light to the government to use this finding in policy interventions or policy formulations because these sectors are moving together with gross domestic product as such it stimulating the economic growth in Tanzania.

Table 2: Cointegration-Bound Test results

F-Bounds Test		Null Hypothesis: No Levels relationship		
Test Statistic	Value	Significance	I(0)	I(1)
			Asymptotic n = 1000	
		10%	2.63	3.35
F-Statistic k	5.466459	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5

Source: Researcher's computation, 2022

4.3 Long run results

Since the variables are cointegrated means have long run relationship then it is important to present the long run results. When variable is statistically significant in long run means variables have long run relationship and vice versa is true. The results connote that one percent increase in industry values increases the gross domestic product by 1.210836 percent in long run. Trade values coefficient is -0.251645. This implies that one percent increase in trade values reduces the gross domestic product by 0.251645 percent in Tanzania. These findings are similar to Sultan (2008) conducted study in Bangladesh found industry was significant whereas trade was insignificant in Bangladesh. In line to that Elfaki et .al (2021) found industry was significant on economic growth in Indonesia similar to this study. See table 3 below.

Table 3: Long run Results

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNGDP)
Selected Model: ARDL(3, 2, 1)
Case 2: Restricted Constant and No Trend
Date: 08/02/22 Time: 12:25
Sample: 1970 2020
Included observations: 48

Levels Equation				
Variable	**Coefficient**	**Std.error**	**t-statistic**	**Prob.**
C	-4.524920	0.527256	-8.582026	0.0000
LNIND	1.210836	0.329120	3.679015	0.0000
LNTRD	-0.251645	0.382433	-0.658012	0.5144

Source: Researcher's computation, 2022

4.4 Short run Results

Having established that variables have long run relationship it is imperative to analyze the short results. In short run the signs and coefficients of changes in some variables are contrary to the expectations. Gross domestic product of the previous year has positive impact on economic growth in the current year in short run. Coefficient of gross domestic product in previous year is 0.952521. This implies that one percent increase in gross domestic product in

previous year increase the economic growth in current year by 0.952521 percent in short run. Again, gross domestic product in two year's back means lag two has positive influence on economic growth in current year in short run but is statistically insignificant at five percent level of significance. Contrary, GDP lag three has negative impact on economic growth and it is statistically significant. Thus, this tells that gross domestic product of the current year normally is influenced positively with previous gross domestic product up to lag 2 only in short run. The findings are similar to Bastola and Sapkota 2015 in Nepal.

Industrial sector has the coefficient of 0.269255 thus, industrial sector has positive impact on economic growth in short run and it is statistically significant at five percent level of significance. This connote that one percent increase in industrial sector values increases the gross domestic product by 0.269255 percent in short run. This similar to Elfaki et .al (2021) they found a positive impact of industry on economic growth in Indonesia. However, the previous year's value of industrial sector produces the conflict results. In lag one has negative impact whereas in lag two has positive impact on economic growth in short run and all are statistically significant.

Trade values has positive coefficient (0.652467) and statistically significant at five percent level of significance. This indicates that one percent increase in trade values increases the economic growth by 0.652467 percent in short run while trade values of the previous year has negative impact on economic growth and it is statistically significant. These empirical findings are similar to Mkubwa et. al (2014), Farahane and Heshmati (2020) as well as Nguyen (2020).

The coefficient of determination indicates good fitting of model of 99 percent as well as F-statistic it is statistically significance at five percent level of significance. The rest of percentage can be explained by other variables not included in this model. This can be well seen in the table 4 below where the adjusted R-square is 0.998560. Therefore, all the explanations above can be seen in the table 4 provided below.

Table 4: Short Run results

Dependent Variable: LNGDP
Method: ARDL
Date: 08/02/22 Time: 12:24
Sample (adjusted): 1973 2020
Included observations: 48 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): SER02 SER03
Fixed regressors: C
Number of models evaluated: 100

Selected Model: ARDL(3, 2, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGDP(-1)	0.952521	0.078507	12.13293	0.0000
LNGDP(-2)	0.000280	0.101230	0.002765	0.9978
LNGDP(-3)	-0.113262	0.051082	-2.217254	0.0325
LNIND	0.269255	0.058794	4.579656	0.0000
LNIND(-1)	-0.316659	0.090732	-3.490056	0.0012
LNIND(-2)	0.241696	0.068016	3.553532	0.0010
LNTRD	0.652467	0.068878	9.472847	0.0000
LNTRD(-1)	-0.692846	0.067642	-10.24280	0.0000
C	-0.726076	0.268854	-2.700630	0.0102

R-squared	0.998805	Mean dependent var	2.617994
Adjusted R-squared	0.998560	S.D. dependent var	0.836537
S.E. of regression	0.031744	Akaike info criterion	-3.894877
Sum squared resid	0.039299	Schwarz criterion	-3.544027
Log likelihood	102.4771	Hannan-Quinn criter.	-3.762291
F-statistic	4075.125	Durbin-Watson stat	2.076967
Prob(F-statistic)	0.000000		

Source: Researcher's computation, 2022

4.5 Error Correction Term Results

After being certain that variables have long run relationship, then error correction term helps to determine the level of adjustment of the variables under study to converge to the equilibrium after being disturbed with any economic shock (s). The findings indicate that, these variables are converging to the equilibrium at the speed of 16 percent per annum. Table 5 below shows the error term coefficient is (-0.160461) that is exactly as per expected sign and it is statistically significant at five percent level of significance.

Similarly, the short run results in table 4 above are similar to short run results in error term coefficients. Gross domestic product of the previous year has positive influence on current gross domestic product but it statistically insignificant in short run. Industry sector has positive impact on economic growth in short run and statistically significant. One percent increase in industry values increases the economic growth by 0.269255 percent in short run. Similarly, trade sector has positive relationship with economic growth in short run and it is statistically significant at five percent level of significance. One percent increase in trade values increases the economic growth by 0.652467 percent in short run. In deed these findings are in line with Elfaki et.al (2021) in Indonesia as well as Bastola and Sapkota (2015) in Nepal they found industry and trade had positive impact on economic growth in short run similar to the present study in Tanzania. In fact, the findings in table 4 above and

table 5 below are the same in industry and trade sectors but results in table 5 below incorporated the error term so as to capture the long run information in short run.

Table 5: Error Correction TermResults

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP(-1))	0.112982	0.071087	1.589349	0.1201
D(LNGDP (-2))	0.113262	0.042403	2.671109	0.0110
D(LNIND)	0.269255	0.053973	4.988651	0.0000
D(LNIND(-1))	-0.241696	0.064764	-3.731983	0.0006
D(LNTRD)	0.652467	0.059829	10.90554	0.0000
CointEq(-1)*	-0.160461	0.033067	-4.852610	0.0000

R-squared	0.938576	Mean dependent var	0.065991
Adjusted R-squared	0.931264	S.D. dependent var	0.116674
S.E. of regression	0.030589	Akaike info criterion	-4.019877
Sum squared resid	0.039299	Schwarz criterion	-3.785977
Log likelihood	102.4771	Hannan-Quinn criter.	-3.931486
Durbin-Watson stat	2.076967		

Source: Researcher's computation, 2022

5. Conclusion and Policy Implications

The present study in unit root finds some variables are stationary at level while all are stationary at first difference as such necessitated to undertake the autoregressive distributed lag (ARDL) analysis. Regarding bound test results variables are a co integrated means have long run relationship. Long run results show that industrial sector has positive influence on economic growth in Tanzania whereas trade sector has negative influence on economic growth in long run. This finding in trade can be supported by the statistics given by World Bank in Tanzania where it shows a negative trade balance as such may impair the economic growth. In short run generally, all variables have positive impact on economic growth in Tanzania. Means industry, trade and gross domestic product of the previous year have significant impact on economic growth in short run. Evidence from bound test that variables are co integrated then error correction term affirmed that finding by showing that these variables are adjusting towards equilibrium after economic shock by 16 percent per annum. Thus, bound test and error correction term results are confirming the presence of long run relationship amongst the variables under study. Based on the empirical results, the government and other supporting government agencies may use these findings to improve the

balance of trade in Tanzania so as to increase the contribution on economic growth in long run. Since the variables are co integrated then may use the long run relationship amongst the variables to formulate policies that stimulate economic growth particularly in trade sector that seems to negatively affecting the economic growth in long run in Tanzania. In line to that, error correction term indicates that industry and trade are adjusting towards the equilibrium then the government should be aware with the appropriate strategy to support the adjustment being deliberate or automatic strategy so as to restore the equilibrium.

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