On The Causal Links Between Foreign Direct Investment And Economic Growth In Nigeria, 1970-2008: An Application Of Granger Causlity And Co-Integration Techniques

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În articol se examinează legăturile cazuale dintre investiţiile directe străine şi creşterea economică din Nigeria (anii 1970-2008). S-a folosit cauzalitatea Granger şi tehnica statistică de cointegrare Johansen pentru analiza relaţiilor de cauzalitate dintre variabile

Abstract

This paper examines the causal links between foreign direct investment and economic growth in Nigeria during the period 1970-2008. The authors employed the Granger causality and Johansen co-integration techniques to analyze the relationship and direction of causality between the variables. The Johansen co-integration statistic indicates that the variables are co-integrated, and the granger causality statistic reveals a unidirectional causality running from foreign direct investment to economic growth.

Keywords: foreign direct investment, economic growth, granger-causality, co-integration.

I. Introduction

Although economic theory points to a positive relationship between foreign direct investment and economic growth, the direction of causality between the variables has continued to generate controversy among scholars and economists alike. Understanding the causal relationship between economic variables is very important because it provides useful information on the variables government and its agencies need to control in order to achieve desired levels of targeted variables (Sajid and Sarfraz, 2008). For instance, if empirical analysis indicates that causality runs from foreign direct investment to economic growth, then government and policy makers would employ strategies to attract foreign investment so as to promote economic growth. On the other hand, if causality is found to run from economic growth to foreign direct investment, government would employ policies that accelerate economic growth in order to encourage foreign investment inflows. Recently, endogenous growth theorists emphasize the importance of external factors on economic growth (see Barro, 1991; Barro and Sala-i-Martin, 1995). The supporters of this school of thought opine that factors such as foreign direct investment helps to fill saving gap (difference between saving and investment) in developing countries and promotes capital formation. In addition, foreign direct investment enhances transfer of technology and skills, and creates job opportunities, thus accelerating economic growth in the host countries. This school concludes that foreign direct investment facilitates economic growth. Some empirical studies support the claim that foreign direct investment promotes and causes economic growth (see Ericsson and Irandoust, 2001; Oscar Eddy Kiiza, 2007; Sumei Tang et al., 2008; and Balamurali and Bogahawatte, 2008).

On the other hand, some scholars argue that higher economic growth encourages foreign direct investment inflows in the host countries. They suggest that economic growth can lead to the inflow of higher foreign investment, especially when foreign investment is seeking consumers' market or when economic growth results to economies of scale. In fact, authors like Veugelers (1991), Trevino et al. (2002), Chowdhury and Mavrotas (2005) and Obida Gobna Wafure and Abu Nurudeen (2009) confirmed that economic growth encourages inflows of foreign direct investment.

In Nigeria, studies on foreign direct investment abound (see Obadan, 1982; Ekpo, 1997; Aremu, 1997; Nyong, 2002; Akinlo, 2004; Risikat, 2007; and Obida Gobna Wafure and Abu Nurudeen, 2009). However, empirical studies on the direction of causality between the variables remain scanty. Thus, our paper investigates the causal relationship between foreign direct investment and economic growth. This paper is organized as follows. Section I is the introduction, while section II contains the literature and theoretical background. Section III consists of model estimation and interpretation of results, while section IV is for conclusion.

II. Literature review and theoretical background

In this section, we survey and discuss the relevant literature on foreign direct investment-economic growth relationship. Theoretically, endogenous growth models emphasize the importance of external factors like foreign direct investment on economic growth (see Barro, 1991; and Barro and Sala-i-Martin, 1995). They argue that foreign direct investment fills the saving gap and enhances capital formation, thereby accelerating economic growth. On the other hand, some scholars opine that higher economic growth helps to attract foreign direct investment, especially if foreign investment is seeking consumers' markets or if growth leads to economies of scale. Many empirical studies have been done to ascertain the direction of causality between foreign direct investment and economic growth. For instance, Ilhan Ozturk and Huseyin Kalyoncu (2007) examined the effect of FDI on economic growth of Turkey and Pakistan during the 1975-2004 period. The authors employed both Engle-Granger co-integration and Granger causality techniques to analyze the direction of causality between FDI and economic growth. The econometric results indicated that it is GDP that causes FDI in the case of Pakistan, while bi-directional causality was reported between the variables for Turkey. Moreover, the results revealed that the variables are co-integrated for both Pakistan and Turkey. On their part, Magnus and Fosu (2007) investigated the causal relationship between FDI and GDP growth for Ghana for the pre- and post-SAP periods. The authors used the Toda-Yamamoto (1995) Granger no-causality to analyze data for the period 1970-2002. The results did not confirm the existence of causality between FDI and economic growth for the entire period as well as the pre-SAP period. Surprisingly, it was shown that FDI granger caused GDP growth in the post-SAP period. In their paper, Hansen and Rand (2004) investigated the direction of causality between FDI and GDP for a sample that consist 31 developing countries covering the 1970-2000 period. The authors reported the following findings. Firstly, a bi-directional causality exists between FDI/GDP ratio and the level of GDP. Secondly, FDI was shown to have a lasting effect on the level of GDP, while GDP has no long run impact on the FDI/GDP ratio. They therefore concluded that FDI causes growth through knowledge transfers and adoption of new technology. Emrah Bilgiç (2007) studied causal relationship between FDI and economic growth in Turkey, between the period 1992:2 and 2006:3. The results of the Johansen co-integration and granger Causality tests did not confirm the existence of any causal relationship between FDI and economic growth in Turkey.

Sridharan et al. (2009) analyzed the causal link between foreign direct investment and economic growth among the BRICS countries. The results revealed a bi-directional causal relationship between growth and foreign direct investment for Brazil, Russia and South Africa, while unidirectional causality runs from

foreign direct investment to growth in the case of India and China. Oscar Eddy Kiiza (2007) investigated the causal relationship between foreign direct investment and economic growth in Uganda. The author's results indicated that foreign direct investment granger causes economic growth, and that the variables are positively related. Melina Dritsaki et al. (2004) examined the relationship between Trade, foreign direct investment and economic growth in Greece between 1960 and 2002. The co-integration tests confirmed the existence of a long-run equilibrium between the variables. Moreover, the results of the granger causality test illustrated that causality exists between the variables. The author submitted that economic growth, trade and foreign direct investment appear to be mutually reinforcing under the open-door policy. Chowdhury and Mavrotas (2005) investigated the direction of causality between foreign direct investment and economic growth for Chile, Malaysia and Thailand between 1969 and 2000. The results of the Toda-Yamamoto test revealed that economic growth granger causes foreign direct investment in Chile, while a bi-directional causal relationship exists between economic growth and foreign direct investment for both Malaysia and Thailand.

Abdus Samad (2009) analyzed the relationship between foreign direct investment and economic growth for 19 developing countries of South-East Asia and Latin America. The author employed the co-integration technique, Granger causality test and Error Correction Model (ECM) to analyze the variables. The author discovered a unidirectional causality that runs from economic growth to foreign direct investment for five countries in Latin America and one country in East and South East Asia. In addition, the author reported a two-way causal relationship between foreign direct investment and economic growth for seven countries (two from Latin America and five from East and South East Asia). Lastly, a unidirectional short run causal link that runs from economic growth to foreign direct investment was found in four countries (one from Lain America and three from East and South East Asia). Sumei Tang et al. (2008) examined the causal link between foreign direct investment, domestic investment and economic growth in China over the period 1988-2003. The authors confirmed a unidirectional causality that runs from foreign direct investment to domestic investment and to economic growth. Furthermore, they discovered a bi-directional causality between domestic investment and economic growth. The authors concluded that foreign direct investment has helped in capital formation, in addition to accelerating economic growth via complementing domestic investment in China. Balamurali and Bogahawatte (2004) examined the relationship between foreign direct investment and economic growth in Sri Lanka over the 1977-2003 period. The econometric results showed a bi-directional causal relationship between foreign direct investment and economic growth. In addition, the results illustrated that foreign direct investment has

a lasting impact on economic growth. Zhang (2002) estimated the impact of foreign direct investment on efficiency and productivity growth in a cross-region regression framework, taking into consideration China's provincial data from 1984 to 1997. The author discovered a bidirectional causality between foreign direct investment and productivity growth across the regions in China.

Ericsson and Irandoust (2001) analyzed the effect of foreign direct investment on output and total factor productivity growth in the host economy. The results of the granger causality test confirmed a bi-directional causality for Sweden, and a uni-directional causality running from foreign direct investment to growth in Norway. However, the authors could not confirm any causal link for both Finland and Denmark. Hansen and Rand (2006) investigated the direction of causality between foreign direct investment and gross domestic product in a sample of 31 developing countries for a period of thirty one years. The authors observe a bi-directional causal relationship between foreign direct investment-gross domestic product ratio and the gross domestic product. Dierk Herzera et al. (2008) examined the claim that foreign direct investment has a direct positive effect on economic growth in 28 developing countries. Unfortunately, the authors could not confirm the existence of a uni-directional positive causality running from foreign direct investment to economic growth in all the countries studied. Kumar and Pradhan (2002) investigated the relationships between foreign direct investment, economic growth and domestic investment for a sample of 107 developing countries between 1980 and 1999. The causality tests show that, whereas the direction of causation is not clear for most countries, causality actually runs from economic growth to foreign direct investment in a considerable number of countries.

In Nigeria, Olusegun Omisakin et al. (2009) investigated causal and long-run interrelationships among foreign direct investment, trade openness and growth between 1970 and 2006. The authors employed the Toda-Yamamoto non-causality test and auto regressive distributed lag techniques to analyze the relationships among the variables. The results indicated that a unidirectional causality runs from foreign direct investment to output growth.

III. Model estimation and interpretation of results

This paper employs the Granger causality and Johansen co-integration techniques to analyze the relationship between economic growth (RGDP) and foreign direct investment (FDI). The econometric model expresses economic growth as a function foreign direct investment. Thus, the model is specified as:

$$RGDP = \alpha_0 + \alpha_1 FDI + U_1 \quad (1)$$

The second model expresses foreign direct investment (FDI) as a function of economic growth (RGDP). Thus, the model is specified as:

$$FDI = \beta_0 + \beta_1 RGDP + U_2 \quad (2)$$

The paper used annual data (time series) that covers the period 1970-2008. The data were collected from the Central Bank of Nigeria statistical bulletin (2009). The variables are measured as follows. Economic growth (RGDP) is captured by the real gross domestic product growth. Real gross domestic product in turn, is measured as gross domestic product divide by the consumer price index (CPI). Foreign direct investment (FDI) is measured as the cumulative foreign private investment inflows.

The equations above are analyzed, using the causality and co-integration tests. Firstly, we examined whether the series are stationary or not. To achieve this purpose, the authors employed the Augment Dicker-Fuller (ADF) statistic and the Phillips-Perron (PP) statistic. The results of the stationarity tests are presented in tables 1 and 2.

Augmented Dicker-Fuller Statistic for Stationarity Tests

Table 1

Variables	ADF-Statistic	Critical values	Order of integration
FDI	-10.54777 (0.0000)	1% = -2.653401 5% = -1.953858 10% = -1.609571	Stationary at second difference
RGDP	-4.880354 (0.0000)	1% = -2.647120 5% = -1.952910 10% = -1.610011	Stationary at level

The Augmented Dicker-Fuller statistic illustrates that foreign direct investment is stationary at second difference, while economic growth is stationary at level.

Phillips-Perron Statistic for Stationarity Tests

Table 2

Variables	PP-Statistic	Critical values	Order of integration
FDI	-3.444772 (0.0013)	1% = -2.650145 5% = -1.953381 10% = -1.609798	Stationary at first difference
RGDP	-4.902849 (0.0000)	1% = -2.647120 5% = -1.952910 10% = -1.610011	Stationary at level

The Phillips-Perron statistic reveals that foreign direct investment is stationary at first difference, while economic growth is stationary at level. Having conducted the stationarity tests, the authors employed the Granger-causality statistic to examine the direction of causality between the variables. The results of the granger causality tests are shown in the table below.

Results of Granger causality tests

Table 3

Pairwise Granger Causality Tests
Date: 02/02/10 Time: 12:39
Sample: 1977 2006
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
RGDP does not Granger Cause FDI	28	0.08437	0.91938
FDI does not Granger Cause RGDP		2.63422	0.09330

The results of the granger causality tests indicate that foreign direct investment granger-causes economic growth. Secondly, the results reveal that economic growth does not granger-cause foreign direct investment. Lastly, we employed Johansen co-integration statistic to perform the co-integration tests. The results of the co-integration analyses are shown in the table below.

Results of Johansen co-integration test

Table 4

Date: 02/02/10 Time: 12:41
Sample(adjusted): 1979 2006
Included observations: 28 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: FDI RGDP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.423063	20.58740	15.41	20.04
At most 1 *	0.169098	5.186800	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 2 cointegrating equation(s) at the 5% level
Trace test indicates 1 cointegrating equation(s) at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.423063	15.40060	14.07	18.63
At most 1 *	0.169098	5.186800	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 2 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates no cointegration at the 1% level

The co-integration tests confirm that foreign direct investment and economic growth are co-integrated. This implies that a long-run equilibrium or relationship exits between the variables.

IV. Conclusion

This paper examines the direction of causality between foreign direct investment and economic growth in Nigeria. The authors employed the granger-causality statistic to analyze the causal relationship between the variables. The empirical results confirm a unidirectional causality running from foreign direct investment to economic growth.

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Appendix 1: Foreign Direct Investment, Gross Domestic Product and Consumer Price Index

Years	Foreign Direct Investment (Nm)	Nominal Gross Domestic Product (Nm)	Consumer Price Index
1970	1,003.20	1,392.70	N.A
1971	1,322.80	1,735.80	N.A
1972	1,571.10	1,884.30	N.A
1973	1,763.70	2,252.50	N.A
1974	1,812.10	4,961.20	N.A
1975	2,287.50	5,530.90	N.A
1976	2,339.00	6,853.10	25.6
1977	2,531.40	8,099.90	29.6
1978	2,863.20	9,103.70	34.5
1979	3,153.10	11,095.90	38.5
1980	3,620.10	13,241.00	42.3
1981	3,757.90	12,675.90	51.2
1982	5,382.80	13,127.10	55.1
1983	5,949.50	14,293.20	67.9
1984	6,418.30	15,750.40	94.8
1985	6,804.00	18,049.30	100
1986	9,313.60	18,393.60	105.4
1987	9,993.60	27,358.30	116.1
1988	11,339.20	36,561.70	181.2
1989	10,899.60	55,410.50	272.7
1990	10,436.10	68,255.90	293.2
1991	12,243.50	80,128.20	330.9
1992	20,512.70	134,716.00	478.4
1993	66,787.00	175,251.10	751.9
1994	70,714.60	235,066.40	1,180.70
1995	119,391.60	493,982.00	2,040.40
1996	122,600.90	686,260.40	2,638.10
1997	128,331.80	715,165.80	2,863.30
1998	152,409.60	697,166.20	3,149.20
1999	154,188.60	816,333.70	3,357.60
2000	157,535.40	1,148,136.00	3,923.80
2001	162,343.40	1,197,270.80	4,268.10
2002	166,631.60	1,758,882.80	5,151.50
2003	178,478.00	2,148,243.20	5,493.30
2004	249,220.60	3,201,996.40	6,318.40
2005	269,844.70	4,078,498.80	7,446.40
2006	302,843.30	5,165,742.00	8,059.60
2007	364,008.50	5,538,294.60	N.A
2008	397,395.20	6,376,225.20	N.A

Source: Central Bank of Nigeria (2008)