An Empirical Analysis of the Relationship between FDI and Economic Growth in Tanzania

Benedict Huruma Peter Mwakabungu [1*], Jignesh Kauangal [2]

[1]Lecturer, College of Business Education, Dodoma, Tanzania
P.O.BOX 2077, Dodoma City, Tanzania
bmwakabungu@yahoo.com
Mobile (s) +255 767400940/+917621987945
Twitter: @petermwakabungu
Facebook: /benedict. mwakabungu.9
ORCID ID: https://orcid.org/0000-0001-5226-2190
LinkedIn: https://www.linkedin.com/in/benedict-huruma-peter-mwakabungu-701b81b9/

[2]Principal (I/c), Shree Narayana College of Commerce, Ahmedabad, India
jigneshkauangal@gmail.com
Mobile +919426300212

***Correspondence:**
Corresponding Author
bmwakabungu@yahoo.com

Abstract

Foreign direct investment (FDI) is considered an important economic growth catalyst, particularly in developing economies. The neoclassical growth theory claims that FDI enhances economic growth through augmenting capital stock and technology. Some empirical studies support the neoclassical claim, but some do not. In July 2020, Tanzania attained lower-middle-income country status, following sustained growth since the early 1990s. In this period, FDI also increased substantially along with economic growth. However, the causal link between FDI and economic growth in Tanzania is not fully known. Hence, this study examines the causal connection between FDI and economic growth in Tanzania during 1990 – 2020 for a timely policy framework and recommendation. The error of omission of variable bias was addressed by including financial development and trade as intermittent variables to form a multivariate Granger-causality system. We used the autoregressive distributed lag model and Granger causality tests, and the findings validate long-run cointegration among variables. Furthermore, the results confirm unidirectional causality from FDI to economic growth in Tanzania irrespective of the time frame. This empirical result provides important policy implications to the Tanzania economy. Therefore, foreign direct investment in the country should be fortified by all tiers of government to achieve the desired economic progress.

Keywords: foreign direct investment; causal relationship; economic growth; granger causality; financial development; trade.

1. Introduction

Scholars have often debated if foreign direct investment (FDI) inflows influence economic growth in developing countries. Nevertheless, the causal connection between these two variables has not been resolved in the literature. Private capital flow in the form of FDI for African countries accelerated during the era of economic reform in the 1990s (Jugurnath et al, 2016). Literature shows, that FDI inflow in Tanzania was zero in 1991 before it increased to 5.7% in 2010 and dropped to 2.0% in 2019 (World Bank report, 2022). In 2017 the world recorded a decline of 23.4% in FDI inflows. There was a 21.5% decline in Africa, yet Tanzania marked an increase of 24.2% as compared to 2016, accounting for about 87.7% of foreign private investments (National Bureau of Statistics, 2018 and Taylor, 2020). From 1991 to 2019 inclusive, the growth rate of FDI inflows in Tanzania was 2.7%; however, from 2001 to 2019 the growth rate grew at 3.2% on average (World Bank, 2021). FDI inflow is considered a means of transmitting production technologies into developing countries from advanced economies. However, a certain threshold level of human capital and financial liberalization must be existing in the recipient country (Borensztein et al., 1998 and Hermes and Lensink, 2003). Countries with enhanced human capital are found to benefit not only from direct productivity effects but also from absorption and diffusion of international knowledge spillovers through imports and FDI inflows (Ali and Roy, 2017).

Recent studies (Adams, 2009; Anyanwu and Yaméogo, 2015; Belloumi, 2014; Elboiashi, 2015; Marobhe, 2015; Masanja, 2018; Nguyen, 2020; Shawa and Shen, 2013; Taylor, 2020 and Velnampy et al., 2014) inter alia, have investigated on the causal relationship between FDI inflows and economic growth in developing countries. Nevertheless, most of the studies were undertaken in Asia and Latin America. Scant research exists about this relationship in sub-Saharan Africa, particularly in the United Republic of Tanzania (Tanzania). Few extant studies have reported inconclusive results.

Empirical studies on the nexus between FDI inflows and economic growth from Tanzania suffer from the following two major limitations. First, the traditional maximum likelihood test based on Johansen (1988) as used in prior studies may not be appropriate, especially when the sample size is too small and time series with mixed order of integration is used (see Narayan and Smyth, 2005). Second, most studies that have been carried out in Tanzania have mainly been based on bi-variate analysis. Resultantly, the inference drawn from the bi-variate structure may be biased due to the omission of a third important variable (Odhiambo, 2009). Hence, the introduction of trade openness in the current study as a third variable that affects both FDI inflows and economic growth in the bi-variate framework may not only change the direction of causality between the two variables but also the extent of the estimate (see Odhiambo, 2011).

Accordingly, to attempt to bridge that gap, the current study employed autoregressive distributed lag (ARDL) for co-integration and the error correction models to examine the causal relationship between FDI inflows and economic growth in Tanzania using annual data (1991–2019). ARDL is an ordinary least square (OLS) based model, applicable for both non-stationary time series as well as for time series with mixed order of integration (Shrestha and Bhatta, 2018). The variable trade openness is an intermittent variable in the model that helps to form a modest tri-variate causality analysis. According to Pesaran et al. (2001), the ARDL method is applicable irrespective of whether the time series was integrated at order zero, I (0), or I (1), or was mutually integrated. However, it is not applicable when a series integrate at order, I (2) because it tends to invalidate results at, I (2). The findings of this study have implications for policy, practice, theory, and research related to the economic growth of Tanzania as the government pursues its policies to support the country's industrialization in the COVID-19 response and recovery period.

This paper consists of five sections. The second section provides an overview of the history of Tanzania, economic reform, and a review of the literature. The third section describes the study's methods. In the fourth section, the study's findings are presented and discussed. Section five concludes the paper.

2. Literature review

The United Republic of Tanzania (Tanzania) was renamed after Tanganyika joined with the former protectorate of Zanzibar on April 26, 1964, to form the United Republic of Tanganyika and Zanzibar, later United Republic of Tanzania (United Nations, 2022). The provisional constitution of 1965 established the United Republic of Tanzania followed by a permanent constitution which was approved in 1977 and amended in 1984 to include a bill of rights (Britannica, 2010).

According to Britannica.com, the Tanzanian economy is particularly agrarian. The country's concern with agricultural production, which improved in the 1970s and '80s, reflects the government's commitment at that time to socialist development and central planning, as defined in the Arusha Declaration of 1967. However, Tanzania presently has a mixed economy with a variety of private and state enterprises, with centralized economic planning and government regulation following comprehensive and structural economic reforms—including trade liberalization and investment promotion—aiming to transform the economy from a command to a market system led by the private sector with little government intervention (Kweka, 2006).

The country recorded impressive macroeconomic performance in the post-2000 period, including the tourism sector, after the 2002 Small and Medium Enterprise Policy, the 2003 Trade Policy, the 2007 Export Development Strategy, the 2009-2013 Tanzania Trade Integration Strategy, and the Sustainable Industrial Development Policy 1996-2020 (Battaile, 2020). From 1991 to 2019, Tanzania's GDP growth was 5.3% on average while in the post 2000 period the rate of growth was 6.4 % (World Bank, 2021). Following this sustained growth for more than two decades, Tanzania, in July 2020, formally graduated from a low-income country to a lower-middle-income country (Battaile, 2020). This attainment reflects continual macroeconomic stability that has supported growth, until the spread of COVID -19 and now in the response and recovery period of the pandemic.

Confronted with empirical data, a wide range of studies have come to inconsistent conclusions on the causal relationship between FDI and economic growth, with support for four major perspectives (Odhiambo, 2021). In the first point of view, empirical findings show that FDI inflows Granger cause economic growth. The Granger causality test is a statistical hypothesis test to determine whether one-time series is useful in predicting another (Wang, 2016). Although, Granger causality may provide misleading results when a true link consists of three or more variables, the inference about causal relationships in time series analysis is still for the most part based on Granger causality (see Berzuini et al., 2012 and Maziarz, 2015). Fadhil and Almsafir (2015) for Malaysia, 1975–2010; Hudea and Stancu (2012) for East European countries, 1993–2009; Salim et al. (2015) for Malaysia, 2000–2010; Sunde (2017) for the Republic of South Africa (South Africa), 1970–2012; Dritsaki et al. (2004) for the Hellenic Republic (Greece), 1960–2002; Reza et al. (2018) for the People's Republic of Bangladesh (Bangladesh), 1990–2015; Marobhe (2015) for Tanzania, 1970–2014; Mohanasundaram and Karthikeyan (2015) for the Republic of India (India), January 2000–December 2014; Doku et al. (2017) for Africa, 2003–2012; and Nguyen (2020) for the Socialist Republic of Vietnam (Vietnam), 2000–2018, concluded that FDI inflows influence economic growth. Notably, the literature shows that in countries with strong financial market systems and human capital bases, FDI inflows positively influence economic growth since the preconditions for technological diffusion in those countries are fulfilled (Fadhil and Almsafir, 2015 and Hermes and Lensink, 2003). This implies that institutional quality enhances the absorptive capacity of a country (Odhiambo, 2011; Aziz, 2020).

Contrary to the first empirical view, the second group of studies supports causality running from economic growth to FDI inflows—i.e., the growth-driven FDI hypothesis—wherein GDP growth drives FDI inflows in the host country, as posited by Odhiambo (2021) for the Republic of Kenya (Kenya), 1980–2018; Sarker and Khan (2020) for Bangladesh, 1972–2017 and Stamatiou and Dritsakis (2014) for Greece, 1970–2012.

The third empirical view argues for bidirectional causality. This view implies that FDI inflows and economic growth are interdependent. Supporters of this include Balamurali and Bogahawatte (2004) for Sri Lanka, 1977–2003; and Lema and Dimoso (2011) for Tanzania, 1970–2007.

The fourth empirical view proposes the neutrality hypothesis. This view posits that there is no causality in either direction. Researchers that support this view include Jayachandran and Seilan (2010) for India, 1970–2007; Belloumi (2014) for the Republic of Tunisia (Tunisia), 1970–2008; Sharma and Kaur (2013) for India and the People's Republic of China (China),1976–2011; Aga (2014) for the Republic of Türkiye (Turkey), 1980-2012; Louzi and Abadi (2011) for the Hashemite Kingdom of Jordan (Jordan), 1990–2009; Shawa and Shen (2013) for Tanzania, 1980–2012; Masanja (2018) for Tanzania, 1990–2013; Velnampy et al. (2014) for the Democratic Socialist Republic of Sri Lanka (Sri Lanka) and Agbloyor et al. (2016) for sub-Saharan Africa. Meanwhile, Taylor (2020), in her investigation in Tanzania (1988–2017) concluded that there is a statistically insignificant relationship between FDI inflows and economic growth, but did not address the direction of the causality.

To resolve the issue of causality, in this study we employed the ARDL technique and the error correction model in its examination of the causal relationship between FDI inflows and GDP growth in the Tanzanian context using annual time series data for the period 1991–2019.

3. Materials and methods

Annual time series data for the period of 1991 to 2019 from the World Bank and United Nations Statistics Division were used. We employed EViews 11 for data analysis, which is a statistical package for Windows, mostly used for time-series oriented econometric analysis (see Xu eta l., 2013). It was developed by Quantitative Micro Software (QMS), now a part of IHS. Unlike other software used for data analysis, "*EViews offers powerful modeling capabilities that are ideally suited for time-series econometric analysis, including dynamic systems modeling and estimation, and stochastic forecasting from systems of equations*" IMF (2022).

We measured economic growth as percentages of annual GDP growth while net FDI inflows we measured as yearly GDP percentages. Trade openness (TO), which is an intermittent variable, was computed as the sum of exports and imports of goods and services (at constant 2015 prices USD) over the annual real GDP at constant 2015 USD. The series of steps in the ARDL procedure involves the investigation of stationarity, co-integration, and causality (see Menegaki, 2019). Stationarity implies that the statistical properties of a process producing a time series do not change with time. However, this does not imply that the time series does not change with time, but the way it changes does not itself change with time (Palachy, 2019). The bounds test assumption of the ARDL models requires each variable to be either I (0), I (1) or a mixture but not I (2) because Pesaran tables are not valid for I (2) variables (see Menegaki, 2019). Stationarity test results that are reported in Table 2 satisfy the bounds test assumption. Table 3 reports the results of the co-integration. To determine the direction of causality concerning the variables investigated, we carried out a causality analysis. The causality results are reported in Tables 5, 7, and 9. To check the robustness of the model, diagnostic tests were performed, and the results are reported in Tables 6, 8, and 10. Graphs 1, 2, 3, and 4 show the long-run stability tests, while Graphs 5 and 6 show the short-run stability tests.

Table 1. Variable description and data availability

Variable Description	**Data access (Direct link)**
GDP growth (Annual %)	https://knoema.com/peqlcoc/tanzania-gdp-fdi-inflows-export-and-import-data-set
FDI inflows, net (% of GDP)	
TO (i.e., Trade openness as the sum of exports and imports / Real GDP). Measured as GDP by expenditure, at constant 2015 prices in USD)	https://knoema.com/xkszuce/real-gdp-exports-and-imports-tanzania-mainland for Tanzania mainland/Tanganyika.

	https://knoema.com/vgbnooc/real-gdp-exports-and-imports-zanzibar for Zanzibar

Source: *World Bank. World Development Indicators- knoema.com and United Nations Statistics Division. National Accounts Main Aggregates Database*

Note 2: For this study, all data were estimated up to four decimal places.

Real GDP, exports and imports figures from Tanzania mainland (Tanganyika) and Zanzibar were added up to get the total amount for Tanzania as a union government before the variable trade openness (TO) was computed

3.1. General model

In the general form, the ARDL (*p*, *q*) model is expressed as follows:

$$\boldsymbol{Y_t} = \alpha_{i0} + \sum_{i=1}^{p} \lambda_i Y_{t-i} + \sum_{i=0}^{q} \beta'_i X_{t-i} + \boldsymbol{\varepsilon_{it}}$$

Where $\boldsymbol{Y_t}$ is a vector, (**X**) stands for exogenous variables, **α** is the constant term., **λ** and **β** are the variables' coefficients; i=1…, k. Letters "p and "q represent optimal lag orders (i.e., the appropriate lag length). $\boldsymbol{\varepsilon_{it}}$ denotes vector of the error terms which is serially uncorrelated.

3.2. ARDL bounds tests to co-integration

The ARDL bounds test is an appropriate approach for this study, not only because of the mixed order of integration of the variables studied but also because the method is more efficient for small and finite sample sizes (Pesaran et al., 2001). Additionally, the ARDL technique tends to avoid the problem of unbiased estimates in the long run (Harris and Sollis, 2003; Belloumi, 2014). The conditional ARDL (p, q_1, and q_2) models, as illustrated in Equations 1, 2, and 3 are expressed in logarithmic form. where p, q_1, and q_2 are the optimal lag orders. The model hypothesis is as follows.

H_0: $\beta_{1i} = \beta 2i = \beta 3i = 0$ where, i = 1, 2, 3

H_1: $\beta_{1i} \neq \beta 2i \neq \beta 3i \neq 0$ β1, β2, and β3 are coefficients.

The null hypothesis (H_0) states that there is no co-integration, whereas the alternative hypothesis (H_1) states that there is co-integration between the variables being investigated. Therefore, if we are unable to reject the null hypothesis, we estimate the ARDL model or, contrary to that, we estimate the error correction model (ECM), or the vector error correction model (VECM). The ARDL model for this study is expressed by the following three equations:

$$D(\ln(gdp)_{\mathrm{t}}) = \alpha_{01} + \beta_{11}\ln(gdp)_{\mathrm{t-i}} + \beta_{21}\ln(fdi)_{\mathrm{t-i}} + \beta_{31}\ln(to)_{\mathrm{t-i}} + \sum_{i=1}^{P}\alpha_{1\mathrm{i}}D(\ln(gdp)_{\mathrm{t-i}}) + \sum_{i=1}^{q_1}\alpha_{2\mathrm{i}}D(\ln(fdi)_{\mathrm{t-i}}) + \sum_{i=1}^{q_2}\alpha_{3\mathrm{i}}D(\ln(to)_{\mathrm{t-i}}) + \varepsilon_{1\mathrm{t}} \quad (1)$$

$$D(\ln(fdi)_{\mathrm{t}}) = \alpha_{02} + \beta_{12}\ln(fdi)_{\mathrm{t-i}} + \beta_{22}\ln(gdp)_{\mathrm{t-i}} + \beta_{32}\ln(to)_{\mathrm{t-i}} + \sum_{i=1}^{P}\alpha_{1\mathrm{i}}D(\ln(fdi)_{\mathrm{t-i}}) + \sum_{i=1}^{q_1}\alpha_{2\mathrm{i}}D(\ln(gdp)_{\mathrm{t-i}}) + \sum_{i=1}^{q_2}\alpha_{3\mathrm{i}}D(\ln(to)_{\mathrm{t-i}}) + \varepsilon_{2\mathrm{t}} \quad (2)$$

$$D(\ln(to)_{\mathrm{t}}) = \alpha_{03} + \beta_{13}\ln(to)_{\mathrm{t-i}} + \beta_{23}\ln(fdi)_{\mathrm{t-i}} + \beta_{33}\ln(gdp)_{\mathrm{t-i}} + \sum_{i=1}^{P}\alpha_{1\mathrm{i}}D(\ln(to)_{\mathrm{t-i}}) + \sum_{i=1}^{q_1}\alpha_{2\mathrm{i}}D(\ln(fdi)_{\mathrm{t-i}}) + \sum_{i=1}^{q_2}\alpha_{3\mathrm{i}}D(\ln(gdp)_{\mathrm{t-i}}) + \varepsilon_{3\mathrm{t}} \quad (3)$$

In this model, ln(.) signifies logarithm, and *D* is the first difference. ε_t are error terms. Other terms have been defined previously. The model equations are formulated based on the intercept, with α_{01}, α_{02} and α_{03} as constant terms. The dependent variable in each model equation is expressed as the past values of itself, the past values of the other variable(s), the past values of the differenced values of itself, and the different past values of other variables (see Menegaki, 2019).

4. Empirical analysis and results

The results in Table 2 show that FDI inflows (lnfdi) became stationary at a level, while economic growth (lngdp) and TO (lnto) became stationary at first difference. No variables became stationary at second difference.

Table 2. Unit root stationarity test results

	Method/ Approach employed						
	Augmented Dickey–Fuller (ADF) test				Phillips–Perron test		
	AIC	At 1%, 5% and 10% levels			At 1%, 5% and 10% levels		
Level	**Lag**	***t*-statistic**	***p*-value**	**Status**	***t*-statistic**	***p*-value**	**Status**
Lngdp	1	-2.559824	0.113	Not stationary	-2.038613	0.2697	Not stationary
Lnfdi	2	-19.09643	0.0001	Stationary	-9.502787	0.0000	Stationary
Lnto	1	-1.483555	0.5275	Not stationary	-1.47685	0.5309	Not stationary
1st diff.	**Lag**	***t*-statistic**	***p*-value**	**Status**	***t*-statistic**	***p*-value**	**Status**
Lngdp	1	-5.165297	0.0002	Stationary	-6.405886	0.0000	Stationary
Lnto	1	-5.134674	0.0003	Stationary	-5.162065	0.0003	Stationary

Note 1: For the Phillips-–Perron test, the truncation lag was based on Newey and West (2017) Bandwidth 3

Source: *Author's computation via EViews® 11*

The optimal lag length was determined using EViews based on Akaike information criterion (AIC) because this criterion gives the lowest values (see appendix A). Then, all ARDL models are selected automatically based on the Akaike information criteria (AIC), unrestricted constant, and no trend. The results of the ARDL bounds test are presented in Table 3. From this table, we see that a convincing long-run equilibrium exists among the variables when regression is normalized in lngdp and lnfdi. In these models, the calculated F- statistic exceeds the upper critical value at 10%, 5%, and 1% level of significance. However, for trade openness (lnto), the F-statistic results are inconclusive. Once the equilibrium is established, the conditional ARDL (*p*, q_1, q_2) long-run model for $lngdp_t$ and $lnfdi_t$ as specified in Equations 4 and 5 can be estimated as follows:

$$lngdp_t = \alpha_{01} + \sum_{i=1}^{p} \beta^1{}_i \ln gdp_{t-i} + \sum_{i=1}^{q_1} \beta_{2i}\, lnfdi_{t-i} + \sum_{i=1}^{q_2} \beta_{3i}\, lnto_{t-i} + +\varepsilon_{4t} \quad (4)$$

$$lnfdi_t = \alpha_{02} + \sum_{i=1}^{p} \beta_{1i}\, lnfdi_{t-i} + \sum_{i=1}^{q_1} \beta_{2i}\, lngdp_{t-i} + \sum_{i=1}^{q_2} \beta_{3i}\, lnto_{t-i} + +\varepsilon_{5t} \quad (5)$$

The variables have been defined previously. The estimations of Equations 4 and 5 are based on Akaike information criterion (AIC) Lags 1, and 2 respectively. Table 4 reports long-run results based on normalizing $lngdp_t$ and $lnfdi_t$.

Table 3. Results of the ARDL bounds test to co-integration

Levels Equation

Case 3: Unrestricted Constant and No Trend

Dependent variable	**Optimal Lag (AIC)**	**Selected model ARDL**	***F*-statistic**	**Co-integration analysis results**
F_{lngdp} (lngdp/lnfdi,lnto)	1	(1,1,0)	29.56176	Co-integration
F_{lnfdi} (lnfdi/lngdp, lnto)	2	(2,0,0)	121.7695	Co-integration
F_{lnto} (lnto/lnfdi, lngdp)	1	(1,2,0)	2.374253	No co-integration
Lower-bound critical value at 10% level of significance is 3.17				

Upper-bound critical value at 10% level of significance is 4.14	
Lower-bound critical value at 5% level of significance is 3.79	
Upper-bound critical value at 5% level of significance is 4.85	
Lower-bound critical value at 1% level of significance is 5.15	
Upper-bound critical value at 1% level of significance is 6.36	

Source: *Author's computation via EViews® 11*

Table 4. Estimates of long-run coefficients using ARDL method

Based on normalizing on $lngdp_t$			
Variable	**Coefficients**	***t*-Statistic**	**Probability**
Lnfdi	0.235177	3.326246	0.0028
Lnto	0.195038	0.676124	0.5054
Based on normalizing on $lnfdi_t$			
Lngdp	0.061173	0.139194	0.8905
Lnto	0.42006	1.115444	0.2762

Case 3: Unrestricted constant and no trend model

Source: *Author's computation via EViews® 11*

The outcomes in Table 4 show that the estimated coefficient of the long-run connection is positive and statistically significant for FDI inflows at all levels of significance, whereas for economic growth and trade openness, coefficients are positive but statistically insignificant.

4.1 Error correction models (ECMs) and the ARDL model

According to Belloumi (2014) and Odhiambo (2009), short-run parameters are obtained by estimating an error correction model (ECM) connected with the long-run estimates. Equations in which the null hypothesis of no co-integration is rejected are estimated with an error correction term (ECT). Hence, in the following vector error correction models, as specified in Equations 6 and 7, the ECT_1 and ECT_2, respectively, denote the long-run aspect for co-integrated equations while Equation 8 represents the no co-integration status (see Table 3).

$$D(lngdp)_t = \alpha_{01} + \sum_{i=1}^{p} \alpha_{1i} D(lngdp)_{t-i} + \sum_{i=1}^{q_1} \alpha_{2i} D(lnfdi)_{t-i} + \sum_{i=1}^{q_2} \alpha_{3i} D(lnto)_{t-i} + \delta_1 ECT_1 + \varepsilon_{6t} \quad (6)$$

$D(lngdp)\ c\ D(lngdp(-1))\ D(lnfdi(-1))\ D(lnto(-1))\ ect1(-1)$

$$D(lnfdi)_t = \alpha_{02} + \sum_{i=1}^{p} \alpha_{1i} D(lnfdi)_{t-i} + \sum_{i=1}^{q_1} \alpha_{2i} D(lngdp)_{t-i} + \sum_{i=1}^{q_2} \alpha_{3i} D(lnto)_{t-i} + \delta_2 ECT_2 + \varepsilon_{7t} \quad (7)$$

$D(lnfdi)\ c\ D(lnfdi(-1))\ D(lnfdi(-2))\ D(lngdp(-1)) D(lngdp(-2))\ D(lnto(-1))\ D(lnto(-2))\ ect2(-1)$

$$D(lnto)_t = \alpha_{03} + \sum_{i=1}^{p} \alpha_{1i} D(lnto)_{t-i} + \sum_{i=1}^{q_1} \alpha_{2i} D(lngdp)_{t-i} + \sum_{i=1}^{q_2} \alpha_{3i} D(lnfdi)_{t-i} + \varepsilon_{8t} \quad (8)$$

Here, α_{1i}, α_{2i} and α_{3i} are short-run coefficients dynamics, and "δ" denotes the speed of adjustment towards equilibrium.

4.2. Results of the causality analysis

Table 5. Equation 6 results, ARDL (1, 1, 0) selected based on AIC

Variables	**Coefficients**	***t*-statistic**	**Probability (*p*-value)**
C	-0.011836	-0.318846	0.7527
D(lnfdi(-1))	0.15473	5.200448	0.0000
D(lnto(-1))	-0.009914	-0.024659	0.9805
ECT_1 (-1)	-1.4468	-7.045979	0.0000
R-squared	0.790529		
Adjusted R-squared	0.754099		
F-statistic	21.7001		0.0000
DW -statistic	2.143945		

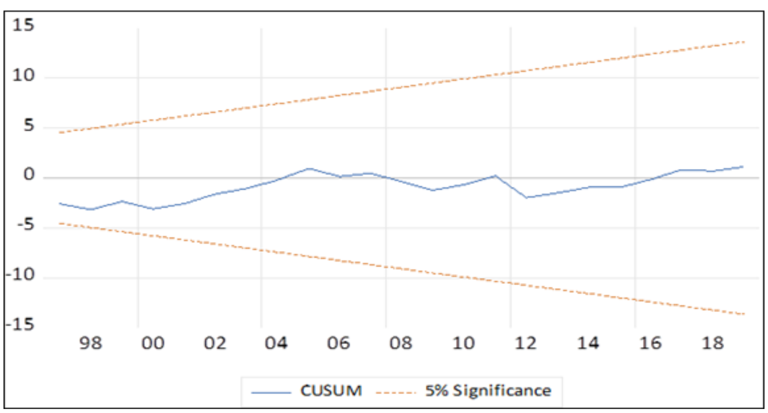
Source: *Author's computation via EViews® 11*

Table 6. Diagnostic test results for Equation 6

Subject	**Type of test**	**Chi-square (χ^2) Statistic**	**Probability *F*-statistic**
Serial correlation LM test	Breusch–Godfrey Serial correlation LM test	0.3425	0.4016
Normality test	Jarque–Bera (3.0158)	-	0.2214
Heteroscedasticity test	Breusch–Pagan–Godfrey	0.5873	0.6356
Ramsey Reset Test	Likelihood ratio–Prob. (0.6866)	-	0.7236

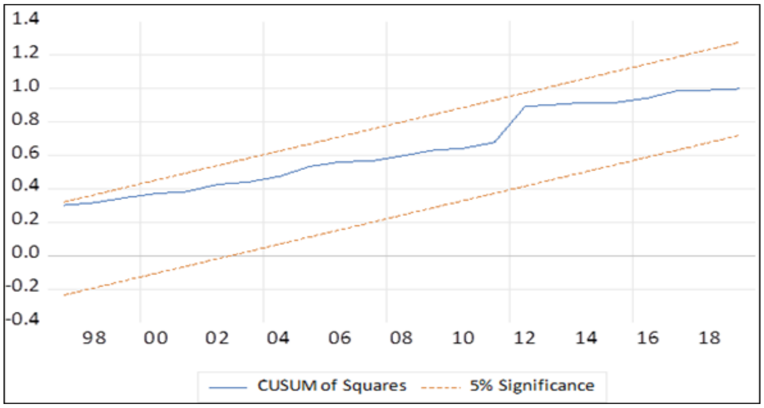
Source: *Author's computation via EViews® 11*

Graph 1. Plot of CUSUM test for Equation 6



Source: *Author's computation via EViews® 11*

Graph 2. Plot of CUSUM square test for Equation 6



Source: *Author's computation via EViews® 11*

Table 7 Equation 7 results, ARDL (2, 0, 0) selected based on AIC

Variables	**Coefficients**	***t*-statistic**	**Probability (*p*- value)**
C	-0.02825	-0.399171	0.6942
D(LNGDP(-1))	-0.075015	-0.302912	0.7652
D(LNGDP(-2))	0.136581	0.612182	0.5477
D(LNTO(-1))	1.989724	2.738687	0.0131
D(LNTO(-2))	-0.245181	-0.35012	0.7301
ECT2(-1)	-1.140517	-5.204517	0.0001
R-squared	0.678201		
Adjusted R-squared	0.559643		
F-statistic	5.720435		0.001133
DW-statistic	2.075912		

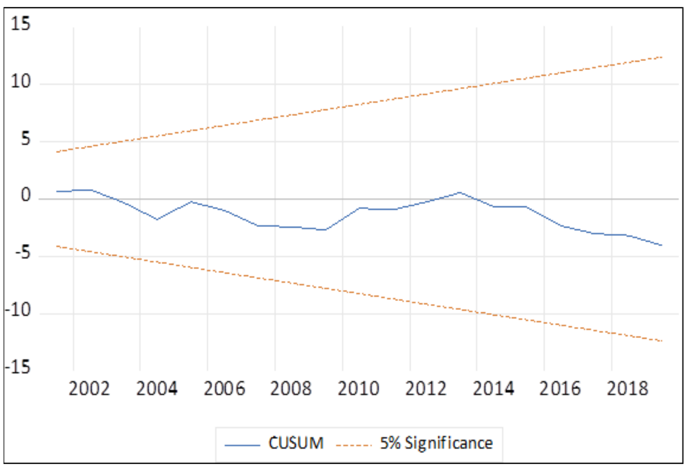
Source: *Author's computation via EViews® 11*

Table 8. Diagnostic test results for Equation 7

Subject of Test	**Type of test**	**Chi-square (χ^2) Statistic**	**Probability *F*-statistic**
Serial correlation LM test	Breusch-Godfrey Serial correlation LM test	0.8507	0.9026
Normality test	Jarque–Bera (3.599678)	-	0.165326
Heteroscedasticity test	Breusch–Pagan–Godfrey	0.7188	0.7899
Ramsey Reset Test	Likelihood ratio–Prob (0.9612)	-	0.9754

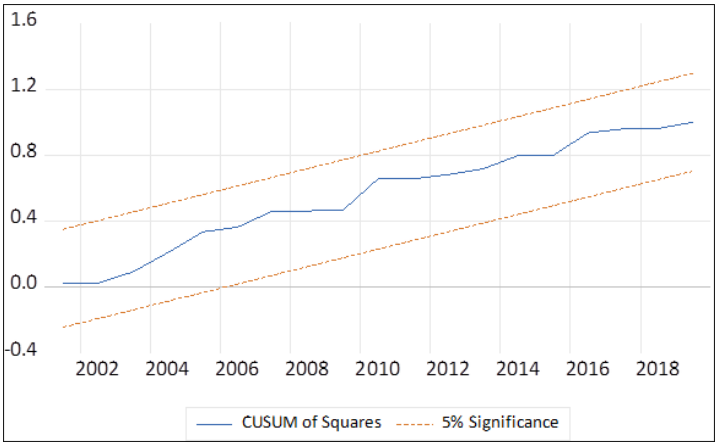
Source: *Author's computation via EViews® 11*

Graph 3. Plot of CUSUM test for Equation 7



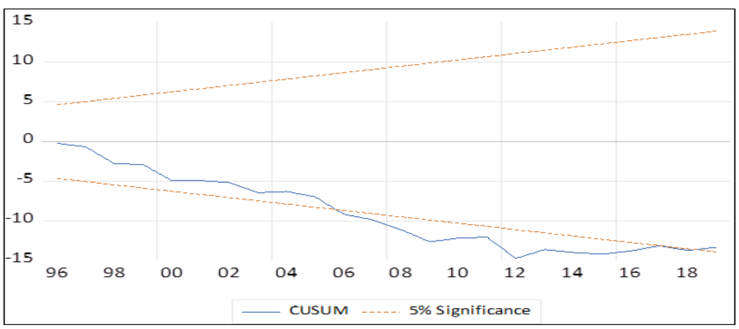
Source: *Author's computation via EViews® 11*

Graph 4. Plot of CUSUM square test for Equation 7



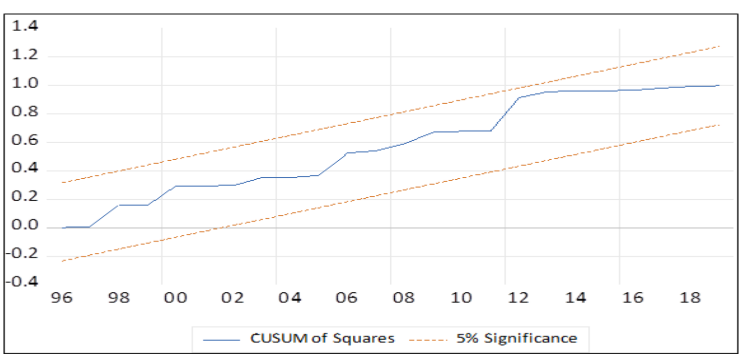
Source: *Author's computation via EViews® 11*

Graph 5. Plots of CUSUM test in short run



Source: *Author's computation via EViews® 11*

Graph 6. Plots of CUSUM square test in short run



Source: *Author's computation via EViews® 11*

The ordinary least squares (OLS) regression method was applied to estimate Equations 6–8 individually. The Granger causality test employed in the current study suggests situations in which the past can foresee the future. The results of the short-run dynamic coefficients connected with that of the long-run dynamic coefficients obtained in Equation 6 are reported in Table 9, along with the short-run diagnostic test results, which are reported in Table 10. Long-run results for the coefficients on the lagged error correction term, (ECT_1 (-1)) are reported in Table 5 and its associated long-run diagnostic tests are reported in Table 6. Graphs 1–6 illustrate the models' stability tests (cumulative sum control chart [CUSUM] and CUSUM squared) in both periods.

Table 9. Results of short-run Granger causality

Dependent variable	*F*-Statistic			Direction of causality
	D(ln(GDP))	*D*(ln(FDI))	*D*(ln(TO))	
D(ln(GDP))	-	33.618	-	FDI → GDP
D(ln(FDI))	-	-	-	None (No causality)
D(ln(TO))	3.676907	-	-	GDP → TO

Note 2: Restrictions are linear in coefficients

Source: *Author's computation via EViews® 11*

Table 10. Short-run diagnostic tests

Dependent Variable	**Type of test**	**Chi-square (χ^2-Statistic)**	**Probability (*F*-statistic)**
Economic growth	Breusch–Godfrey Serial correlation LM test	0.1134	0.1538
	Jarque–Bera normality test (0.8272)	-	0.6613
	Breusch–Pagan–Godfrey heteroscedasticity test	0.8258	0.8561

Source: *Author's computation via EViews® 11*

The results revealed unidirectional causality running from net foreign direct investments inflows to economic growth at a 5% level of significance in both the short run and long run. As expected, the lagged error correction term (ECT_1 (-1)) confirms the existence of this long-run relationship in the economic growth (GDP) equation, which is negative and statistically significant (see Table 5). Similarly, the *F*-statistic, which is significant in Table 9, reveals a short-run causality. Therefore, net FDIs inflows Granger cause economic growth in Tanzania (FDI $\rightarrow$ GDP), and the results of the current study support the FDI growth hypothesis. However, at the 10% level of significance, economic growth leads to net FDI inflows in Tanzania (see Table 7), irrespective of the timeframe. Table 8 shows the diagnostic test results based on the error correction term (ECT_2 (-1)), which are negative and statistically significant, as expected. However, in the short-run *F*-statistic results in Table 9, economic growth leads to trade openness (TO) at the 5% level of significance.

5. Discussion, limitations, and conclusion

This study examined the causal relationship and long- and short-run dynamics between foreign direct investment (FDI) inflows and economic growth in Tanzania from 1991 to 2019. Trade openness (TO) was included in the model of study between FDI inflows and economic growth as an intermittent variable to address the problem of variable omission bias, thus forming a multivariate model (see Odhiambo, 2011). The autoregressive distributed lag (ARDL) bounds test for co-integration, the error correction model (ECM) based on Granger causality tests in the long run, and the *F*-statistic (Wald test) in the short run were employed in this study. Majority of previous studies on FDI in developing countries have focused on Asia and Latin America, and have rarely focused on sub-Saharan Africa, particularly Tanzania. Several investigations on this subject from Tanzania employed the traditional methodology of maximum likelihood test, based on Johansen (1988), which is not suitable for time series with mixed order of integration. Moreover, the method is unfit when the sample size is small or finite (see Narayan and Smyth, 2005)—and bivariate causality analysis—which is prone to the problem of variable omission bias.

The empirical results of the current study discovered unidirectional causality (i.e., short run and long run) running from FDI inflows to economic growth (FDI $\rightarrow$ GDP) in Tanzania. These results support the FDI-driven growth hypothesis which suggest that FDI Granger-cause economic growth. They are in accordance with those of Marobhe (2015), but are against Lema and Dimoso (2011), Shawa and Shen (2013), and Masanja (2018) with respect to Tanzania.

5.1 Limitations

Despite the promising results, this paper is not free from limitations. First, the estimation method may be subject to potential omission of variable (s) bias and endogeneity of some explanatory variables (see Yaya Keho, 2017). Thus, an extension to the current investigation would be adding some other pertinent variable (s) in a system of equations where FDI inflows and economic growth can also be determined by other economic variables. This could help to extricate the conduits through which FDI inflows influences growth. Secondly, this study could be improved by increasing the sample size as the sample size used is relatively small. Finally, the triangulation method could also have improved validity and the generalizability of the study.

5.2 Conclusion

Given our study's results, we conclude that the financial system of Tanzania is strong enough to allow the diffusion of technology in the country (see Aziz, 2020; Hermes and Lensink, 2003). Our findings also suggest that Tanzania has attained the minimum threshold for human capital development (see Ali and Roy, 2017 and Borensztein et al., 1998). Therefore, policy makers should continue to develop, implement, and enforce judicious macroeconomic policies that can attract foreign investment to increase the country's prosperity.

Acknowledgements

This paper could have not been possible without valuable comments from Taylor and Francis editing services and the good work of anonymous reviewers prior to publication.

Disclosure of interests

The authors report there are no competing interests to declare.

Funding

The authors received no direct funding for this study

Data availability

Data are available in the World Bank and United Nations Statistics Division at:

https://knoema.com/peqlcoc/tanzania-gdp-fdi-inflows-export-and-import-data-set ,

https://knoema.com/xkszuce/real-gdp-exports-and-imports-tanzania-mainland , and

https://knoema.com/vgbnooc/real-gdp-exports-and-imports-zanzibar

Author biographies

Mr. Benedict Huruma Peter Mwakabungu presently is a research scholar, pursuing Ph. D in economics at Gujarat University in India. He has work experience of more than 15 years in different organizations including 13 years worked with the University of Dodoma. He is now working with the College of Business Education (CBE) Dodoma campus in Tanzania as assistant lecturer, where he has been teaching economics for more than 3 years. He is responsible for teaching, research and consultancy. He has published and attended several academic workshops and presented papers in national and international conferences. His major research area of interest is economic analysis, development economics, and applied econometrics.

Dr. Jignesh Kauangal (Ph.D., M.Phil. in economics) is a faculty at Shree Narayana College of Commerce, Ahmedabad India. He is working as an in-charge principal in the college since inception. He has teaching experience of more than 20 years and has presented and published papers in international and national level seminars and conferences. His major research area is industrial economics. He has authored/co-authored many books. He is recognized as Ph.D. guide at Gujarat University and has guided students to complete Ph.D. Thesis for final degree.

References

Adams, S. (2009). Foreign direct investment, domestic investment, and economic growth in Sub-Saharan Africa. Journal of policy modeling, 31(6), 939-949.

Aga, A. A. K. (2014). The impact of foreign direct investment on economic growth: A case study of Turkey 1980–2012. International Journal of Economics and Finance, 6(7), 71-84.

Agbloyor, E. K., Gyeke-Dako, A., Kuipo, R., and Abor, J. Y. (2016). Foreign direct investment and economic growth in SSA: The role of institutions. Thunderbird International Business Review, 58(5), 479-497.

Ali, M., Cantner, U., and Roy, I. (2017). Knowledge spillovers through FDI and trade: the moderating role of quality-adjusted human capital. In *Foundations of Economic Change* (pp. 357-391). Springer, Cham.

Anyanwu, J. C., and Yaméogo, N. D. (2015). Regional comparison of foreign direct investment to Africa: Empirical analysis. African Development Review, 27(4), 345-363.

Aziz, O. G. (2020). FDI inflows and economic growth in Arab region: The institutional quality channel. International Journal of Finance & Economics.

Battaile, W.G. (2020). What does Tanzania's move to lower-middle income status mean? Africa Can End Poverty. 10th July. Available from: https://blogs.worldbank.org/africacan/what-does-tanzanias-move-lower-middle-income-status-mean .

Belloumi, M. (2014). The relationship between trade, FDI and economic growth in Tunisia: An application of the autoregressive distributed lag model. Economic systems, 38(2), 269-287.

Berzuini, C., Dawid, P., and Bernardinell, L. (Eds.). (2012). *Causality: Statistical perspectives and applications*. John Wiley and Sons.

Borensztein, E., De Gregorio, J., and Lee, J. W. (1998). How does foreign direct investment affect economic growth?.Journal of international Economics, 45(1), 115-135.

Britannica, T. Editors of Encyclopaedia (2010). Tanganyika. Encyclopedia Britannica. March 15. Available from: https://www.britannica.com/place/Tanganyika

Britannica (n.d) Economy of Tanzania. Available from: https://www.britannica.com/place/Tanzania/Economy .

Diyamett, B., and Mutambla, M. (2014). Foreign direct investment and local technological capabilities in least developed countries: Some evidence from the Tanzanian manufacturing sector. African Journal of Science, Technology, Innovation and Development, 6(5), 401-414.

Doku, I., Akuma, J., & Owusu-Afriyie, J. (2017). Effect of Chinese foreign direct investment on economic growth in Africa. Journal of Chinese Economic and Foreign Trade Studies.

Dritsaki, M., Dritsaki, C., and Adamopoulos, A. (2004). A causal relationship between trade, foreign direct investment, and economic growth for Greece. American Journal of applied sciences, 1(3), 230-235.

Elboiashi, H. (2015). The effect of FDI on economic growth and the importance of host country characteristics. Journal of Economics and international finance, 7(2), 25-41.

Fadhil, M. A., and Almsafir, M. K. (2015). The role of FDI inflows in economic growth in Malaysia (time series: 1975-2010). Procedia economics and finance, 23, 1558-1566.

Harris, R., and Sollis, R. (2003). Applied time series modelling and forecasting. Wiley.

Hermes, N., and Lensink, R. (2003). Foreign direct investment, financial development, and economic growth. The journal of development studies, 40(1), 142-163.

Hudea, O. S., and Stancu, S. (2012). Foreign direct investments, technology transfer and economic growth: A panel approach. Romanian Journal of Economic Forecasting, 15(2), 85-102.

IMF (2022) Training catalog session details. Available from: https://www.imf.org/en/Capacity-Development/Training/ICDTC/Schedule/IT/2019/INS-CRSIT19-07 .

Jayachandran, G., and Seilan, A. (2010). A causal relationship between trade, foreign direct investment and economic growth for India. International research journal of finance and economics, 42, 74-88.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, *12*(2-3), 231-254.

Jugurnath, B., Chuckun, N., and Fauzel, S. (2016). Foreign direct investment & economic growth in Sub-Saharan Africa: an empirical study. *Theoretical Economics Letters*, *6*(4), 798-807.

Kweka, J. (2006). Trade Policy and Transport Costs in Tanzania. Center for Research in Economic Development and International Trade. Resarch Paper, 6(10), 6-10.

Lema, N. C., and Dimoso, R. (2011). Foreign Direct Investment and Economic Growth in Tanzania: The Granger-Causality Analysis. Uongozi Journal of Management and Development Dynamics, 22(2), 22-37.

Louzi, B. M., and Abadi, A. (2011). The impact of foreign direct investment on economic growth in Jordan. IJRRAS-International Journal of Research and Reviews in Applied Sciences, 8(2), 253-258.

Marobhe, M. (2015). Do foreign direct investment inflows cause economic growth in Tanzania? The granger causality test approach.

Masanja, C. (2018). The extent to which Foreign Direct Investment (FDI) contribute to the growth of host economies: evidence from Tanzania. Business Management Review, 21(1), 1-22.

Maziarz, M. (2015). A review of the Granger-causality fallacy. *The journal of philosophical economics: Reflections on economic and social issues*, *8*(2), 86-105.

Menegaki, A. N. (2019). The ARDL method in the energy-growth nexus field; best implementation strategies. Economies, 7(4), 105.

Mohanasundaram, T., and Karthikeyan, P. (2015). Foreign direct investment and economic growth: empirical evidence from India. Afro-Asian Journal of Finance and Accounting, 5(4), 344-355.

Narayan, P. K., and Smyth, R. (2005). Electricity consumption, employment and real income in Australia evidence from multivariate Granger causality tests. Energy policy, 33(9), 1109-1116.

National Bureau of Statistics. (2018). Tanzania investment report, 2018: Foreign private investment. Dar e-s Salaam, Tanzania.

Newey, W. K., and West, K. D. (2017). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Прикладная эконометрика No1 (33) 2014*, 125.

NGUYEN, H. H. (2020). Impact of foreign direct investment and international trade on economic growth: Empirical study in Vietnam. The Journal of Asian Finance, Economics, and Business, 7(3), 323-331.

Odhiambo, N. M. (2021). Foreign direct investment and economic growth in Kenya: An empirical investigation. International Journal of Public Administration, 1-12.

Odhiambo, N. M. (2011). Financial deepening, capital inflows and economic growth nexus in Tanzania: A multivariate model. Journal of social sciences, 28(1), 65-71.

Odhiambo, N. M. (2009). Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach. Energy policy, 37(2), 617-622.

Odunga, P. S. (2020). The determinants and impact of foreign direct investment (FDI) in Kenya and Tanzania: an OECD and non-OECD perspective 1996-2016.

Palachy, S. (2019). Stationarity in time series analysis. *Recuperado desde.* Available from: *https://towardsdatascience. com/stationarity-in-time-series-analysis-90c94f27322*.

Pesaran, M. H., Shin, Y., and Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326.

Reza, S. M., Fan, H., Reza, T., and Wang, B. (2018). The impact of foreign direct investment inflows on economic growth: Evidence from Bangladesh. Journal of Business and Retail Management Research, 12(2).

Salim, N. J., Mustaffa, R., and Hanafiah, N. J. A. (2015). FDI and economic growth linkages in Malaysia. Mediterranean Journal of Social Sciences, 6(4), 652-652.

Sarker, B., and Khan, F. (2020). Nexus between foreign direct investment and economic growth in Bangladesh: an augmented autoregressive distributed lag bounds testing approach. Financial Innovation, 6(1), 1-18.

Sharma, R., and Kaur, M. (2013). Causal links between foreign direct investments and Trade: A Comparative study of India and China. Eurasian Journal of Business and economics, 6(11), 75-91.

Shawa, M. J., and Shen, Y. (2013). Causality relationship between foreign direct investment, GDP growth and export for Tanzania. International Journal of Economics and Finance, 5(9), 13-19.

Shrestha, M. B., and Bhatta, G. R. (2018). Selecting appropriate methodological framework for time series data analysis. *The Journal of Finance and Data Science*, *4*(2), 71-89.

Stamatiou, P., and Dritsakis, N. (2014, June). The impact of foreign direct investment on the unemployment rate and economic growth in Greece: A time series analysis. In International Work-Conference on Time Series Analysis (ITISE) (Vol. 1, No. 1, pp. 97-108).

Sunde, T. (2017). Foreign direct investment, exports and economic growth: ADRL and causality analysis for South Africa. Research in International Business and Finance, 41, 434-444.

Taylor, R. S. (2020). Foreign direct investment and economic growth. Analysis of sectoral foreign direct investment in Tanzania. African Development Review, 32(4), 699-717.

United Nations (2022) UN Documentation: Trusteeship Council. Available from: https://research.un.org/en/docs/tc/tanganyika .

United Nations Statistics Division. National Accounts Main Aggregates Database. Available from: https://knoema.com/UNNAMAD2018/national-accounts-main-aggregates-database

Velnampy, T., Achchuthan, S., and Kajananthan, R. (2014). Foreign Direct Investment and Economic Growth: Evidence from Sri Lanka. International Journal of Business and Management, 9(1), 140.

Wang, W. (2016). *Achieving inclusive growth in China through vertical specialization*. Chandos Publishing.

World Bank. World Development Indicators- knoema.com. Accessed from: https://knoema.com/WBWDI2019Jan/world-development-indicators-wdi

Xu, T. T., Peng, J. L., and Ding, F. (2013). Linkage Relationship between Port Logistics and Regional Economy based on Eviews Software. *J. Softw.*, *8*(4), 971-978.

Yaya Keho | (2017) The impact of trade openness on economic growth: The case of Cote d'Ivoire, Cogent Economics & Finance, 5:1, 1332820, DOI: 10.1080/23322039.2017.1332820

Appendix A. Optimal lags selection based on AIC: Akaike information criterion.

Vector autoregressive (VAR) lag order selection criteria

Endogenous variables: LNGDP Exogenous variables: C LNFDI LNTO						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7.260255	NA	0.121946	0.732875	0.875612	0.776511
1	-1.837354	9.296403*	0.089015*	0.416954*	0.607269*	0.475135*
2	-1.282358	0.911779	0.092064	0.44874	0.686633	0.521466
Endogenous variables: LNFDI Exogenous variables: C LNGDP LNTO						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-13.2249	NA*	0.186723	1.158921	1.301657	1.202557
1	-11.51778	2.92649	0.177729	1.108413	1.298728	1.166594
2	-9.587429	3.171287	0.166619*	1.041959*	1.279853*	1.114686*
Endogenous variables: LNTO Exogenous variables: C LNGDP LNFDI						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1.092386	NA	0.078494	0.292313	0.435049	0.335949
1	28.68488	51.04674*	0.010061*	-1.763206*	-1.572891*	-1.705025*
2	28.71239	0.045191	0.010805	-1.693742	-1.455848	-1.621015

Note 3:

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion