Foreign Direct Investment and Economic Growth in Botswana: A Dynamic Causality Test

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Authors' contributions

This work was carried out in collaboration between both authors. Author OC designed the study, carried out the analysis and reviewed the draft manuscript. Authors OC and EK carried the out the literature review and wrote the first draft of the manuscript. Both authors read and approved the final manuscript.

Review Article

ABSTRACT

Aims: The study examines the relationship between Foreign Direct Investment (FDI) and economic growth using yearly time series data for the period 1980 to 2012.
Study Design: Multi-model econometric study.
Place and Duration of Study: Botswana, January 1980 to December 2012.
Methodology: The study uses Augmented Dickey-Fuller and the Phillips-Perron test to test the stationarity of the variables. Johansen and Juselius cointegration test was used to test for cointegration. Finally, the study uses the Granger causality test to determine whether FDI influences economic growth.
Conclusion: Using Johansen cointegration test applied on a dynamic model, we found out that there is a long-term term relationship between FDI and economic growth in Botswana. However,

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using the Granger causality tests, we were not able to confirm whether it is the FDI that is spurring economic growth or it is economic growth that is promoting FDI inflows.

Keywords: Foreign direct investment; economic growth; granger causality; Botswana.

1. INTRODUCTION

There is widespread consensus among many economists that FDI is an important driver of economic growth (for example, Hak [1] and Sghaier and Abida [2]. As a result, countries in need of speedy economic development are generally encouraged to create conditions that attract foreign direct investment. The rationale for increased efforts to attract more FDI stems from the belief that FDI has several positive effects which include productivity gains, technology transfers, the introduction of new processes, managerial skills, and know-how in the domestic market, employee training, international production networks, and access to markets [3]. In the developing world, FDI is actually seen as a necessity that does not only stimulate economic growth, but help to eradicate poverty. In other words, FDI is seen as panacea to the economic and social problems bedeviling the developing world. Thus, attraction of FDI has become a key economic policy in most developing countries.

For most countries in the developing world, attraction of FDI is actually the centre of their overall economic policies [4]. In fact, attraction of FDI has been one of the core objectives of structural adjustment programmes witnessed in most developing countries. Botswana, being a developing country, is one country that has made attraction of FDI a priority, in its endeavor to achieve economic prosperity. Over the last decade, Botswana FDI inflows have averaged about US380 million, reaching a high of just US 1 billion in 2011. Much investment inflows go towards the mining sector. For example, out of the P18.144m that was received in 2011, P13.744 million went into the mining sector (see Table 1).Over the same period, the country have consistently registered positive economic growth rate which averaged about 5%. The country's economic performance may be attributed to the FDI inflows. Thus, Botswana may be a perfect example of the positive effect of FDI on economic growth.

Whilst the FDI inflows might be having an impact on economic growth, for policy purposes, it is important to understand the impact with certainty. Furthermore, numerous researches have actually found the impact of FDI on economic growth to be insignificant in some instances (for example Adewumi [4] and Geijer [5]) and also to be significant only under particular environments Alfaro et al. [3] and Ozturk [6]. Thus, attributing economic growth being experienced in Botswana to FDI inflows without an empirical investigation might be incorrect.

Table 1. Foreign direct investment in Botswana, 2011

Industry	FDI (Pula - Million)
Mining	13 744
Manufacturing	199
Finance	3 228
Retail and wholesale	417
Electricity gas and water	65
Real estate and business services	2
Transport, storage and communication	193
Construction	65
Hospitality	140
Public administration	0
Other	359
Total	18 414

Source: Bank of Botswana [7]

In this paper, we investigate the relationship between FDI inflows and economic growth in Botswana. Our aim is to find out, with some degree of certainty, the causal relationship between FDI and economic growth in Botswana. The rest of the paper is structured as follows: Section 2 reviews literature related to the impact of FDI on economic growth, Section 3 discusses the data and methodology, Section 4 presents the results and Section 5 concludes the paper.

2. LITERATURE REVIEW

FDI is broadly defined as capital flows resulting from the behavior of multinational companies [8]. It is an amount invested by resident of a country in a foreign enterprise over which they have effective control [9]. Contrary to other capital flows, FDI is less volatile and does not show a pro-cyclical behaviour and has therefore become the "favorite capital inflows" for developing countries [6]. FDI is now considered as one of

the strongest pillars for the economy and everything is done at the level of procedures, regulations and various obligations to attract them [10].

There is overwhelming evidence of consensus among academia and practitioners that FDI tends to have significant effect on economic growth. For example, Hassen and Anis [10] used time series techniques to analyse the relationship between FDI and economic growth in Tunisia over the period 1975-2009. Their empirical results suggest that FDI could help boost the process of long-term economic growth.

Hak [1] used a panel data regression analysis on data collected from a sample of 89 countries, to analyse the impact of trade openness and FDI on economic growth. The study concludes that FDI has a significant impact on economic growth.

Sghaier and Abida [2] examined the causal linkage between FDI, financial development, and economic growth in a panel of 4 countries of North Africa (Tunisia, Morocco, Algeria and Egypt) over the period 1980-2011. Using Generalized Method of Moment (GMM) panel data analysis, they found strong evidence of a positive relationship between FDI and economic growth.

Bengoa and Sanchez-Robles [11] examined the interplay between economic freedom, FDI and economic growth using a panel data analysis for a sample of 18 Latin American countries for the period 1970-1999. The study reveals a positive relationship between FDI and economic growth.

With increasing evidence of support for strong relationship between FDI and economic growth, a greater amount of literature has also focused on the channels through which FDI may have a positive impact on economic growth. Literature suggest three main channels through which FDI impact on economic growth. These are capital formation, technological transfer and human capital. (1) FDI is a source of capital that augments domestic savings in the process of capital formation, thereby increasing the capital stock of the country and ultimately leading to economic growth; (2)FDI eases the transfer of technology thereby leading to an increase in factor productivity and efficiency in the utilization of resources, which ultimately leads to economic growth and (3) FDI enhances human capital (skills and knowledge) thereby increasing and improving the existing stock of knowledge in the recipient economy through labor training, skill acquisition and diffusion, leading to more efficient organization of the production process, which ultimately translate into economic growth [6,9,12].

Though there is overwhelming evidence of a significant relationship between FDI and economic growth, evidence of insignificant relationship between FDI and economic growth has also appeared in literature. For example, Adewumi [4] examined the contribution of FDI to economic growth in Africa using graphical and regression analysis. He used data for eleven countries within the continent for the empirical analysis for the period 1970-2003. He found out that the contribution of FDI to growth is positive in most of the countries but not significant.

Geijer [5] used a multiple regression model with GDP as per capita dependent variable to examine whether FDI has any impact on economic growth in Mexico. Though, FDI produces positive spillover effects mainly through knowledge and technology spillovers on the domestic economy, the study did not find FDI to have any significant impact on economic growth.

The insignificant relationship between FDI and economic growth noted in literature might be because of the specific empirical approaches and the different time periods used by different researchers [13]. However, much of the literature seems to attribute this to the specific conditions of the country receiving the FDI. In fact, literature seems to emphasize that FDI only has a significant positive impact on economic growth under particular environments. Bengoa and Sanchez-Robles [11] pointed out that host countries would require adequate human capital, economic stability and liberalized markets to benefit from the resultant long-term capital flows. Ozturk [6] pointed out there is a positive association between FDI inflows and growth provided receiving countries have reached a minimum level of educational, technological and/or infrastructure development. Alfaro et al. [3] pointed out that FDI brings more positive effect and spillover if host countries minimum threshold level of human capital, and country is more export orientated, and if FDI is focused on more technology intensive sectors. Fortanier [14] used a panel data analysis of 71 host countries by for the period 1989-2002. The study results confirmed that the growth consequences of FDI vary depending on the host country

characteristics. Carkovic and Levine [15] used a Generalized Method of Moments (GMM) estimator to extract consistent and efficient estimates of the impact of FDI inflows on economic growth. They found out that FDI do not exert an independent influence on economic growth, thereby implying that the impact of FDI on economic is influenced by other growth determinants.

With literature emphasizing the importance of country specific conditions in influencing economic growth, a vast amount of empirical studies focus on the impact of country specific conditions on the FDI-economic relationship. For example, Busse and Groizard [13] analyzed the impact of the regulatory environment on the relationship between FDI and economic growth. Their results indicates that more regulated economies are less able to take advantage of the presence of multinational companies, implying that the more regulated a country is, the lower its capability to make use of FDI to spur economic growth.

Toulaboe et al. [16] used an endogenous model to examine the impact of level of economic development on the beneficial effects of FDI. Their study reveals that the impact of FDI on economic growth is greater among technological leaders, thereby implying that absorptive capacity in the host country is important in allowing FDI to positively and fully impact economic growth.

Freckleton et al. [17] examined the impact of corruption on the FDI-economic growth relationship. They studied forty two developing countries using Panel Dynamic Ordinary Least Squares. Their results suggested that corruption has a significant influence on per capita GDP in the short-run, thereby implying that lower levels of corruption enhance the impact of FDI on economic growth.

Based on some empirical findings, it is evident that the impact of FDI on economic growth is therefore not sure and straightforward. It depends on the country conditions under which FDI is provided. It is incorrect to assume that merely increasing FDI inflows will result in greater economic growth. Thus, it is imperative for any country to analyze the true impact FDI on its economy.

3. EMPIRICAL MODEL SPECIFICATION AND ESTIMATION TECHNIQUES

3.1 Theoretical Model

We identified a two variable model which hypothesize Economic Growth (RGDP - Y) as a function of FDI (FDG - X)

$$RGDPG_t = F(FDG_t) \qquad (1)$$

The model is specified as follows:

$$Y_t = \alpha + \beta X_t + \varepsilon_t \qquad (2)$$

3.2 Estimation Techniques

Using the above model we followed the following steps, to determine the true impact of FDI on economic growth in Botswana.

3.2.1 Stationarity test

Firstly, we performed a stationarity test of the model. Stationarity of a series is an important phenomenon because it can influence its behaviour. If x and y series are non-stationary random processes (integrated), then modelling the x and y relationship as a simple Ordinary least Squares (OLS) relationship as in equation 2 will only generate spurious regression.

Time series stationarity is the statistical characteristic of a series such as its mean and variance over time. If both are constant over time, then the series is said to be a stationary process (i.e. is not a random walk/has no unit root), otherwise, the series is described as being a non-stationary process (i.e. a random walk/has unit root). Differencing a series using differencing operations produces other sets of observations such as the first-differenced values, the second-differenced values and so on.

x level	x_t
x 1st differenced value	$x_t - x_{t-1}$
x 2nd differenced value	$x_t - x_{t-2}$ (3)

If a series is stationary without any differencing, it is designated as I(0), or is of order zero (0). On the other hand, a series that has stationary first differences is designated I (1), or integrated of order one (1). Augmented Dickey-Fuller (ADF) suggested by Dickey and Fuller [18] and the Phillips-Perron (PP) test recommended by

Phillips and Perron [19] have been used to test the stationarity of the variables.

3.2.2 Johansen and Juselius cointergration test

Secondly, we performed a cointergration test to determine whether there is long-term relationship between FDI and economic growth as measured by GDP. We specifically used Johansen and Juselius cointergration tests. Johansen and Juselius [20] procedures uses two tests to determine the number of cointegration vectors: The Maximum Eigenvalue test and the Trace test. The Maximum Eigenvalue statistic tests the null hypothesis of *r* cointegrating relations against the alternative of *r-1* coniteggrating relations for r = 0, 1, 2…n-1. This test statistics are computed as:

$$LR_{max} (r/n+1) = -T * \log(1 - \lambda) \tag{4}$$

Where λ is the Maximum Eigenvalue and T is the sample size. Trace statistics investigate the null hypothesis of *r* cointegrating relations against the alternative *n* cointegrating relations, where *n* is the number of variables in the system for r = 0, 1, 2…n-1. Its equation is computed according to the following formula:

$$LR_{tr} = -T * \sum_{i=r+1}^{n} \log(1 - \lambda) \tag{5}$$

In some cases Trace and Maximum Eigenvalue statistics may yield different results and Alexander [21] indicates that in this case the results of Trace Test should be preferred.

3.2.3 Granger-causality

Finally we performed the Granger causality test to determine the whether FDI influences economic growth. A general specification of the Granger causality test in a bivariate (X,Y) context can be expressed as:

$$Y_t = \alpha O + \alpha_1 Y_{t-1} + ….. + \alpha_i Y_{t-i} + \beta_1 X_{t-1} + …… \beta_i X_{t-i} + \mu \tag{6}$$

$$X_t = \alpha O + \alpha_1 X_{t-1} + ….. + \alpha_i X_{t-i} + \beta_1 Y_{t-1} + …… \beta_i Y_{t-i} + \mu \tag{7}$$

In the model, the subscripts denote time periods and μ is a white noise error. The constant parameter "O" represents the constant growth rate of Y in the equation (6) and X in the equation (7) and thus the trend in these variables can be interpreted as general movements of

cointegration between X and Y that follows the unit root process. We can obtain two tests from this analysis: The first examines the null hypothesis that the X does not Granger-cause Y and the second test examines the null hypothesis that the Y does not Granger-cause X. If we fail to reject the former null hypothesis and reject the latter, then we conclude that X changes are Granger- caused by a change in Y [22]. Unidirectional causality will occur between two variables if either null hypothesis of equation (7) or (8) is rejected. Bidirectional causality exists if both null hypothesis are rejected and no causality exists if neither null hypothesis of equation (7) nor (8) is rejected [23].

3.3 Data

We used the data of FDI and GDP (growth rate of GDP) spanning from 1980 to 2012. The data was collected from the World Bank [24], World Development Indicators.

4. RESULTS AND DISCUSSION

4.1 Stationary Test

The null hypothesis of no unit roots for both the time series are rejected at levels at 1% level of significance since the ADF and PP test statistics values are less than the critical values at 1% level of significance, Table 2.

Table 2. ADF and PP unit root test

	ADF	PP
Series	**Level**	**Level**
RGDPG	-3.702	-3.702
p- value	(0.0001)	(0.0001)
FDG	-3.702	3.702
p-value	(0.0000)	(0.0000)

RGDPG and FDG are both I(0). That is, there is no need for differencing. Both variables are stationary in levels

4.2 Co-Integration Test

Cointegration rank is estimated using Johansen methodology. Johansen's approach derives two likelihood estimators for the Cointegation (CI) rank; a trace test and maximum Eigen value test, Table 3.

The trace statistic either rejects the null hypothesis of no co-integration among the variables or does not reject the null hypothesis

Table 3. Results of cointegration tests

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	26	-322.83723	.	19.6166	15.41
1	29	-313.69794	0.50491	1.3380*	3.76
2	30	-313.02894	0.05016		

Table 4. Granger causality test

Null hypothesis	χ^2	Probability	Decision
FDIG does not Granger-cause RGDPG	2.77528	0.4276	Do not reject
RGDPG does not Granger-cause FDIG	1.028712	0.7943	Do not reject

that there is one co-integration relation between the variables. We start by testing H0: r = 0. If it rejects, we repeat for H_0: r = 1. When a test is not rejected, stop testing there and that value of r is the commonly used estimate of the number of co-integration relations. From Table 3; H_0: r = 1 is not rejected at the 5% level (1.3380<3.76). In other words, this trace test result does not reject the null hypothesis that these two variables are not cointegrated. Since the rank is equal to one which is greater than zero and less than the variables, the series are cointegrating among the variables. That is, there is long term relationship between FDI and economic growth in Botswana.

4.3 Granger Causality Tests

The study employs the error-correction-based causality test, since it captures both the short run and long run dynamics. Having confirmed the existence of the long-run relationships been FDI and real GDP per capita, the next step is to examine the Granger-causality between the two variables. The direction of the Granger-causality in this case can be tested by using the following model [25,26].

$$\Delta In\text{RGDPG} / N_t = \phi_0 + \sum \phi_{1i} \Delta In\text{RGDPG} / N_{t-i} + \sum \phi_{2i} \Delta In\text{FDI}_{t-i} + \text{ECM}_{t-1} + \mu_t \quad (8)$$

$$\Delta In\text{FDIt} = \delta_0 + \sum \delta_{1i} \Delta In\text{FDI}_{t-i} + \sum \delta_{2i} \Delta In\text{RGDPG} / N_{t-i} + \text{ECM}_{t-1} + \mu_t \quad (9)$$

where ECM_{t-1} = the lagged error-correction term obtained from the long-run equilibrium relationship.

Table 4 provides the results of the pair wise analysis. Significant probability values denote rejection of the null hypothesis.

From Table 4, since neither of the null hypotheses is rejected, there is no Granger - causality in either direction between FDI and economic growth in Botswana. Thus, our results cannot confirm that FDI is influencing economic growth. The results are in line with the findings by Geijer [5].

5. CONCLUSION

FDI is regarded as important driver of economic growth. The widespread belief is that FDI facilitates economic growth. This has made attraction of FDI an important element of the formulation of any economic policy, especially in the developed world. However, empirical evidence reveals that the relationship is not straightforward. In some cases, FDI does not lead to an improvement in economic growth. It is therefore imperative for a country like Botswana which is prioritizing attraction of FDI, to determine whether FDI certainly leads to economic growth.

The paper investigated the relationship between FDI and economic growth in Botswana. Using Johansen cointegration test applied on a dynamic model, we found out that there is a long-term term relationship between FDI and economic growth in Botswana. However, using the Granger causality tests, we were not able to confirm whether it is the FDI that is spurring economic growth or it is economic growth that is promoting FDI inflows. Nevertheless, the fact that there is a significant relationship between economic growth and FDI imply that both affect each other in one way or another. Botswana should therefore continue to create conditions that attract FDI in order to influence economic growth. At the same time Botswana should continue to improve the economy so as to attract FDI which will in turn help to further grow the economy.

Further research could use time series models like vector autoregression model (VAR), to test linear relationship between FDI and economic growth, including controls variables like investment (as a percentage of GDP) and human capital formation. Furthermore, FDI could be split into different categories, like Chinese and South African investments, in determining its impact on economic growth.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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