CHAPTER NINETEEN

EVALUATING THE IMPACT OF FOREIGN DIRECT INVESTMENT ON ECONOMIC GROWTH AND ITS ENVIRONMENTAL FOOTPRINT IN NIGERIA

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Abstract
It is a known fact that foreign direct investment inflow stimulate economic growth of host economies, however, it also poses numerous challenges to the environment of the host countries. This study therefore evaluated the impact of foreign direct investment on economic growth and its environmental footprints in Nigeria for the period 1986 to 2022. The research employed the Autoregressive Distributed Lag (ARDL) bounds test to determine the relationship among the variables of interest. The study established a long-run relationship among the variables of interest. It was discovered that, in general, foreign direct investment caused an increase in the economic growth of Nigeria in both the short and long-run. The study also found a negative relationship between carbon emissions associated with foreign direct investment and economic growth in both the short and long-run period. On the basis of the findings, the study recommended that, the Nigeria government should invest more in critical sectors that can attract more foreign direct investment into the economy; research and development in the energy sector for alternative sources of energy should be reemphasized; and the regulatory institutions charged with the responsibility of implementing environmental laws should be strengthen to combat incidence of environmental damage due to foreign direct investment inflow and economic growth in the economy.

Introduction
Foreign Direct Investment (FDI) is one of the international sources of capital flow that has witnessed increased frequency due to economic globalization. It helps host countries' economies thrive but also leads to an astronomical rise in carbon emissions. Overall, global foreign direct

investment flows will grow by $718 billion in 2021, with developed economies accounting for nearly three-quarters of the total (United Nations Conference on Trade and Development UNCTAD, 2022). FDI, as one of the essential components of international transfers in the global economy, significantly impacts the environment of both developed and developing economies. Literature (Iamsiraroj, 2016; Kpoghul, Okpe & Anjande, 2020; Wang, Li & Wang, 2023) believed that FDI is an essential source of know-how, human capital and technological diffusion, and the productivity brought by these factors contribute to the economic growth of the host country through FDI inflows. On the other hand, economies with scarce capital and weak environmental regulations, such as Nigeria, India, Indonesia and South Africa, among others, depend majorly on non-renewable energy to attract FDI inflows in energy-intensive and carbon-intensive industries, and this often increases the consumption of non-renewable energy and consequently evoke high emission of pollutants in most of the host countries (Wang *et al*., 2023; Sarkodie & Strezov, 2019).

Theoretically, two arguments exist on the nexus between foreign direct investment- economic growth and its environmental footprint. The first is the pollution paradise hypothesis (see Malik *et al*., 2020; Aller *et al*., 2021; Ugur, 2022; Chandrika *et al*., 2022; and Wang *et al*., 2023) that views foreign direct investment as a potential determinant of carbon emission (CO2) in low-income economies. This hypothesis strongly supported the fact that foreign direct investment causes environmental degradation in the host countries where enterprises in pollution-intensive industries are set up in countries with low income and low environmental standards. On the other hand, the second argument championed by the pollution halo hypothesis (see Pazienza, 2019; Zubair, Samad & Dankumo, 2020; and Saqib *et al*., 2023) opined that foreign direct investment brings in a total package comprising of capital investment, managerial skills and technological development to the host country and therefore enhances standard production models and consequently environmental quality.

Foreign direct investment in Africa and Nigeria has increased with its expected package of spillovers, including technological innovations, employment, supply of foreign exchange, and carbon emission (CO2), among others. Over the years, foreign direct investment inflow to Nigeria, which is mainly into the oil and gas and the manufacturing sectors of the

economy, averaged 826.62 USD million from 1990, reaching an all-time high of 3084.90 USD million in the fourth quarter of 2012 and a record low of -1537.28 USD million in the second quarter of 2022. This represents a 90% drop in FDI inflow. Foreign direct investment as a contribution to Nigeria's Gross Domestic Product (GDP) has been low over the years from 1986 up to 2022, averaging 1.60%. The net inflow of FDI as a percentage of GDP reached an all-time high of 5.8% in 1994 and a record low of -0% in 2022 (National Bureau of Statistics NBS, 2022). The level of CO2 emissions has been on the increase globally, from 20,625,273kt in 1990 to 34,344,006kt in 2019 (World Bank, 2019). In Nigeria, the intensity of carbon (CO2) emission, according to the World Bank (2018), was 0.59 in 1990 and rose to 0.71 in 2014. Also, CO2 emissions that stem from the burning of fossil fuels and manufacturing of cement, including carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring in kilotons (kt) for 2020 were 111,978.10kt indicating a 6.33% decline from 2019 which was 119,544.10kt a 5.2% higher than 113,633.10kt in 2018 (World Bank, 2022).

One crucial and thought-provoking issue concerns the foreign direct investment-economic growth nexus and its potential deleterious consequences for the environment in Nigeria, where environmental laws are less strict. This is because foreign direct investment and economic growth occurs simultaneously with tendencies of rising environmental footprints. Therefore, the crux of this study is to know whether or not foreign direct investment inflows to Nigeria over the years have impacted economic growth, and if so, is there evidence of environmental footprint in the economy? In answering this question, the main objective of this research is to evaluate the impact of foreign direct investment on economic growth and its environmental footprints in Nigeria over the years.

The remainder of the paper is divided as follows: section 2 (two) discusses the literature review; Section 3 (three) presents the methodology; Section 4 (four) comprises the results and discussion of findings; and finally, section 5 (five) presents the conclusions and policy recommendations.

Theoretical and Empirical Review

The pollution haven hypothesis suggested that inflows of foreign direct investments are connected to a larger amount of carbon emission. This is because developed nations, in the urge for higher returns, most times invest in emerging economies with less stringent environmental rules or cheaper environmental levies, which often result in the relocation of pollution-intensive companies to developing countries such as Nigeria. When this happens, an increase in carbon emission in the countries hosting foreign direct investment-economic growth is to be expected. Literature established (see Ulucak, 2022; and Kayani *et al*., 2022) that foreign direct investment contributes to the economic growth of nations, but it considerably boosts carbon emissions in poorer countries with weak institutions and laxer environmental regulations. Multinational carbon-intensive corporations often lobby corrupt government institutions that are supposed to monitor their activities to weaken environmental rules and regulations (Ullah *et al*., 2021). Meanwhile, the pollution halo theory argues in favor of foreign direct investment-led growth. The theory suggests that foreign direct investment inflows bring cleaner and most innovative-efficient technology to the host economy, which is favorable and likely to reduce carbon emissions.

To unravel the evidence of environmental footprints given the foreign direct investment-led growth in Nigeria, the empirics for this study are both cross-country and country-specific. Le, Nguyen & Phan (2022) examined the impact of foreign direct investment and environmental pollution on economic growth in an emerging economy. Using annual data for the period 1986 to 2020 within the non-linear Autoregressive distributed Lag (ARDL) model framework. The study confirmed the asymmetric relationship between foreign direct investment, environmental pollution and economic growth in both the short and long run, as well as a long-run relationship between environmental pollution and economic growth. Also, the study established that there is evidence of the disproportionate impact of foreign direct investment on economic growth in the long run and a disproportionate impact of environmental pollution on the economy in both the short and long terms.

Huang *et al*. (2022) examined the impact of foreign direct investment inflows on carbon emissions, exploring the influence channels through the

moderating effects of economic development and regulatory quality. Using the Feasible Generalized Least Squares (FGLS) and heteroscedasticity and corrected errors among G20 economies. The study found that foreign direct investment inflows were positively associated with carbon emissions, and economic development and regulatory quality negatively contributed to the impacts of foreign direct investment inflows on carbon emissions. This suggests that although foreign direct investment inflows tend to increase carbon dioxide emissions, they are more likely to mitigate carbon emissions in countries with higher levels of economic development regulatory quality.

Ugur (2022) investigated the impact of foreign direct investment, energy consumption and economic growth on CO2 emissions in Turkey from 1974 to 2015. Using the ARDL model with structural breaks, the study found a long-run relationship between the variables. It indicated that foreign direct investment contributes positively to CO2 emissions, validating the pollution haven hypothesis. Economic growth had a significant positive relationship with CO2 emissions, whereas the impact of its squared on CO2 emission was also significant but negative, which confirms the Environmental Kuznet Curve (EKC) hypothesis. Energy consumption was also positively associated with CO2 emission, implying that a larger level of energy consumption leads to higher environmental degradation. Bildirici (2021) explored the relationship among terrorism, environmental pollution, foreign direct investment, energy consumption, and economic growth in China, India, Israel and Turkey for the period 1975 to 2017 within the framework of Pedroni, Kao and Westerlund co-integration tests. The study established that foreign direct investment contributed to the growth of gross domestic product and increased environmental pollution.

Ashraf, Rehman & Chaudhry (2020) examined the impact of foreign direct investment, urbanization, economic growth, and fossil fuel consumption on carbon emissions in 11 rising Asian economies. The study employed a panel analysis and ARDL/PMG model from 1990 to 2018 and found that in these growing Asian Countries, the desire to achieve economic growth, foreign direct investment, urbanization and fossil fuels was increasing CO2 emissions and further deteriorated the environmental conditions at the regional level. Hence, it concluded that foreign direct investment was

a source of environmental humiliation and increased CO2 emissions. Zameer *et al*. (2020) used co-integration and VECM to explore the effects of FDI, exchange rate, GDP, and import-export framework on pollution. The study found that FDI led to an increase in carbon emission, leading credence to the pollution-haven theory. Demena & Afesorgbor (2020) conducted a metal analysis on the effect of foreign direct investment on environmental emissions using 65 primary studies that produced 1006 elasticities. The study found that the underlying impact of foreign direct investment on environmental emissions was close to zero; however, after accounting for heterogeneity, it was established that foreign direct investment significantly reduced environmental emissions.

Zhang & Zhang (2018) indicate that FDI inflows caused an increase in carbon emissions in China, and local governments were concerned that implementing policies that restricted FDI to the industries to which it flows may damage the local economy. Saibu & Mesagan (2016) investigated the growth effect of foreign direct investment on environmental quality in Nigeria from 1970 to 2013, considering variables such as foreign direct investment, inflation, trade openness, interest rate, carbon emission, human capital, and per capita income. The research found a long-run relationship among the variables. However, foreign direct investment and environmental degradation negatively enhanced growth individually, while the interactive variable positively enhanced economic growth.

There are several studies in the literature (see Le *et al*., 2022; Huang *et al*., 2022; Ugur, 2022; Ashraf *et al*., 2020; and Saibu *et al*., 2016) on the impact of environmental pollution on economic growth. However, their findings on the relationship between foreign direct investment, economic growth, and environmental pollution still need consistency. Most significantly, the environmental footprint of the relationship between foreign direct investment and economic growth in Nigeria is yet to be explored, given that the Nigerian economy receives a huge volume of foreign direct investment in the oil and gas sector. This study stands to fill the identified gap in the literature.

Methodology

Data

This study aims to reevaluate the impact of foreign direct investment on economic growth (proxy by gross domestic Product) and its environmental footprint (proxy by CO2 emissions) in Nigeria. To perform the Autoregressive Distributed Lag (ARDL) bound estimation, there is a need for an efficient number of observations. Annual data for the period 1986 to 2022, specifically on Nigeria's Gross Domestic Product (GDP), Foreign Direct Investment (FDI), and Carbon Emissions in (kt) (CO2), Exchange rate (EXR) and the index of openness (OPN) were obtained from World Bank Development Indicators, Central Bank of Nigeria's Bulletin and National Bureau of Statistic Reports.

Model Specification

In this study, Autoregressive Distributed Lag (ARDL) bound test popularized by Pesaran, Shin & Smith (2001) was adopted to test the long-run relationship among the variables of interest. The ARDL was suitable for time-series data, that are stationary at the I(0), or I(1), or a combination of I(0) and I(1). The model for this study is in line with the works of Le *et al*. (2022) and Ashraf *et al*., (2020). Therefore, the equation for the study on the impact of foreign direct investment on economic growth and its environmental footprint is specified as follows:

$$GDP = f(FDI, CO_2, EXR, OPN) \quad - \quad - \quad 3.1$$

Where GDP is gross domestic product representing economic growth, FDI is the net of foreign direct investment inflow, CO_2 is carbon emission in (kt) representing environmental footprint, EXR is exchange rate, and OPN is the index of trade openness.

From equation (3.1) the linear form of the model is stated as follows:

$$GDP = \beta_0 + \beta_1 FDI + \beta_2 CO_2 + \beta_3 EXR + \beta_4 OPN + \mu_t \quad -3.2$$

Where β_0 is the intercept, $\beta_1 - \beta_4$ are the coefficients and μ is the stochastic error term. From economic theory and institutional knowledge, it is expected that β_1 and $\beta_4 > 0$, while β_2 and $\beta_3 < 0$. The $\beta_1 > 0$ means that foreign direct investment inflow should impact gross domestic product positively; $\beta_4 > 0$ implies that higher degree of trade openness is

expected to stimulate the inflow of foreign direct investment. While, $\beta_2 < 0$ means that increase in carbon emission and other environmental hazards are expected to impact economic growth negatively; $\beta_3 < 0$ is expected to exhibits unexpected behavior due to the volatile nature of the foreign exchange market in Nigeria.

The Autoregressive distributed Lag (ARDL) bound test model for this study is specified as followed:

$$\Delta GDP_t = \beta_O + \sum_{i=1}^{P} \beta_{1i} GDP_{t-1} + \sum_{i-0}^{P} \beta_{2i} \Delta FDI_{t-1} + \sum_{i-0}^{P} \beta_{3i} \Delta CO_{2t-1} + \sum_{i-0}^{P} \beta_{4i} \Delta EXR_{t-1} + \sum_{i-0}^{P} \beta_{5i} \Delta OPN_{t-1} + \varphi GDP_{t-1} + \varepsilon_1 \quad \text{-3.3}$$

Presentation of results and Analyses

Unit Root Test

In order to test for the stationarity properties of the series, the Augmented Dickey Fuller unit root test was used and the results are presented in Table 1.

Table 1: Results of Unit Root Test

Variable	ADF t-statistic	Critical Value @ 5%	Prob*	Order of integration
GDP	-3.856026	-2.948404	0.0057	I(1)
FDI	-3.545808	-2.948404	0.0123	I(0)
CO2	-3.848166	-2.948408	0.0058	I(1)
EXR	-6.204307	-2.948404	0.0000	I(1)
OPN	-8.434508	-2.948404	0.0000	I(1)

Source: Author's estimation Using E-views 10

Table 1 indicates the results of the unit root test of ADF for all the series used in this analysis. It can be seen that all the series are integrated of order one, I(1), except foreign direct investment (FDI) which is integrated at level, I(0). This suggests that the variables have mean reverting ability. The implication is that, any shock to the variables will fizzle out with the passage of time.

The criterion for selecting the optimal lag length for the model is presented in Figure 1.

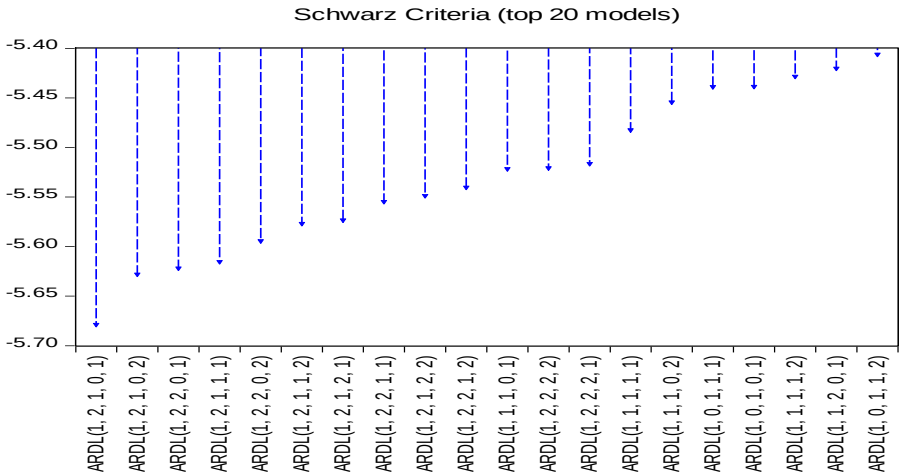

Figure 1: ARDL Optimal Lag Selection Results.
Source: Author's Estimation Using E-views 10

The result of the optimal lag selection reveals that the ARDL (1,2,1,0,1) model is the optimal ARDL model to be estimated among the top 20 ARDL models. Furthermore, in determining the presence of a long-run relationship among the variables of interest in the model, Autoregressive Distributed Lag (ARDL) bounds test was estimated and the results are presented in Table 2 as follows.

Table 2: The Results of ARDL Bounds Test

Test Statistic	Value	Sign.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	26.92434	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Author's Estimation Using E-views 10

The result suggests that there is a linear long-run relationship among the variables of interest specified in the model. This is verified because; the F-statistics value of 26.92 is higher than the upper bound value of 3.49 at a 5% level of significance. Having established a long-run relationship among the series, the short-run and the long-run estimates were estimated as shown in Tables 3 and 4 respectively.

Table: 3 Short-Run Estimates of ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.103780	0.108624	-0.955410	0.3485
GDP(-1)*	0.027338	0.012726	2.148201	0.0201
FDI(-1)	0.002047	0.000895	2.287191	0.0309
CO2(-1)	-0.010601	0.002227	-4.759451	0.0001
EXR**	3.652305	3.601205	1.014215	0.3202
OPN(-1)	0.000946	0.000199	4.759819	0.0001
D(FDI)	0.001604	0.000608	2.638157	0.0215
D(CO2)	-0.000464	0.002348	-0.197644	0.8449
D(OPN)	6.161205	0.002010	3.062229	0.0008
ECM(-1)	-0.027338	0.001963	-13.92319	0.0000
Adjusted R-squared	0.997829			
F-statistic	1737.082			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.434356			

Source: Author's Estimation Using E-views 10.

Table 3 demonstrates the results of the short-run relationship among gross domestic product, foreign direct investment, carbon emission, exchange rate and index of openness. The result shows that the lag value of gross domestic product had a positive and statistically significant effect on economic growth in Nigeria. The lag and the current values of foreign direct investment indicated a positive and statistically significant impact on economic growth in Nigeria in the short run. This suggests that a 1% increase in foreign direct investment will lead to a 0.002% and 0.002%

increase in economic growth, respectively. The lag value for carbon emission indicates a negative but statistically significant impact on economic growth in Nigeria in the short run. This suggests that, in the short run, a 1% increase in carbon emission in Nigeria will lead to a reduction of 0.01% in economic growth in the country. This finding is in tandem with the study by Zameer *et al*. (2020), Bildirici (2021), and Ugur (2022), which found that carbon emissions arising from the activities of foreign direct investment negatively impact economic growth. This may be attributed to the weak and corrupt nature of environmental laws, regulations and institutions in the country. Also, the current value of carbon emission reveals a negative and statistically insignificant impact on economic growth in the short run. The exchange rate has a positive but statistically insignificant impact on economic growth in Nigeria in the short run. The lag and the current values of the index of openness have positive and statistically significant impacts on economic growth in Nigeria in the short run. This suggests that a 1% increase in the trade openness index will lead to a 0.001% and 6.16% increase in economic growth, respectively. This finding confirms the findings of Kpoghul, Okpe & Anjande (2020) and Saibu & Mesagan (2016) that an increased level of openness stimulates the inflow of foreign direct investment and, consequently, economic growth of host countries.

The speed of adjustment [ECM(-1)] of variables to equilibrium in the long run is negative (-0.027338) and statistically significant. This means that disequilibrium among gross domestic product, foreign direct investment, carbon emission, exchange rate and openness index will readjust to equilibrium in the long run. The adjusted R-squared value of 0.99% suggests that foreign direct investment, carbon emission, exchange rate, and openness index have explained short-run variations in economic growth by 99% in Nigeria. Also, the F-statistic value of 1737.082 is statistically significant, implying that the explanatory variables in the model strongly affect economic growth in Nigeria. Finally, the Durbin-Watson statistic value of 2.434356 shows the absence of autocorrelation among the variables in the model. Also, the long-run estimate of the model is presented in Table 4.

Table 4: Long-Run Estimates of the ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	0.074862	0.018725	3.997971	0.0007
CO2	-0.387774	0.112483	-3.447009	0.0008
EXR	0.010335	0.102197	0.101134	0.4321
OPN	0.034599	0.016890	2.048490	0.0276
C	3.796232	0.809420	4.690062	0.0001

Source: Author's Estimation Using E-view 10.

The result in Table 4 indicates the long-run relationship among the variables foreign direct investment, carbon emission, exchange rate and index of openness in the model. Foreign direct investment has a positive and statistically significant impact on economic growth in Nigeria in the long run. This suggests that a 1% increase in foreign direct investment inflow in the long run will lead to a 0.07% increase in Nigeria's economic growth. This is in agreement with the study by Nepal *et al*. (2021) that, in the long run, foreign direct investment brings innovations and efficiency that cause increases in economic growth and reduces the consumption of non-renewable energy sources. Carbon emission has a negative but statistically significant impact on economic growth in Nigeria in the long run. This implies that a 1% increase in carbon emission due to foreign direct investment activities will reduce economic growth in Nigeria by 0.39% in the long run. This finding supports the pollution heaven hypothesis that increases in foreign direct investment inflow cause higher environmental pressure that evokes carbon emissions in the host country, potentially negatively impacting economic growth (Zhang & Zhang, 2018; Kayani & Sadiq, 2022). The exchange rate has a positive but statistically insignificant long-term impact on economic growth. The openness index indicates a positive and statistically significant impact on economic growth in Nigeria in the long run. This means that a 1% increase in the index of openness will increase economic growth by 0.03% in Nigeria in the long run.

Diagnostic Tests

In order to ensure the validity of the results, diagnostic tests were estimated and presented in the following tables.

Table 5: Results of Ramsey Reset Test

	Value	Df	Probability
t-statistic	1.201451	24	0.2413
F-statistic	1.443485	(1, 24)	0.2413

Source: Author's Estimation Using E-views 10

The t-statistic and F-statistic of the Ramsey Reset tests are both statistically insignificant. This suggests that, the model is correctly specified in terms of its functional form and inclusion of relevant explanatory variables. Again, the normality test of the residuals was estimated and the results are presented in Figure 2.

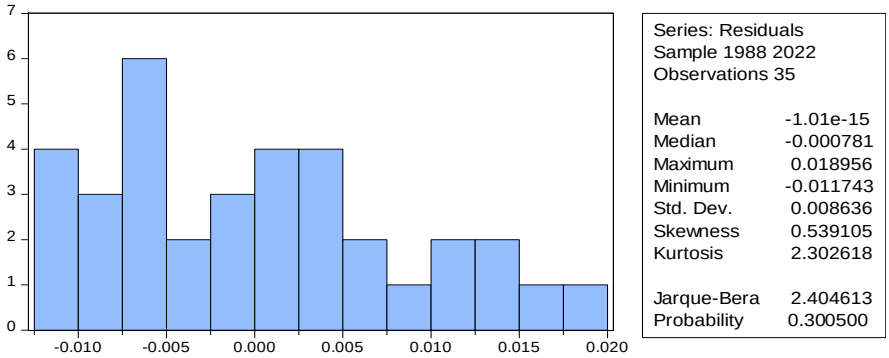

Figure 2: Normality Test

Source: Author's Estimation Using E-Views 10

The normality histogram and the Jarque-Bera statistics have both shown that, the residuals of the model are not normally distributed. However, the violation of the assumption of normality in a distributed lag model does not have serious consequences on the validity of the estimates. Also, the Breusch-Godfrey Serial Correlation LM test and the Heteroskedasticity - Breusch-Pagan-Godfrey test were estimated and the results are presented in Table 6.

Table 6: Serial Correlation and Heteroskedasticity Tests

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.512878	Prob. F(2,23)	0.2414
Obs*R-squared	4.069102	Prob. Chi-Square(2)	0.1307
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.494370	Prob. F(9,25)	0.8643
Obs*R-squared	5.287946	Prob. Chi-Square(9)	0.8085

Source: Author's Estimation Using E-views 10

The results of the Breusch-Godfrey serial correlation LM test and Breusch-Pagan-Godfrey heteroskedasticity test indicate that, both the F-statistics and Chi-Square (2) are statistically insignificance indicating the absence of serial correlation among the residuals of the model and that the residuals are homoscedastic respectively. Finally, stability test were conducted and the results are presented in Figure 3.

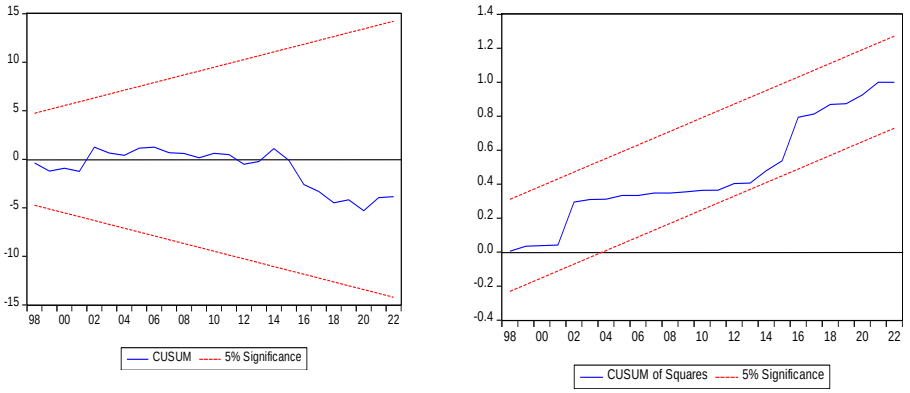

Figure 3: The CUSUM and CUSUM of Squares Test for Stability
Source: Author's Estimation Using E-views 10

The results of both the CUSUM and CUSUM of Square tests have shown the presence of stable estimates, since all the graphs are within the 5% significance critical bounds.

Conclusion

This study reevaluated the impact of foreign direct investment on economic growth and its environmental footprints in Nigeria. A long-run relationship was established among the variables of interest. It was discovered that, in general, foreign direct investment caused an increase in Nigeria's economic growth in the short run. However, increased energy consumption associated with foreign direct investment evoked higher carbon emissions in the country due to non-strict environmental laws. Also, the study found that foreign direct investment led to economic growth in the long run and significantly reduced carbon emissions due to innovations and efficiency, such as alternative energy sources for production and consumption in the economy.

Based on the above findings, this study therefore recommends the following. First, the government, through the Ministry of Environment and Sanitation and its regulatory agencies such as the National Environmental Standards and Regulations Enforcement Agency (NESREA), National Oil Spill Detection and Response Agency (NOSDRA), and National Biosafety Management Agency (NBMA) should put in place mechanisms that will attract and absorb foreign direct investment with minimal negative external impacts like carbon emission and other environmental challenges. This can be done by investing in critical infrastructures in sectors that need foreign capital. Second, through the Ministry of Power, the government should increase public spending on energy research and development by investing heavily in alternative energy sources, such as solar power biogas, among others. Finally, environmental protection laws and regulations should be put in place by an act of law by the legislative arm of the government to help reduce the combined negative externalities of foreign direct investment and economic growth on the environment. This can be done by introducing environmental taxes such as emission tax.

Reference

Aller, C., Ductor, L. & Grechyna, D. (2021). Robust determinants of CO2 emissions. *Energy Econ*, 96:105154

Ashraf, M.W., Rehman, H.U. & Chaudhry, I.S. (2020). The impact of economic growth, foreign direct investment, urbanization, fossils fuel consumption on environmental degradation in emerging

Asian economies. *Journal of Business and Social Review in Emerging Economies,* 6(4), 1479-1495

Bildirici, M.E. (2021). Terrorism, environmental pollution, foreign direct investment, energy consumption, and economic growth: evidence from China, India, Israel, and Turkey. *Energy and Environment*, 23(1), 75-95

Chandrika, R., Mahesh, R. & Tripathy, N. (2022). Is India a pollution haven? Evidence from cross-border mergers and acquisitions. Journal of Cleaner Product, 376:134355

Demena, B.A. & Afesorgbor, S.K. (2020). The effect of foreign direct investment on environmental emissions: evidence from a metal analysis. *Journal of Energy Policy,* 138:111192. https://doi.org/10.1016/j.enol.2019.111192

Huang, Y. Chen, F., Wei, H., Xiang, J., Xu, Z. & Aram, R. (2022). The impact of foreign direct investment inflows on carbon emissions: economic development and regulatory quality as moderators. Front Energy Res. 9:820596. Doi:10.3389/fenrg.2021.820596

Iamsiraroj, S. (2016). The foreign direct investment-economic growth nexus. *International Review of Economics and Finance,* 42(3). 116-133

Kayani, F.N. & Sadiq, M. (2022). Analyzing the impact of inward FDI and economic growth on CO2 emissions of Ukraine. *International Journal of Energy and Policy*, 12(5), 202-208

Kpoghul, E.T., Okpe, J.I. & Anjande, G. (2020). A macro-econometric analysis of trade openness, foreign direct investment and the performance of the Nigerian economy. *Journal of Economics and Allied Research,* 4(3), 1-24

Le, T.T.H, Nguyen, V.C. & Phan, T.H.N. (2022). Foreign direct investment, environmental pollution and economic growth: an insight from non-linear ARDL co-integration approach. Sustainability, 14(13), 8146. https://doi.org/10.3390/su14138146

Malik, M.Y., Latif, K., Khan, Z., Butt, H.D., Hussain, M. & Nadeem, M.A. (2020). Symmetric and asymmetric impact of oil price, foreign direct investment and economic growth on carbon

emission in Pakistan: evidence from ARDL and non-linear ARDL approach. Sci Total Environ, 726:138421. https://doi.org/10.1016/j.scitotenv.2020.138421

National Bureau of Statistics (2022). Foreign direct investment and gross domestic product. https://nigeriastat.gov.ng/news/78.

Nepal, R., Paija, N., Tyagi, B. & Harvie, C. (2021). Energy security, economic growth and environmental sustainability in India: does FDI and trade openness play a role. *Journal of Environmental Management,* 281:111886. https//doi.org/10.1016/j.jenvman.2020.111886

Pazienza, P. (2019). The impact of foreign direct investment in the OECD manufacturing sector on CO2 emission: evidence and policy issues. *Environ impact Assess Rev,* 77(1), 60-68.

Pesaran, M.H., Shin, Y. & Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics,* 16(3), 289-326.

Saibu, O.M. & Mesagan E.P. (2016). Environmental quality and growth effects of foreign direct investment in Nigeria. *Iran Economic Review,* 20(2), 125-140.

Saqib, N., Ozturk, I., Usman, M., Sharif, A. & Razzaq, A. (2023). Pollution haven or halo? How European countries leverage foreign direct investment, energy and human capital to alleviate their ecological footprint. Gondwana Res, 116(2), 136-148

Sarkodie, S.A., & Strezov, V. (2019). Efeect of foreign direct investments, economic development and energy consumption on greenhouse gas emissions in developing countries. *Science of the Total Environment,* 646, 862-871. https://doi.org/10.1016/j.scitotenv. 2018.07.365

Ugur, M.S. (2022). The relationship between foreign direct investment, economic growth, energy consumption and Co2 emissions: evidence from ARDL model with structural break for Turkey. *Ege Academic Review,* SS. 337-352.

Ulucak, R. (2022). Analyzing energy innovation-emissions nexus in China: a novel dynamic simulation method. *Energy,* 244:123010

Ullah, S., Nadeem, M., Ali, K. & Abbas, Q. (2021). Fossil fuel, industrial growth and inward foreign direct investment impact on CO2 emissions in Vietnam: testing the EKC hypothesis. *Management of Environmental Quality: An International Journal* 33, 222-240. Doi 10.1108/meg-03-2021-0051

UNCTAD (2022). World investment report 2022. https://unctad.org/system/files/official-document/wir2022_en.pdf

Wang, Q., Yang, T., Li, R. & Wang, X. (2023). Reexamining the impact of foreign direct investment on carbon emissions: does per capita GDP matter? *Humanities and Social Sciences Communications.* 10:406, 1-18. https://doi.org/10.1057/s41599-023-01895-5.

World Bank (2018). World Bank Open Data. https://data.worldbank.org/.

World Bank (2019). World Bank Open Data. https://data.worldbank. org/.

World Bank (2022). World Bank Open Data. https://data.worldbank. org/.

Zameer, H., Yasmeen, H., Zafar, M.W., Waheed, A. & Sinha, A. (2020). Analyzing the association between innovation, economic growth, and environment: divulging the importance of FDI and trade openness in India. Environmental Science Pollution Research, 27(23), 29539-29553. https://doi.org/10. 1007/s11356-020-09112-5

Zhang, Y. & Zhang, S. (2018). The impact of GDP, trade structure, exchange rate and FDI inflows on China's carbon emissions. *Energy Policy* 120:347-353. https://doi.org/10.1016/j.enpol.2018.05.056

Zubair, A.O., Samad, A. & Dankumo, A.M. (2020). Does gross domestic income, trade integration, foreign direct investment inflows, gross domestic product and capital reduces CO2 emissions? An empirical evidence from Nigeria, Current Research in Environmental Sustainability 2:100009. https://doi.org/10.1016/j.crsust.2020.100009