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Granger Causality Analysis Among Macroeconomic Variables in Tanzania

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Abstract

This study aims to investigate the causal links among Foreign Direct Investment (FDI), domestic investment, financial development, telecommunication infrastructure, the quality of labor force, and economic growth using the time series data covering the period between 1990 and 2017 in Tanzania. The study employs the concept of Granger causality and the vector error correction model to identify whether there exists either a long-term or a short-term Granger causality among the variables of interest. The results from the Johansen co-integration test show that the variables move together in the long run. Granger causality results reveal a one-way causality running from telecommunication infrastructure to FDI as well as the quality of labor and financial development in the short-run. Furthermore, FDI and financial development are found to cause economic development. In the long run, the results indicate causality running from FDI, domestic investment, labor force, financial development, and telecommunication infrastructure to economic growth. The results pose some policy implications as follows: since labor force, FDI, financial development, domestic investment, and telecommunication infrastructure are found to be among the significant determinants of economic growth in the long run, it is advised that policies designed to improve these macroeconomic indicators should be encouraged and reinforced. Furthermore, the country needs to find coherent ways to attract more foreign investors, improve the quality of labor force, and encourage both public and domestic investment.

Keywords: *Foreign direct investment, Domestic investment, Telecommunication infrastructure, Granger causality, Economic development, Tanzania.*

1. Introduction

Tanzania, similar to other developing countries, has deliberate efforts to attract foreign direct investment in the country. The move started in early 1990 by unveiling an entity that was responsible for monitoring all types of investments in the country. The first entity established in 1990 was called Investment Promotion Centre (IPC). However, IPC faced a lot of challenges and it did not manage to achieve its objectives. Hence in 1997, the Tanzania Investment Center (TIC) was formed. The main objective of TIC, among others, is to promote both foreign and domestic investments by providing the needed information to investors (TIC, 2014). Furthermore, according to the Tanzania Investment Report of 2012, the government of Tanzania has been taking coherent measures to improve the investment climate to investors in order to be able to attract more foreign investors (TIR, 2012). However, despite the initiatives taken to attract FDI, the country has been experiencing very few foreign investors compared to other developing countries. Only a few sectors such as mining, construction and telecommunication have attracted a substantial number of foreign investors. Factors related to poor infrastructure, the quality of labor force and institutions are pointed out to be among the factors influencing the decisions of foreign investors (Mna, 2019; Raza et al., 2019).

So far, there have been very few empirical researches carried out to identify the causality among FDI and other macroeconomic variables in Tanzania. This scant knowledge in the area of causality among FDI has necessitated this study, which aims at exploring the causal links between FDI, domestic investment, financial development, telecommunication infrastructure, and the quality of labor force. It uses Tanzania as a case study to represent other African countries. The study employs the concept of Granger causality to identify the direction of causality among the variables of interest. Indeed, the identification of the causal links among these macroeconomic variables will assist policymakers to come up with appropriate policies for economic development of the country. The next section reviews the available literature on the subject matter, with the aim of contextualizing the study and establishing the theoretical framework of the study.

2. Literature Review

This section reviews the theoretical and empirical studies on the causal links among FDI and other macroeconomic variables of interest. It specifically focuses on exploring the literature that explicates the findings on inter-linkages among FDI, domestic investment, the quality of labor force, infrastructure, financial development and economic growth. Since there is enormous research in this strand, the study centers its focus on country-specific case studies.

2.1. FDI and Economic Growth

The available literature has investigated the causal links between FDI and economic growth from different standpoints. It has been identified that FDI supplements other deep determinants of economic growth of the host country through knowledge transfer, employment creation, formation of foreign capital, technology transfer, inter alia (Abbes et al., 2015; Ciobanu, 2021; Nistor, 2014; Omri et al., 2014; Rehman, 2016). However, there have been differing views concerning the impact of FDI on economic growth. Some studies found direct links between the two variables while others found indirect relationships between them. Furthermore, the available literature posits that the impact of FDI on economic growth depends on the economic and financial conditions of the host country (Alfraro et al., 2004; Azman-Sain et al., 2010b; Hermes & Lensink, 2003). Raza et al. (2019) posit that the relationship between foreign direct investment and economic growth can be vindicated in the presence of a good governance system. Ciobanu (2021) expounds that foreign direct investment, trade openness, and labor force are the main determinants of economic growth in the long run in Romania.

On the other hand, Alfaro et al. (2004) argue that FDI has a positive impact in countries with well-developed financial markets. However, Carkovic and Levine (2002), in their study, found that FDI had no impact on economic growth in the long run even when such variables were included. Therefore, no unanimous conclusions have been reached so far to the causal links between the two macroeconomic indicators. Issues related to the data used, the methodology employed, case studies chosen, and the span of the data used, have been pointed out to be one of the causes of such mixed conclusions. While others, such as Adams (2009b), Azman-Sain et al. (2010a), Herzer et al. (2008), Nair-Reichert and Weinhold (2001), Alfaro et al. (2004), Borensztein et al. (1998), Carkovic and Levin (2002), Durham (2004), and Alfaro (2003) employed an Ordinary Least Square (OLS) regression model, other researchers employed the Granger causality framework (See, for example, Chowdhury and Mavrotas, 2006; Dash and Parida, 2011; Dash and Sharma, 2013; Kholdy and Sohrabian, 2005; Mencinger, 2003). However, the OLS regression technique has been pointed out to trigger serious endogeneity problems, which make results somehow unreliable (Chenhall and Moers, 2007). Furthermore, other researchers have employed the Cobb-Douglas production

function, where FDI is assumed to complement other factors of production in influencing the output (see, for example, Fedderke and Romm, 2006; Vu and Noy, 2009).

2.2. FDI and Domestic Investment

The causal links between these two broad categories of investments (i.e. FDI and domestic investment) have been a subject of debate in scholarship circles. Both FDI and domestic investment (private and public investment) are found to complement other deep determinants of economic growth. However, there have been differing views concerning the direction of relationships between these two macroeconomic indicators (See, for example, Adams, 2009a; Ali and Mna, 2019; Arndt et al.,2010; Mohamed et al., 2017; Shah et al., 2010). Some have posited that FDI crowds out domestic investment (e.g., Adams et al., 2009a) while others found FDI complementing domestic investment in the host country (See, for example, Ndikumana and Verick, 2008; Raza et al. 2019). Adams (2009a) investigated the impact of FDI on domestic investment in a panel of 42 Sub-Saharan African countries. The results indicated a net crowding-out effect between the two variables. Nevertheless, as has been explicated earlier, the direction of causality between the two variables has been a subject of debate. Some have posited that it is the quality of the domestic investment of the host country that influences the decisions of foreign investors, and hence the relationship runs from domestic investment to FDI and not vice versa (Apergis et al., 2006; Chan et al., 2014). This is because, domestic investors have access to more valuable information than foreign investors and hence can provide a valuable signal to foreign investors (Chan et al., 2006). However, others have pointed out that the positive externalities associated with the presence of foreign investors tend to spill over to domestic investments and hence improves the productivity of all sectors including domestic investment (Chan et al., 2006). But also, the two macroeconomic variables can influence each other, and therefore the direction of causality can be both ways.

2.3. FDI and Financial Development

The causal links between FDI and the financial system have also been empirically investigated in the extant literature. Specifically, the focus has been on the role of financial markets and banking services in influencing the investment decisions of foreign investors. Theoretically, foreign investors prefer to invest in countries where the financial system is well developed. This is because, when they enter a host country, they expect somehow to use local financial markets and banks to raise fund and deposit their money in local bank accounts. On the other hand, banks and other financial intermediaries can benefit more from the presence of foreign investors when using funds deposited in their accounts for their lending undertakings. There have been numerous empirical researches in this strand and the results are somehow influenced by models and the financial development indicators employed (see, for example, Agbloyor et al., 2013; Alfaro et al., 2004; Ang, 2009; Azman-Saini et al., 2010b; Fauzel, 2016; Sghaier and Abida, 2013; Sirag et. al., 2018). In their study, Agbloyor et al. (2013) found bidirectional causality between financial markets and FDI using Two-Stage Least Squares (2SLS) regression analysis. They employed indicators for the banking sector and stock markets and these are: private credit, bank credit, M2 (money and quasi money), market capitalization, and stock market turnover rations. Alfaro et al. (2004) found FDI to have a positive influence on economic growth when interacted with financial development indicators. They, Alfaro and his colleagues, used Ordinary Least Squares (OLS) regression analysis and the indicators used to capture financial development were: liquidity liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-financial intermediaries divided by GDP), commercial-central bank assets,

private sector credit and bank credit. Similar conclusions were drawn by Ang (2009) using indicators from the only banking sector, principal component analysis, and the vector error correction model. Ang (2009) employed the ratio of a number of commercial banks offices per 1000 people, the ratio of M3-M1 to nominal GDP, the ratio of commercial bank assets to the sum of central bank assets and commercial bank assets, and the ratio of bank claims of the private sector to nominal GDP as the proxies for financial development. Azman-Saini et al. (2010b), using a threshold regression model, found that FDI has a positive influence on growth only when financial development exceeds a certain threshold level.

2.4. FDI, Labor Force and Infrastructure

Scholars have also examined the causal links among FDI, quality of labor force and infrastructure. It has been found that the quality of labor force of the host country is one of the factors that attract foreign investors in a certain economy (See, for example, Fung et al., 2002b; Gao, 2005; Noorbakhsh et al., 2001). Gao (2005) employed data from statistical yearbooks of individual provinces of China and found that the quality of labor has a significant positive influence on FDI. In their study, Noorbakhsh et al. (2001) found that human capital is statically a significant determinant of FDI in developing countries. They used the secondary school enrollment ratio, the number of accumulated years of the secondary school enrollment present in the labor force, and the number of accumulated years of secondary and tertiary education within the labor force to capture human capital. Kottaridi and Stengos (2010) employed non-parametric approaches using the non-linear model to explore the nature of relationships among FDI, human capital and economic growth in middle-income countries. Their results found human capital to have a significant positive influence on FDI. However, others did not find any significant relationship between the quality of labor and the attraction of foreign investors (See, for example, Cheng and Kwan, 2000a, 2000b). Hence no unanimous conclusion has been reached so far.

Furthermore, it has been pointed out that the quality of infrastructure whether physical, government or social infrastructures, has a significant influence on the location of foreign investors (Bende-Nabende et al., 2001; Chan et al., 2014; Globerman & Shapiro, 2002; Kinda, 2010). Chan et al. (2014) employed provincial panel data, using China as a case study, to explore the determinants of FDI. Their results found that the growth of physical infrastructure has an indirect influence on FDI. Globerman and Shapiro (2002) found that government infrastructure is very significant in influencing the location of foreign investors. In their study, they used the six governance indicators as defined by Kaufman et al. (1999), including rule of law, voice and accountability, government effectiveness, political stabiligy and absence of violence, regulatory quality and to capture government infrastructure. Kinda (2010) employed the firm-level data across 77 developing countries to identify factors that impede the development of FDI in these countries. The results indicated that problems related to physical infrastructure and government institutions discourage the attractiveness of FDI. Batuo (2015) indicated that investment in telecommunication infrastructure spurs more returns and hence improves the economic growth of the host country.

3. Data and Econometric Methodology

3.1 Data

The data used in this study are the time series data covering the period between 1990 and 2017. All the series were extracted from the World Bank Development Indicator (WDI) data bank (World Bank, 2014). The variables used are FDI net inflows (% GDP), the growth rate of GDP per capita which was used as an indicator for economic growth, gross fixed capital formation (% GDP) as an indicator for domestic investment, labor force participation rate (%

of total population ages 15-64, estimated by International Labor Organization). Telecommunication infrastructure was captured by the number of fixed telephone subscriptions (per 100 people), and the level of financial development was captured by a growth rate of broad money. The trend of FDI, domestic investment, and the growth rate of GDP per capita are depicted in Figure 1. It has been observed that domestic investment surpasses foreign investment in terms of its contributions to economic growth. However, there have been fluctuations in both types of investments. In terms of domestic investment, the highest pick value can be observed in 2012 and the lowest value can be observed in 1997. In the case of FDI, the highest value was observed in year 2004, and thereafter, the trend keeps on decreasing with marginal rate.

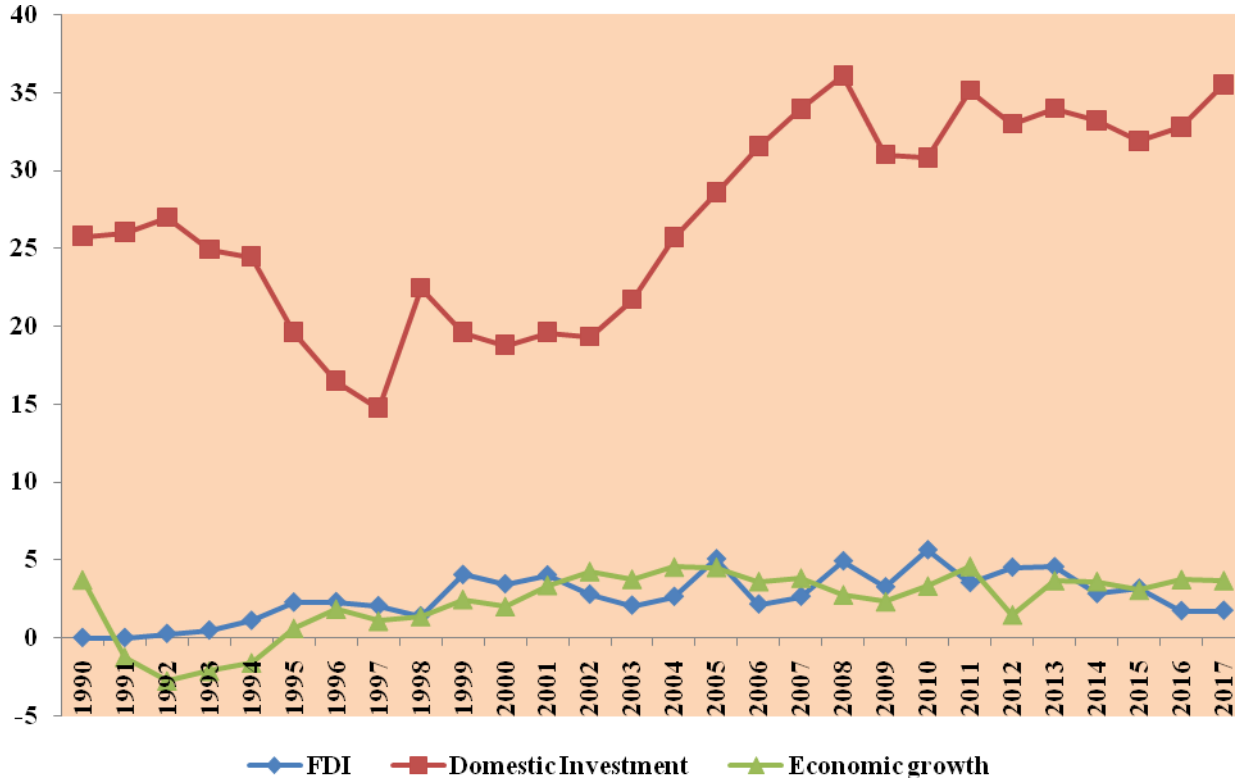

Figure 1: Trend of FDI, domestic investment and economic growth

3.2. Unit Root Test

There are numerous techniques available in the extant literature proposed to test for the presence of a unit root in time-series variables. The most commonly employed techniques are the Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) tests (see Dickey and Fuller, 1979, 1981; Said and Dickey, 1984; Phillips and Perron, 1988). In this study, the researcher employed the ADF unit root test, which was founded by Said and Dickey (1984). This technique eliminates the problem associated with serial correlation, which is prevalent in the DF test. The ADF test has been pointed out to be a suitable approach for testing large and complicated time series models. The ADF test equations are as indicated in Equations (1) to (3) below.

$$\Delta Y_t = \theta Y_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (1)$$

$$\Delta Y_t = \beta_0 + \theta Y_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

$$\Delta Y_t = \beta_0 + \beta_1 T + \theta Y_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (3)$$

Where Y_t represents the series whose stationarity property is to be tested, p is the optimal lag length, θ denotes the autoregressive coefficient to be estimated, Δ is the first difference operator, β_0 is the constant term or intercept, β_1 denotes the coefficient of trend component, T stands for trend component and γ_i for $i = 1,\ldots,n$ representing the coefficients of the first difference series. As observed above, the test Equation (1) includes neither the constant/intercept nor the trend components. However, equation (2) includes the intercept term only, and Equation (3) includes both the intercept term and the time trend components. The null hypothesis to be tested states that the series has a unit root. If the ADF test statistic is greater (i.e. less negative) than the corresponding critical value, then the null hypothesis will not be rejected at the given level of significance and the series for this scenario is said to be non-stationary, and if the ADF test statistic is less (i.e. more negative) than the corresponding critical value, then the series is stationary hence the null hypothesis will be rejected.

3.3. Testing for Co-integration

Co-integration is defined as the long-term relationship between non-stationary time series whose linear combination is stationary (Brooks, 2008). Therefore, if the series of interest are non-stationary at their level form, but become stationary after being differenced once, then testing for co-integration can be embarked on. Otherwise, if the conditions stated above are not met, then testing for co-integration among the variables under study will not be imperative. Various approaches have been developed in the extant literature for testing co-integration among macroeconomic variables. Some are appropriate for individual time-series data (See, for example, Engle and Granger, 1987; Johansen, 1988, 1991; Johansen and Juselius, 1990). The Johansen co-integration technique which was first pioneered by Johansen (1988) and later extended by Johansen and Juselius (1990) as well as Johansen (1991) is carried out under the vector autoregressive (VAR) model framework. The technique is based on the asymptotic distribution of the data set and therefore is more suitable for a large sample. Therefore, in this study, the researcher employed the Johansen cointegration test to see whether there exists a long-term relationship among the variables of interest.

3.4. Granger Causality Test

This study employed the Granger causality test developed by Granger (1969) and Wiener (1956) to analyze the relationships among the variables of interest. Granger (1969) points out that a variable *x* is said to Granger-cause another variable *y* if the variable *y* can be better predicted by the past or lagged values of both *x* and *y* than by the lagged values of *y* alone. For the case of two variables, the test for Granger causality can be performed by estimating Equations (3) and (4).

$$Y_t = \delta_{10} + \sum_{i=1}^{n} \delta_{1i} Y_{t-i} + \sum_{i=1}^{n} \beta_{1i} X_{t-i} + \mu_{1t} \quad (4)$$

$$X_t = \delta_{20} + \sum_{i=1}^{n} \delta_{2i} X_{t-i} + \sum_{i=1}^{n} \beta_{2i} Y_{t-i} + \mu_{2t} \quad (5)$$

where μ_{1t} and μ_{2t} are assumed to be mutually uncorrelated white noise processes and n represents the number of lagged variables. Additionally, X is said to Granger-cause Y if the estimated coefficients of the lagged values of X in Equation (4) are statistically and significantly different from zero as a group, and Y is said to Granger-cause X if the estimated coefficients of lagged Y in Equation (5) are statistically different from zero as a

group. Despite this, the Granger causality test can be carried out based on either VAR or VECM model specifications. VAR framework is only valid when the variables under consideration are not co-integrated (Granger, 1988). Moreover, VAR captures only the short-term effects among the variables, while the vector error correction (VECM) model considers both the short-term and long-term causal relationships. The VECM of lag *p* is specified in Equation.

$$\Delta y_t = \Pi ECT_{t-1} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \ldots + \Gamma_p \Delta y_{t-p} + \mu_t \quad (7)$$

Where y_t is a column vector of the endogenous variables used in the study, Π denotes the long-term coefficients matrix, ΠECT_{t-1} represents the long-term error correction term, which captures the speed of adjustment to the long-term equilibrium after a short-term shock, and Δ stands for the difference operator. The VECM indicates that the differenced dependent variables are influenced by the long-term error correction term and the short-term first differenced lagged variables ($\Delta y_{t-1}, \ldots, \Delta y_{t-p}$).

4. Analysis of Results

4.1. Results for Unit Root Test

Table 1 denotes the results for the unit root test of all series used in this study. The results show that all the series are non-stationary in their level form. However, they become stationary after being differenced once. Hence the series are integrated of order one, i.e., I (1). Therefore, the researcher proceeds with testing whether the series are co-integrated by employing Johansen co-integration techniques.

Table 1: Unit Root Test Results

Variable	ADF test statistics Level series	ADF test statistics Difference series	Order of Integration
FDI, net inflows (% of GDP)	-3.039	-8.343***	I(1)
GDP per capita growth	-2.423	-5.758***	I(1)
Gross fixed capital formation	-2.027	-4.753***	I(1)
Labor force, participation rate	-2.152	-4.964**	I(1)
Telecommunication infrastructure	-1.197	-4.805***	I(1)
Broad Money	-2.600	-7.258***	I(1)

Note: 1) The test equations does not include either the constant term or trend term. 2) ***, and **denote significance at 1% and 5% level respectively.

4.2. Johansen Co-integration Test Results

The results for the co-integration test for both trace statistic and maximum eigenvalue statistic are reported in Table 2. Both trace statistics and maximum eigenvalue tests indicate 1 co-integrating equation at 1% level of significance. Based on these results, it is clear that the series are co-integrated. That is, they move together in the long run. However, co-integration merely means there is a long-term relationship among the variables of interest, but it does not indicate the direction of causality. Hence, the researcher proceeds with the concept of Granger causality to detect the direction of causality among the variables by using the vector error correction model framework.

Table 2: Co-integration Results

Hypothesized No. of CE(s)	Eigen-value	Test Statistic	0.05 Critical Value	Prob.**
Trace Statistic				
None *	0.870565	140.0091	95.75366	0.0000
At most 1 *	0.789556	86.85008	69.81889	0.0012
At most 2	0.560837	46.32812	47.85613	0.0691
At most 3	0.391089	24.93313	29.79707	0.1638
At most 4	0.357336	12.03497	15.49471	0.1553
At most 5	0.020536	0.539487	3.841466	0.4626
Maximum Eigen-value Statistic				
None *	0.870565	53.15899	40.07757	0.0010
At most 1*	0.789556	40.52196	33.87687	0.0070
At most 2	0.560837	21.39499	27.58434	0.2531
At most 3	0.391089	12.89816	21.13162	0.4616
At most 4	0.357336	11.49548	14.26460	0.1311
At most 5	0.020536	0.539487	3.841466	0.4626

* Denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

4.3. Granger Causality Results

Table 3 denotes the results for Granger causality analysis for both short-run and long-run as captured by the error correction term. In the short run, the results denote that there is a one-way causality running from telecommunication infrastructure to FDI at 1% level of significance. In the context of Tanzania, the results imply that changes in infrastructure should precede changes in FDI. Furthermore, the results show that there is a unidirectional Granger causality running from FDI and financial development to economic growth at 5% and 1% level of significance respectively. This indicates that both FDI and financial sector development have a significant influence on the level of economic growth in Tanzania. Moreover, there is a bidirectional causality between labor force penetration ratio and domestic investment, hence these indicators are simultaneous to each other. The researcher also found a one-way causality running from financial development and telecommunication infrastructure to labor force at a 5% level of significance. Telecommunication infrastructure is found to Granger cause financial development at a 10% level of significance. However, the results do not reveal any causal links among GDP per capita, domestic investment, labor, financial development and FDI. Only telecommunication infrastructure is found to be one of the determinants of FDI in Tanzania in the short run.

In the long run, the p-value of Error Correction Term (ECT) indicates that there is causality running from FDI, domestic investment, labor force participation rate, financial development, and telecommunication infrastructure to economic growth at 5% level of significance. The coefficient of ECT is -0.053 which implies that the speed of adjustment towards the long-run equilibrium is 5.3% per year after a short-term shock. Furthermore, the results show that there is causality running from FDI, domestic investment, labor force participation rate, financial development and economic growth to telecommunication infrastructure. The error correction term stands to be -0.002. Hence there is a bidirectional causality between economic growth and infrastructure in the long run. This means that both economic growth and infrastructure may have a direct influence on each other in the context of Tanzania. The coefficients for *ECT,* when FDI and labor force are dependent variables, are found to be significant at a 5% level. However, the coefficients are positive and hence meaningless in this context.

Table 3: Granger Causality Results

Dependent ➡ Variable	**FDI**	**GDP per capita**	**GFCF**	**Labor**	**Financial Development**	**Telecommunication infrastructure**
FDI	-	6.383** (0.0115)	1.204 (0.2725)	0.311 (0.5770)	0.069 (0.7921)	0.831 (0.3619)
GDP per capita	0.691 (0.4056)	-	0.907 (0.3407)	0.053 (0.8167)	1.084 (0.2977)	0.215 (0.6427)
Domestic Investment	0.819 (0.3653)	0.164 (0.6853)	-	3.449* (0.0633)	1.765 (0.1840)	0.001 (0.9661)
Labor force participation rate	0.020 (0.8862)	0.010 (0.9195)	2.590* (0.1075)	-	1.955 (0.1620)	0.714 (0.3979)
Financial development	1.102 (0.2938)	2.842* (0.0918)	1.333 (0.2481)	4.108** (0.0427)	-	0.340 (0.5597)
Telecommunication infrastructure	8.820*** (0.0030)	0.824 (0.3639)	0.858 (0.3541)	5.029** (0.0249)	2.692* (0.1008)	-
ECT	0.054** (0.0234)	-0.053** (0.0352)	-0.057 (0.7838)	0.013*** (0.0031)	-0.047 (0.8017)	-0.002** (0.0267)

Note: ***, **, * Denote significance at 1%, 5%, and 10% levels

5. Conclusion

The study aimed to investigate the causal links among FDI, economic growth, domestic investment, quality of labor force, financial development and telecommunication infrastructure in Tanzania by employing the Granger causality approach. The study started by testing the presence of unit root in series under investigation in order to avoid some spurious results associated with the time-series data. This is because, many macroeconomic variables are somehow far away from being stationary, and also some of the econometric techniques such as the Granger causality concept need to be carried out when the series under study are stationary. In this study, the researcher used Augmented Dickey-Fuller unit root test procedures.

The results showed that all the series are non-stationary at their level form, however, they became stationary after being differenced once. Hence, the researcher proceeded to test whether the series move together in the long run, i.e., co-integration test. The researcher employed Johansen (1988, 1995) full information maximum likelihood co-integration test approach, and the results indicated that the variables are co-integrated. However, co-integration vindicated only the existence of a long-run relationship among the variables of interest; it did not show the direction of causality. Thus, the researcher embarked on carrying out the Granger causality analysis based on the VECM framework. In this way, the researcher found six uni-directional causalities and one bi-directional causality among the variables in the short run. On one hand, telecommunication infrastructure was found to Granger cause FDI, labor, and financial development. On the other hand, both FDI and financial development were revealed to directly Granger cause economic growth in the short run. The researcher also found a bi-directional Granger causality between domestic investment and labor force participation. In the long run, the results indicated causality running from FDI, domestic investment, labor force, financial development, and telecommunication infrastructure subscriptions to economic growth at a 5% level of significance. Furthermore, the results showed causality running from FDI, domestic investment, labor force participation

rate, financial development and economic growth to telecommunication infrastructure. This implied that there was a bidirectional causality between the level of economic growth and telecommunication infrastructure.

The results pose some policy implications as follows: since labor force, FDI, financial development, domestic investment, and telecommunication infrastructure are found to be among the significant determinants of economic growth in the long run, it is advised that policies designed to improve these macroeconomic indicators should be encouraged and reinforced in the country. Furthermore, the country needs to find coherent ways to attract more foreign investors, improve the quality of labor force, and encourage both private and public investments. Besides, investment in telecommunication services should be highly encouraged.

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