

## **ECONOMETRIC ANALYSIS OF THE IMPACT OF FOREIGN DIRECT INVESTMENT ON ECONOMIC GROWTH IN NAMIBIA: EVIDENCE FROM ANNUAL DATA**

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### **—Abstract—**

The driving objective of the study was to measure in quantitative terms the influence of foreign direct investment on economic growth through cointegration techniques. Namibia was used as a case study. Annual dataset stretching from 1990 to 2014 was also applied. The imperative findings arising from the study constitutes the following: The study found long-run relationships among all the variables under consideration in the econometric model. The estimated long-run equation also indicates a positive association between the explanatory variables and real gross domestic product. In particular, net foreign direct capital was found to have a stronger influence on economic growth compared to openness and real foreign exchange rate. Correspondingly, a unidirectional relationship running from real exchange rate to net foreign direct investments was found. In addition, amongst the three explanatory variables used in the model, openness and net foreign direct investment contributed more towards innovations in economic growth during the forecast horizon compared to real exchange rate variable. The research paper concludes by creating opportunities for further investigations.

**Key Words:** *Co-integration, economic growth, innovation*

**JEL Classification:** C13, C20, F10, F21, 040

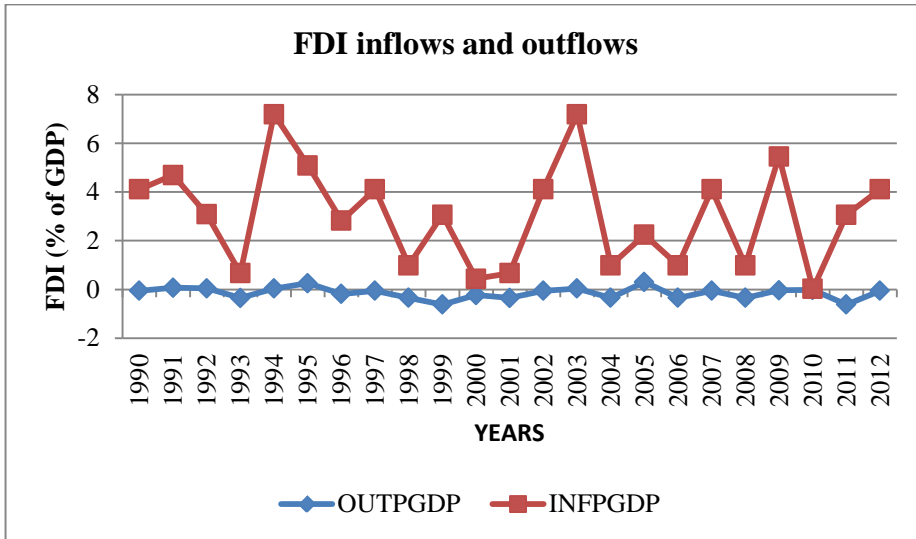
## 1. INTRODUCTION

A burning pragmatic question facing development economists in today's modern economies concerns the influence of foreign direct investment (FDI) on the economic performance of less-developed countries (LDCs). Indeed, the empirical literature succinctly acknowledges the potential benefits arising from FDI on the part of the host country. Biswas (2002) points out the following as constituting the benefits of FDI on the part of host countries: It improves the competitiveness of the host countries' economies in the international arena, as well as better access to global markets. Further, FDI improves the quality of products and processes across sectors. Besides, profits generated by FDI contribute to corporate tax revenues of the host country. Employment opportunities are created, especially in sectors that are heavily driven by labour intensive technologies. The agriculture sector is a case in point. In addition, FDI in manufacturing will in most cases boost the level of productivity in the local economy.

Also, contributing to this discussion the Bank of Namibia (2006) maintained that FDI allows the transfer of technology, particularly in the form of capital inputs, which cannot be achieved through financial investments or trade in goods and services. Upon the attainment of independence in 1990, the Namibia Investment Centre (NIC) was established under the Foreign Investment Act No.27 of 1990 specifically to promote, attract, encourage and facilitate FDI to Namibia. Indeed, this investment centre has so far succeeded in attracting a number of FDIs to Namibia, especially through the export processing zones scheme of the country.

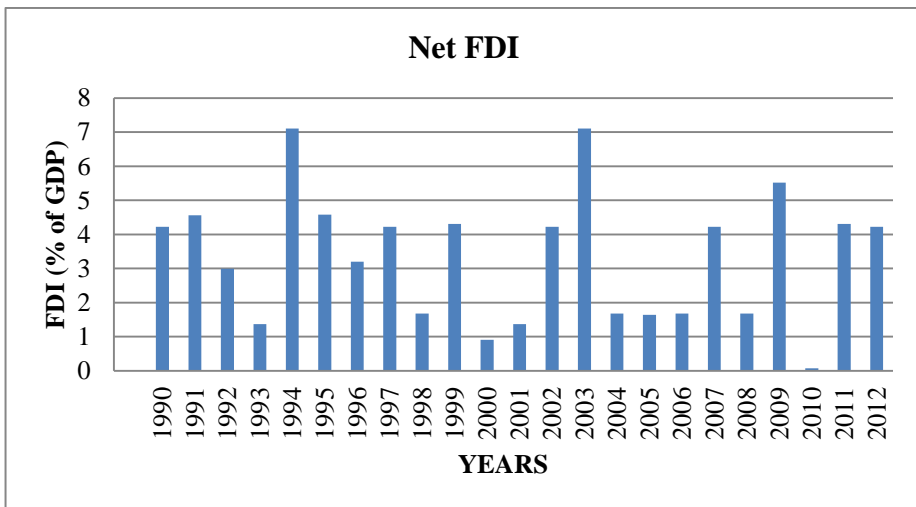
Graphs 1 depicts Namibia's FDI inflows and outflows for the period 1990 to 2012, while graph 2 reflects net FDI in Namibia for the same period.

**Graph 1 DI inflows and outflows in Namibia 1990 to 2012**



Source: Author’s construct from Namibia statistical agency bulletin (2013)

**Graph 2: Net FDI in Namibia, 1990 to 2012**



Source: Author’s construct from Namibia statistical agency bulletin (2013)

As examination of graph 1 reveal that FDI outflows as a percentage of gross domestic product (GDP) were more stable compared to FDI inflows during the period under review. In particular, there was a rapid increase in FDI inflows

between the periods 2000 and 2003. This was ascribed mainly to the increased borrowing on the part of subsidiaries from their parent companies abroad. The establishments of the Ramatex manufacturing company as well as the Scorpion zinc mine also contributed significantly to the rise in FDI inflows to Namibia between the years 2000 and 2003. In a dissimilar fashion, FDI outflows from Namibia between 1990 and 2012 in most cases were negative. This was principally due to the fact that investors generally preferred to reinvest their profits in Namibia instead of taking it out to other destinations during the period under review. Further, net FDI in Namibia during the period under consideration as presented in Graph 2, displays many fluctuations. In particular, the years 1993, 1998, 2000, 2001, 2004, 2005, 2006 and 2008 recorded low net FDI flows, while the years 1990, 1991, 1992, 1994, 1995, 1996, 1997, 1999, 2000, 2003, 2007, 2009, including 2011 and 2012 registered high net FDI flows. A combination of developments in the domestic and international fronts contributed to these fluctuations in net FDI in Namibia during the period under scrutiny (Government of Namibia, 2012:87-131).

Despite the huge amount of FDI that Namibia has been receiving since its independence in March 1990, the exact impact of these capital flows on the country's economic performance is still opened to speculation. Therefore, this study sets to investigate whether FDI has made any impact on economic growth in Namibia for the period 1990 to 2014. The remaining part of this research article is structured in the following manner. Section 2 presents the empirical literature, while section 3 details data and methodology. Section 4 concerns the analysis of econometric results, while section 5 concludes and directs on future research opportunities.

## **2. LITERATURE REVIEW**

Existing empirical literature on FDI-growth nexus is somewhat enormous. This study makes an attempt to review a few of such empirical studies in a chronological and selective fashion.

Li and Liu (2005) assessed the relationship between FDI and economic growth through the application of co-integration procedures and found the following. Firstly, the authors found a direct relationship between FDI and growth. Secondly, a negative relationship was observed, when FDI was regressed over existing technological gap between the source and host economy in the face of an increased sample size.

Also, contributing to the existing literature Blonigen and Wang (2005) using two samples drawn from developed and developing countries estimated the impact of FDI on growth. The authors found evidence of a positive connection between FDI flows and growth for developing countries, while the developed world presented a contrary result. This result is very surprising considering the widely acknowledged contribution of FDI in the industrialization process of the developed countries.

In a related study, Ayanwale (2007) empirically analysed the determinants of FDI using Nigeria as a laboratory test centre. The author combined both single and simultaneous equations to carry out the inquiry. The study found market size, infrastructural development and responsive macroeconomic policies as the main inducing-factors of FDI to Nigeria. The author also found a positive connection between FDI and growth in Nigeria. The use of a three stage least squares (3SLS) technique would have potentially improved upon the results obtained by the study, at least from an econometric perspective.

Vu and Noy (2009) examined the relationship between FDI and growth for selected developed countries within a sectoral framework. More elaborately, the authors attempted to find out, if each of the sectors identified for purposes of the study has a direct link with FDI. The study found conflicting results across countries and economic sectors. This result reinforces the outcome of the research work of Blonigen and Wang (2005).

Karimi and Zulkornain (2009) estimated the causal relationship between FDI and growth in Malaysia by employing econometric time series approaches. The study found a positive and significant relationship between these two variables. Indeed, the study found that FDI could be used to explain the growth pattern that has taken place in the economy of Malaysia over time. Therefore, the need for Malaysia to pay particular attention to FDI cannot be overstressed.

Ruxanda and Muraru (2010) investigated the possibility of an endogenous relationship between FDI and economic performance in the Romanian economy within the framework of a simultaneous equation model. The study found a bidirectional relationship between FDI and economic. This implies that FDI can lead to economic growth and vice versa.

Chaitanya and Tamazian (2010) assessed the causal link between FDI and growth for twenty two selected Latin American countries covering the period stretching from 1980 to 2006. The authors made use of econometric time series approach in probing into this relationship. The findings of the study indicate a positive

relationship between these two variables as suggested by the correlation coefficient value. Correspondingly, the two variables failed to pass the statistical significance test, which could be interpreted to imply a weak link between FDI and growth in the various economies used for the study.

Emin (2011) explored the possibility of a long-run relationship among economic growth, FDI, trade and inflation for Turkey using a macroeconomic time series datasets covering the period 1970-2006. The findings imply that FDI, trade surplus and inflation have both positive and statistical significant impact on economic growth.

Agrawal and Khan (2011) analysed the impact of FDI on economic growth using five selected countries. The study made use of panel data for the period 1993-2009 and obtained the following findings: Firstly, the study found that FDI indeed promotes economic growth. Secondly, a 1 percent rise in FDI would lead to a 7 percent increase in economic growth across the five countries investigated.

Farkas (2012) tested the FDI-growth nexus for selected developing countries for the period of 1975-2000 by employing co-integration methods. The result indicates that FDI had a positive and significant influence on economic growth over the period covered by the study. The study, however maintained that the extent of the impact of FDI on economic growth would depend on the level of a country's human capital development, as well as developments occurring in its financial markets. The study also suggested that FDI should be seen as a complementary variable to other sources of growth in developing countries.

Ray (2012) attempted to measure the relationship between FDI and economic growth for India for the period 1990 to 2011 by applying co-integration procedures. The findings suggest a bidirectional relationship between FDI and economic growth. There is a possibility that, the study would have potentially obtained a superior result from an econometric point of view, if the datasets used were increased to cover a longer period of time.

Iamsiraroj and Doucouliagos (2015) investigated the success of economic growth in attracting FDI for a number of countries cutting across developed and developing countries. The authors applied meta-regression technique to 946 estimates from 140 empirical studies. The study attained the following results: Firstly, a robust positive association between growth and FDI was found. In particular, significantly larger correlations were established for single country case studies in relation to cross-country analysis. Furthermore, it also seems that

growth is more associated with FDI in developing countries compared to developed countries.

It is pertinent to note that, while most of the existing literatures that have been reviewed so far suggest a positive relationship between FDI and economic growth, a few of them did present conflicting and, indeed, inconsistent results. In this study, an attempt is made to investigate the FDI-growth nexus for Namibia by applying co-integration methods.

### 3. DATA AND METHODOLOGY

The following served as vital sources for the gathering of macroeconomic data that were used in this study: The Bank of Namibia’s statistical publications, the Namibia Statistical Agency’s Bulletins, the World Bank statistical publications, as well as the Namibia’s National Planning Commission’s bulletins. The annual macroeconomic data used in the study stretched from the period 1990 to 2014. The datasets used in the estimation process have been transformed into their respective natural logarithms so as to enable the determination of elasticity values. Further, all the data used in the study have been deflated through the employment of appropriate and relevant deflators so as to control the influence of price disturbances.

The study primarily estimated the impact of FDI on Namibia’s economic performance. Based on empirical literature, theoretical economic knowledge and the driving objective of the study, the following variables are included in the econometric model for purposes of estimation: Real gross domestic product (RGDP), which serves as the dependent variable, while real exchange rate (RER), openness index (OPI) and net foreign direct investment (NFDI) are used as the explanatory variables. In consideration of this, the empirical model to be estimated can be written in its general form as:

$$RGDP_t = (RER_t, OPI_t, NFDI_t) \dots\dots\dots(1)$$

In specific terms, the equation (1) can be rewritten as:

$$\ln RGDP_t = b_0 + b_1 \ln RER_t + b_2 \ln OPI_t + b_3 \ln NFDI_t + U \dots\dots\dots(2)$$

Where:

$b_0$  = numerical constant

$b_1, b_2$  and  $b_3$  = coefficients of the regressors

$RGDP_t$  = regressand

$RER_t, OPI_t$  and  $NFDI_t$  = regressors

$t$  = time period

$\ln$  = natural logarithm and  
 $U$  = disturbance term

RGDP is a macroeconomic measure of the value of economic output in respect of a country for a given period adjusted for price changes. RER refers to the price, strength or value of a local currency in relation to another country's currency adjusted for price changes, while NFDI is used to describe the difference between capital inflows and outflows. OPI refers to the sum of a country's export and import of goods and services divided by its gross domestic product at a given time period.

The study made use of cointegration procedures involving the following: Unit root tests, cointegration tests, error correction modelling, diagnostic tests, Granger-causality tests, and forecast error variance decomposition analysis. Unit root tests are performed so as to check for the presence of unit roots or stationarity in the time series datasets used in the study. The use of non-stationarity time series data in the estimation process would potentially produce spurious results, hence the technical necessity of these tests. The study employed the augmented Dickey-Fuller (ADF) procedures for this purpose due to its simplicity and popularity. Cointegration implies the existence of long-run relationships among the variables used in a time series econometric model. A number of procedures are recommended in the literature to test for cointegrating relationships. The rule is that the presence of, at least, one co-integrating vector or relation in a model implies the existence of long-run relationships among the variables used in the estimation process. Indeed, if this is the case, the study can then proceed with the estimation of the error correction model. This study made use of the Johansen cointegration test which combines Trace and Max-Eigen statistics. The use of this procedure is mainly due to its popularity in time series econometric studies. Once cointegrating relation among the variables is established, the study can proceed to estimate the long-run equation as well as the short-run error correction model. The error correction model (ECM) is usually derived from the estimated long-run equation.

Specific tests to determine the presence of serial correlation, conditional heteroscedasticity, as well as finding out if the model is normally distributed usually follows upon estimating the long-run equation. These tests are to ensure that the estimated model fulfils certain requirements. After such tests, Granger-causality test can follow. Causality denotes a correlation between the current value of one variable and the past values of others. The impulse response



functions are used to produce the time path of the dependent variables in the system, to shocks from all the explanatory variables. Assuming that the system of equations is stable any shock should deteriorate to zero. Similarly, an unstable system would yield an explosive time path.

The forecast error variance decomposition analysis is an alternative method to the impulse response functions for examining the effects of shocks in respect of the dependent variables. This technique determines how much of the forecast error variance for any variable in a system is accounted for by changes to each explanatory variable over a succession of time horizons. In most cases, own series shocks do account for most of the error variance. It is also significant to note that the forecast error variance decomposition, as well as the impulse response functions perform similar role in time series econometric studies.

#### 4. DISCUSSION OF ECONOMETRIC RESULTS

The discussion of results followed the following sequence: Unit root tests, co-integration tests, and estimation of the long-run equation, diagnostic checks for autocorrelation, heteroscedasticity and normality, causality tests, as well as the forecast error variance decomposition analysis.

The empirical estimation process regarding the study began with testing for unit roots. In this regard, the study employed the augmented Dickey-Fuller (ADF) procedures for this purpose. Table 1 summarises the unit root test results.

**Table 1: Unit root tests: Augmented Dickey-Fuller (ADF) in Levels and First Difference.**

Variables	Levels	First Difference	Remarks
	ADF stat	ADF stat	
lnRGDPt	-0.23289	-4.69576**	I (1)
lnNFDIt	-5.67807**	-4.98506**	I (0)
lnRERt	-4.29942**	-7.50000**	I (0)
lnOPIt	-1.37016	-3.82002**	I (1)

Note that \*\* implies rejection of the null hypothesis at the 5 percent level.

Source: Author's compilation.

Upon inspection of table 1, it was observed that net foreign direct investment and real exchange rate attained a stationary status in levels, while real GDP and openness index only became stationary after first differencing.

Next, the study tested for co-integration. It is essential to establish whether the variables have some long-term relationships. That is, the existence of a long-run

equilibrium to which an economic system converges over time. In this regard, the study made use of the Johansen test. Table 2 displays the co-integration test results.

**Table 2: Johansen cointegration test**

Maximum Eigen test				Trace test			
H <sub>0</sub> : rank = r	H <sub>a</sub> : rank =	Statistic	95% Critical value	H <sub>0</sub> : rank = r	H <sub>a</sub> : rank =	Statistic	95% Critical value
r = 0	r = 1	31.24496	24.15921	r = 0	r = 1	51.10040	40.17493
r ≤ 1	r = 2	14.13435	17.79730	r ≤ 1	r = 2	19.85544	24.27596
r ≤ 2	r = 3	5.696695	11.22480	r ≤ 2	r = 3	5.721094	12.32090
r ≤ 3	r = 4	0.024400	4.129906	r ≤ 3	r = 4	0.024400	4.129906

Note: Both Maximum-Eigen test and Trace test shows one co-integrating equation at the 5 percent level.

Source: Author’s construct.

It is apparent from the results reported in Table 2 that the variables under investigation are cointegrated. Therefore, there is every reason to suspect the existence of a long-run relationship among the four variables under investigation. Afterwards, the study proceeded with the estimation of the long-run equation which yielded the following result:

$$\Delta \ln \text{RGDP} = -19.070 + 12.657 \Delta \ln \text{NFDI} + 5.123 \Delta \ln \text{OPI} + 4.353 \Delta \ln \text{RER} \dots \dots \dots (3)$$

The equation (3) confirms a long-run relationship among the dependent and independent variables used in the study. Indeed, all the independent variables, namely, net foreign direct investment, openness index and real exchange rate were positively related to real gross domestic product. A further scrutiny of the estimated model suggests that a 10 percent increase in net foreign direct investment leads to approximately 12.7 percent rise in economic growth, while a 10 percent increase in openness is also expected to lead to approximately 5 percent jump in economic growth. Similarly, a 10 percent increase in real exchange rate will result to approximately 4 percent rise in economic growth. This is a rather surprising result. When a country’s national currency becomes expensive to purchase, the general expectation is that its exports will be negatively affected, since they will be expensive and vice versa.

The study also conducted a diagnostic test to check for serial correlation and conditional heteroscedasticity. The results confirm the absence of serial correlation and conditional heteroscedasticity. Besides, the model was also found to be normally distributed. Therefore, the econometric model employed in the

study can be considered to be robust from an econometric point of view. The results are reported in Table 3.

**Table 3: Diagnostic checks**

Test	Null hypotheses	t-statistic	Probability
Durbin-Watson stat	No serial correlation	2.0124	1.0000
Jarque-Bera (JB)	There is normality	1.7075	0.4258
White (Chi-square)	No conditional heteroscedasticity	4.1453	0.2465

Source: Author's construct.

Next, the study reports on the Granger-causality tests. The Granger-causality results are displayed in Table 4.

**Table 4: Pairwise Granger-causality test results**

Null Hypotheses	Obs	Prob.
LOGRER does not Granger Cause LOGRGDP	21	0.3688
LOGRGDP does not Granger Cause LOGRER	21	0.1396
LOGNFDI does not Granger Cause LOGRGDP	21	0.3948
LOGRGDP does not Granger Cause LOGNFDI	21	0.2652
LOGOPI does not Granger Cause LOGRGDP	21	0.1824
LOGRGDP does not Granger Cause LOGOPI	21	0.1734
LOGNFDI does not Granger Cause LOGRER	21	0.1088
<b>LOGRER does not Granger Cause LOGNFDI</b>	<b>21</b>	<b>0.0481**</b>
LOGOPI does not Granger Cause LOGRER	21	0.6013
LOGRER does not Granger Cause LOGOPI	21	0.6043
LOGOPI does not Granger Cause LOGNFDI	21	0.2447
LOGNFDI does not Granger Cause LOGOPI	21	0.1203

Note that \*\* means the rejection of the null hypothesis at the 5 percent level.

Source: Author's computation.

Upon inspection of Table 4, a unidirectional relationship running from real exchange rate to net foreign direct investment was found. None of the remaining pairs demonstrated any form of causal relationship between themselves

Next, the study reports on the forecast error variance decomposition. The variance decomposition results are displayed in Table 5.

**Table 5: Forecast error variance decomposition**

Variance Decomposition of LOGRDGP				
PERIOD	LOGRGDP	LOGRER	LOGOPI	LOGNFDI
1	100	0	0	0
2	79.988	0.998	13.687	5.325

3	69.673	5.253	21.515	3.556
4	69.795	5.897	18.615	5.690
5	71.576	5.411	15.719	7.292
6	73.279	4.875	14.153	7.690
7	73.084	4.655	14.854	7.405
8	72.945	4.252	15.938	6.864
9	72.724	4.309	15.853	7.113
10	73.644	4.028	13.976	8.350

Source: Author's construct.

Table 5 presents forecast error variance decompositions for each variable in the model over a 10-period forecast horizon. The results depict that consistently, economic growth itself accounted for most of the changes or innovations that occurred with respect to economic growth for the entire period under consideration. Indeed, the results show that in the first period the fluctuations in economic growth are 100 percent purely driven or explained by economic growth itself. Amongst the three explanatory variables used in the model, openness and net foreign direct investment consistently contributed more towards changes in economic growth during the forecast horizon compared to real exchange rate.

## 5. CONCLUSION AND POLICY IMPLICATION

Many developing countries are increasingly realising the importance of attracting FDI in the growth process, and, indeed, have made this as part and parcel of their developmental desires. The study examines the influence of FDI on growth, using Namibia as a case study. Cointegration methods and annual data for the period 1990 to 2014 have been employed as well.

The study found long-run relationships among all the variables under consideration in the econometric model. The estimated long-run equation also indicates a positive association between the explanatory variables and real gross domestic product. In particular, net foreign direct capital was found to have a stronger influence on economic growth compared to openness and real foreign exchange rate. Correspondingly, a unidirectional relationship running from real exchange rate to net foreign direct investments was found. In addition, amongst the three explanatory variables used in the model, openness and net foreign direct investment contributed more towards changes in economic growth during the forecast horizon compared to real exchange rate variable. Indeed, these findings are in agreement with the outcome of the studies of Chaitanya and Tamazian (2010) and Iamsiraroj and Doucouliagos (2015) in some ways.

The role of FDI in the promotion of growth in Namibia seems to have been exaggerated over the years considering the findings of this study. Therefore, the need for policymakers to explore other means of catalysing Namibia's process of economic growth, while correspondingly exercising caution in the selection of foreign direct investment opportunities cannot be overemphasised.

Further research should direct its attention to the following: Firstly, causality analysis between FDI and Namibia's growth should be investigated. Secondly, various econometric models should be employed in future studies. Thirdly, a sectoral impact analysis could be useful in illuminating more information about FDI and economic growth in Namibia.

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