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The Relationship Between Foreign Direct Investment Oriented Economic Growth in Uganda: An Empirical Study Based on VAR Model

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Abstract

The purpose of this paper is to investigate the relationship between Foreign Direct Investment (FDI) and Economic growth as measured by Gross Domestic Product (GDP) over Uganda, from 1980-2018. Vector Autoregressive Model (VAR) and Granger Causality test were used. The results show that lag 1 is the optimal lag hence bivariate VAR (1) model was used. GDP and FDI exhibits long-term equilibrium since the two-time series are cointegrated in long run. The causality test indicates that there exists a unilateral relationship between FDI and GDP, and FDI causes GDP growth and not vice versa. Understanding these causality links can help in future forecasting of Uganda's economic growth.

Keywords: Economic Growth, Foreign Direct Investment, Vector Autoregression Model, Uganda

1. Introduction

According to Organization for Economic Cooperation and Development (OECD, 2011), Foreign Direct Investment is a cross-border investment that is made by a resident in one economy (the direct investor) with the aim of establishing a lasting interest in an enterprise (the direct investment enterprise) that resides in another country other than that of the direct investor. Foreign direct investment has been associated with economic growth in many developing countries by stimulating capital growth (Borgean, 2015). Particularly, this occurs in countries that have high per capita income, high trade openness, developed financial systems, and an educated labor force (OECD, 2002; Alfaro et al., 2004; Busse and Groizard, 2008; Lipsey, 2010). However, some researcher argues that FDI can reduce capital accumulation when foreigner investors claim scarce resources. Additionally, knowledge spillover is falsified as many domestic firms are unable to learn from multinational companies (Herzer, 2012). Due to a lack of consensus on the impacts of FDI on economic growth, there is a need to revisit individual countries. Based on that, this study aims at assessing the link between GDP and inwards inflows of FDI in Uganda.

There are various types of FDI based on; target market, strategic motives, internal structure, industry, way of growth, ownership, and others. The determinant factors are partly overlapping hence reflecting the multidimensional nature of the investment decision. However, on most occasions, investment is not usually made based on one specific motive, but a combination of various motives (Eiteman et al., 1992). Notably, Outwards and Inwards FDI flows are the most prominent types of FDI. Outward FDI refers to the investments made by a certain country into other foreign markets while inward foreign direct investment is the investment made by a foreign company in a specific country (OECD, 2011).

There is a dearth of comprehensive current knowledge about the nexus between FDI, and economic growth in Uganda. The objective of this paper is to assess the trend and stationarity of FDI and GDP over Uganda from 1980-2018, establish the empirical relationship between FDI and Economic growth, then determine the causality link between the two. This paper contributes significantly to the body of literature on FDI and economic growth in one of the developing countries in Africa.

This research work aims at answering the following scientific questions:

- What is the optimal lag length suitable for the bivariate VAR model build between FDI and GDP over Uganda?
- Does the FDI and GDP time series exhibit stationary?
- Does FDI and GDP over Uganda exhibit causality links and in which direction?

The paper is arranged as follows; Section 2 describes the previous studies related to the current topics abroad and at home country. Then section 3 describes the types of the dataset used, their stationarity characteristics, and the Vector autoregressive model. The results together with discussions are shown in section 4. In section 5, the conclusion and recommendations are drawn.

2. Literature Review

There exists a significant body of literature on the relationship between FDI and economic growth. Nevertheless, there is a significant lack of consensus on the relationship between FDI and GDP among countries. Hence the essence of reviewing the existing literature review and identifying the existing literature gaps.

2.1. Impacts of the Inward FDI on Economic growth of the host country

The impacts of FDI on economic growth differ from one country to another and from developed to developing world. Over the European Union countries, FDI is negatively correlated to GDP and the key determinant of the economic growth over EU is caused by the FDI spillover effect (Mencinger, 2003). Over the United Arab countries, for FDI to have significant positive impacts on GDP, there must be an interaction with the financial parameters at a certain threshold and favorable FDI policies (Omran and Bolbol, 2003). Over Sub-Sahara Africa, based on panel data collected over a 24-year cycle (1975-1999), FDI is associated with economic growth over the region. According to Adofu and Ilemona (2009), FDI has a huge effect on the Nigerian economic growth rate.

Kojrajaras, (2010) identified that FDI led to economic growth through technology transfer, which is directly dependent on the recipient countries' economic situation. Further, human resources, trade openness, and infrastructure construction in FDI zones are links to be an economic growth booster. According to Kojrajaras, (2010), FDI can only have a positive effect on economic development if the countries have a favorable political and economic condition. Other studies reinforce the case by preserving the outcomes of an unsuitable condition like political uncertainty, which reduces international companies tendency to invest directly in a specific country. According to Mangir et al. (2012), most developed countries lack sufficient capital to create savings due to low national income. As a result, FDI fills the void between investment needs and domestic capital in host countries (UNCTAD, 2013).

Other economists contest that high FDI's productivity on economic growth does not only results from human resources but also from infrastructure improvement. For instance, Hermes and Lensink, (2003), found out that, the documented positive impacts of FDI on economic growth results from the empowerment of the host country's financial system. Additionally, the domestic financial sector enhances the equitable distribution of capital hence attracting FDI. Conclusively, these findings strongly indicate that FDI will help fuel economic growth in the appropriate situations.

2.2. The Causality Links

There exists controversy about the causality link between FDI and GDP. Some of the studies assessing the causality link between FDI and GDP indicate the presence of a unidirectional causality link which is from FDI to GDP (Katircioglu and Naraliyeva, 2006; Tang et al., 2008; Ghazali, 2010; Majagaiya and Qingliang, 2010). Another study by Frimpong and Oteng-Abayie, (2006) showed that there is no causality link between FDI and growth (Frimpong and Oteng-Abayie, 2006). Notably, the causality link is enhanced by the presence of higher trade openness, low acquisition of aids, and low-income level of the host county (Dhakal et al., 2010).

2.3 Cointegration Related studies

The existence of a long-run relationship between FDI and GDP has been investigated by several studies using the Cointegration test. Numerous studies have reported the existence of a *positive long-run relationship between FDI and GDP although this impact is heterogenous* (Cuadros et al., 2004; Fedderke and Romm, 2006; Liu et al., 2009). *These previous studies, despite exhibiting consensus on the co-integration links, don't provide the determinants of this observed heterogeneity. Using a higher panel cointegration test over 31 developing countries using panel data spanning from 1970-2000, Hansen and Rand (2006), reported the existence of cointegration between FDI and GDP. Additionally, the study also documented differential impacts of FDI on economic growth among the countries investigated. The FDI depicted a positive long-run effect on GDP, however, GDP did not have long-run impacts on FDI (Hansen and Rand, 2006).*

3. Data and Methodology

3.1. Data

The study uses 38 years period of data from 1982-2019 obtained from the World Bank database. The data is archived on; <https://data.worldbank.org/country/Uganda>. The viability of the data has been checked through the IFS. In this study, Gross domestic product GDP is used as a proxy for economic growth. Basically, GDP reflects the economic size of a country and it's a major factor that foreign investors consider before investing in a certain country (Aseidu, 2006). GDP measures the total value of all goods and services produced in a country over a specific time in dollars. The GDP growth (annual %) was used to show the annual economic growth of Uganda.

FDI refers to the sum of equity capital, reinvestment of earnings, and other long and short-term capital as shown in the balance of payments. The data for FDI net inflows (% GDP) will be used in this category.

3.2. Methodology

3.2.1 Augmented Dickey-Fuller test (ADF)

Augmented Dickey-Fuller (ADF) test is used to assess the stationarity of a time series. It is crucial to test the presence of unit root in a time series since it can lead to biased results when building empirical models. The ADF is based on the following hypothesis;

The null hypothesis (H_0) states there is the presence of unit root hence the time series is non-stationary.

The Alternative hypothesis (H_1) there is no unit root hence the time series is stationary

The ADF test adopted in this study uses three types of models to test unit-roots on time series and on their first differenced series. The three models adopted can be expressed mathematically as;

a) The model without constant and trend:

$$\Delta y_t = \alpha y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-1} + \varepsilon_t \quad (1)$$

b) The model with constant and no trend

$$\Delta y_t = \gamma_0 + \alpha y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-1} + \varepsilon_t \quad (2)$$

c) The model with constant and trend

$$\Delta y_t = \gamma_0 + \gamma_1 t + \alpha y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-1} + \varepsilon_t \quad (3)$$

y_t denote any time series i.e. GDP, and FDI, $\Delta y_t = y_t - y_{t-1}$ is the first difference of the series (y_t), γ , α , and β represents the coefficients of the model where else ε_t is the error term in the regression model.

3.2.2 Vector Autoregression Model (VAR)

This type of regression model is used to forecast the current and future value of a variable by using the independent variable and other regressors at different lags. This approach has been used in previous similar studies (York, 2012; Ocaya et al., 2013). The general format of the model with multiple time series is;

$$GDP_t = \delta + \sum_{i=1}^p \alpha_{1i} GDP_{t-i} + \sum_{j=1}^p \beta_{1j} FDI_{t-j} + \varepsilon_{1t} \quad (4)$$

$$FDI_t = \theta + \sum_{j=1}^p \alpha_{2j} GDP_{t-j} + \sum_{i=1}^p \beta_{2i} FDI_{t-i} + \varepsilon_{2t} \quad (5)$$

where δ and θ are the intercepts for the two models while α_{1i} , β_{1j} , α_{2j} and β_{2i} are the coefficients of the regressors at lag 1.

GDP_t represents the gross domestic product (constant 2010 US\$), while FDI_t is the foreign direct investment net inflows expressed as a percentage of GDP_t , t ($t = 1, 2, 38$) is the length of the study period and p represents equal lags for GDP and FDI. The optimal lag for this dataset was one. The ε_{1t} , ε_{2t} are the white noise/error term in the model at the time (t).

The following assumptions are constructed in building this model;

$$E(\varepsilon_{1t}) = E(\varepsilon_{2t}) = 0 \quad (6)$$

$$E(\varepsilon_{1t}\varepsilon_{2t}) = \sum = \begin{pmatrix} var(\varepsilon_{1t}) & cov(\varepsilon_{1t}\varepsilon_{2t}) \\ cov(\varepsilon_{1t}\varepsilon_{2t}) & var(\varepsilon_{2t}) \end{pmatrix} \quad (7)$$

$$E(\varepsilon_{1t}\varepsilon_{2t}) = \sigma_i^2 \text{ for } i = 1, 2 \quad (8)$$

$$E(\varepsilon_{1t}\varepsilon_{2t}) = 0 \text{ for } t \neq \tau \quad (9)$$

3.2.3 Granger Causality test

The statistical Granger causality test (Granger, 1969) that is based on prediction was utilized to establish the direction of causation between the time series of the two parameters investigated. The relationship is based on the following hypothesis;

The null hypothesis (H_0) states that a variable X_i does not granger-cause a variable Y_i .

The Alternative hypothesis (H_1) states that a variable X_i granger-cause a variable Y_i

The alternative hypothesis signifies that X_i contains past information of Y_i hence can be skillfully to predict the future variation of Y_i and not vice versa.

3.2.4 Engle-Granger tests and Johansen cointegration test

These above-mentioned two statistical methods were used to test the presence of cointegration in the time series. This step is crucial to test because if two or more non-stationary time series are integrated, it means they cannot diverge in long run. Thus, if used together in the empirical model, they bring spurious casualties. The variance inflation factor (*vif*) test is used to test the autocorrelation among the regressors (Multicollinearity) effect. The results show that none of the variables exhibited a significant correlation with each other as depicted by $vif < 1.5$.

4. Results and Discussion

4.1. Time series analysis

To capture the variability of GDP annual growth and FDI inflow as a percentage of GDP over Uganda, time series analysis was used. Results show that the Gross domestic product of Uganda has been increasing at a rate of 0.06% despite fluctuating from one year to another (Fig.1). Uganda experienced an economic recession in 1985 as witnessed a documented negative GDP growth (Fig.1). This can be attributed to unfavorable government policy and the previous expropriations of foreign investors in Uganda.

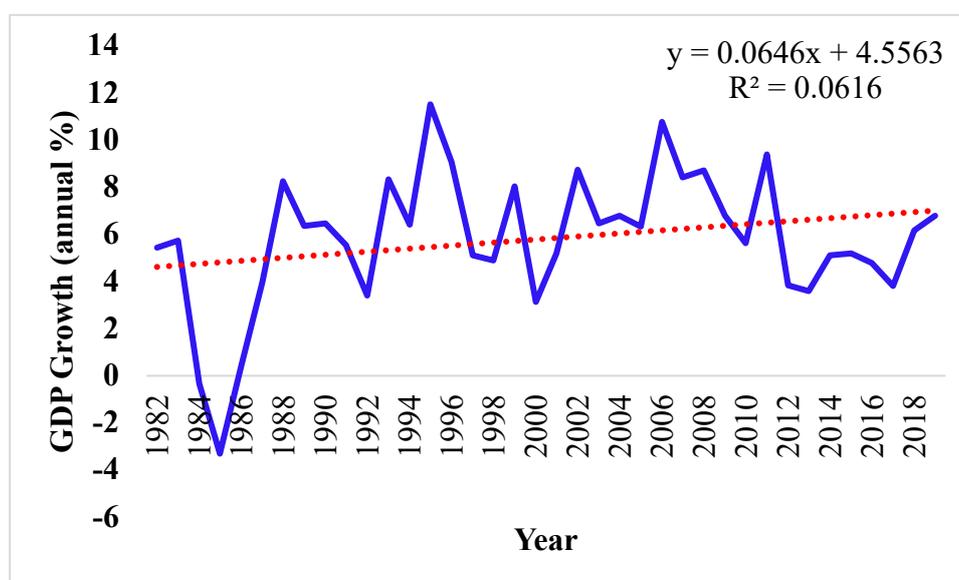


Figure 1: The trend of GDP over Uganda

The FDI inflows over Uganda have been expressed as the percentage of GDP has been fluctuating through the study period. Notably, some years like 1983, and 1984 documented the negative contribution of FDI to GDP over Uganda. This can be attributed to unfavorable government conditions that did not favor FDI. For instance, the bad governance of Iddi Amin that expelled the British-Asians from Uganda and expropriation of their assets and businesses hence crumbling industries. The post impacts of these events are evidenced in Uganda and it has taken time to rejuvenate the FDI inflows. Nevertheless, the FDI inflows over Uganda have been increasing at a rate of 0.07% every year.

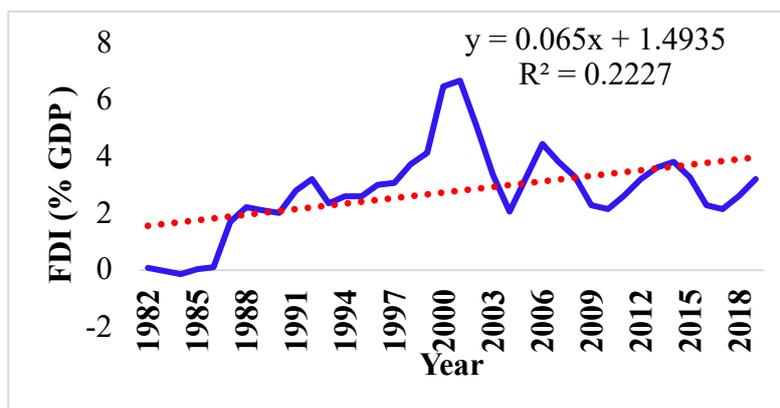


Figure 2: The trend of FDI (as % of GDI) over Uganda

After 1992, the FDI inflows contribution to Ugandan GDP has increased although fluctuating from one year to another. This increase has been linked to government reforms and policies aiming at attracting FDI inflows in Uganda. They include; foreign exchange rates reform, liberalization of the existing legal framework like naturalization, simplified administrative procedures, investment promotion policies that enhance macroeconomics stability, and formation of the Investment Code 1991 that controls investment in Uganda (UNCTAD, 1998). Additionally, the discovery of oil and minerals like cobalt, gold, and the insertion of numerous tax incentives in the 2008/2009 budget has led to a tremendous increase in the current uptrend contribution of FDI to the economic growth of Uganda.

4.2. Stationarity test

Before building the VAR model, it is important to make sure the time series are stationary. In this case, Augmented Dickey-Fuller (ADF) (1979) test was used to evaluate the unit root in the time series. The results show that GDP exhibited unit root, but upon first difference, the time series became stationary (Table 1). The FDI time series was stationary even before differencing but all the time series had to be first differenced before proceeding to the subsequent analysis.

Table 1: Stationarity test results

Variables	No Constant & no trend	Constant & no trend	Constant & trend	Conclusion
FDI	0.465	-2.18	-2.0	Non-Stationary
GDP	2.66	0.99	-2.54	Non-Stationary
First Difference				
FDI	-4.13*	-4.11*	-4.11*	Stationary
GDP	-5.11*	-6.4*	-6.35	Stationary

Notably: ** signifies significance level at 95%.

4.3 Selection of Optimal Lag to be used in the modeling

Different statistical model selection; Akaike Information Criterion (AIC) (Akaike, 1970), Hannan-Quinn information criterion (HQ), and Schwarz information criterion (SC) were used in assessing the optimal lag to be used in the construction of the VAR model. The selected lag is supposed to be the one that accounts for serial correlation in the residuals and reduces the loss of degrees of freedom. The lower the value of the criteria, the better the performance of the model at that lag. The results show that all the models consensually agree that lag one is the optimal lag (Table 2). Therefore, the VAR model built is of the form VAR (1).

Table 2: Identification of the optimal lag

Lag1	2	3	4
AIC(n)	39.3*	39.3	39.4439.63
HQ(n)	39.4*	39.5	39.70 39.96
SC(n)	39.8*	40.0	40.340.68

* Selected lag according to AIC, HQ, and SB criteria.

The abbreviations in Table 2 indicate;

AIC: Akaike information criterion

HQ: Hannan-Quinn information criterion

SC: Schwarz information criterion

4.4 Model Estimation

Based on the optimal lag, the researcher built the Vector autoregressive model. The results show that lag of GDP by one year is significant in forecasting future trends in GDP.

Table 3: VAR model results

	Dependent variable:	
	(1)	y (2)
GDP.11	0.885*** (0.091)	117,262,352.000*** (40,765,897.000)
FDI.11	0.000 (0.000)	1.044*** (0.006)
Observations	37	37
R2	0.929	1.000
Adjusted R2	0.925	1.000
Residual Std. Error (df = 35)	0.792	354,639,050.000
F Statistic (df = 2; 35)	230.352***	65,587.280***
Note:	*p<0.1; **p<0.05; ***p<0.01	

4.5 Granger Causality test

To discern the existence of a relationship between GDP and FDI and its direction, the Granger causality test is used. The results show that there exists a statistically significant unidirectional relationship between FDI and GDP. This guided the researcher in accepting the alternative hypothesis and reject the null hypothesis that FDI does not granger-cause GDP. This unilateral relation runs from FDI to GDP and not vice versa (Table 4). Further analysis shows that GDP does not granger cause FDI as the p-value is 0.7 hence the researcher is not able to reject the null hypothesis even at a 90% significance level (Table 4). Conclusively, the positive one-direction causation effects from FDI to GDP depict that an increase in FDI inflows increases the economic growth of Uganda.

Table 4: The Granger causality test results

Statement	F	Pr(>F)	Decision
GDP do not Granger-cause FDI	0.1438	0.7069	Accept the null hypothesis
FDI do not Granger-cause GDP	7.7086	0.008873 **	Reject the null hypothesis and accept the alternative hypothesis

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

5. Conclusion and Recommendations

This paper aims at discerning the links between economic growth as determined by gross Domestic Products and Foreign Direct Investment (FDI) over Uganda from 1982-2019. Several statistical measures were used, and they include, time series analysis, VAR, Cointegration test, and Granger causality test. The results show that the FDI and GDP exhibit non-stationary at lag zero, but the time series become stationary at lag 1 which was identified as the optimal lag. Future analysis shows that the previous GDP has a significant influence in determining the next year's GDP. The causality links show that there exists a unilateral relationship between FDI and GDP and FDI granger-cause GDP and not vice versa.

The results of this study are crucial to policymakers and they contribute significantly to the body of literature review on the links between GDP and FDI.

Conflict of interest

The authors wish to declare that there is no conflict of interest whatsoever.

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