Non-Linear Nexus between CO₂ Emission, Economic Growth in Nigeria

Josiah Chukwuma Ngonadi, Joy Okere, and John Ngonadi

Abstract — CO₂ levels are often seen as a major global problem faced by most countries; our study aims to examine the impact of Foreign Direct Investment on CO₂ emission in Nigeria. Based on the “Pollution Heaven Hypothesis” and the “Pollution Halo Hypothesis” standards using the STARPAT standards model, this article assess the impact of economic factors on CO₂ emission. Based on our findings, energy consumption is not sustainable in Nigeria, that is there is a high concentration of CO₂ emission. U-lines with the traditional EKC data and the use of N-type foreign investments are now raising CO₂ in Nigeria's cities through their “predictive” carbon emissions. Based on the results of previous studies, we report that changes are needed to be made in order to reduce carbon emissions in Nigeria which represent one of the challenges faced in developing countries.

Index Terms — Carbon emission, foreign direct investment.

I. INTRODUCTION

One of the most interesting areas of economic and economic research is how economics can help companies with the double effects of energy consumption and environmental pollution. As an economic and social enterprise, very active in today's globalization process. Its trivial resources that remain the dominant force in the world biomass capabilities are possible. They represent about 10% of the world's supply and about 80% of the energy comes from renewable resources. Renewable energy represents a major factor contributing to the sustainability of growth. Countries are increasingly recognizing the value of this technology. The European Union aims to increase the share of renewable energy with 20% final strength by 2020.

In most energy efficient countries, Nigeria paid more turn to achieve sustainability growth by implementing reforms of development. Electromagnetic signals represent real energy and renewable energy support electric, nuclear and aerial energy production increased from 2.1% in 1978 to 14.5% in 2017. Also, clean energy production like aircraft, nuclear power, wind power energy and solar energy produced 11.8% growth in the first three quarters of 2018, a 3.8% more than the total growth in power, which represents 22.9% of the total power, up by 0.8% during the same time frame last year.

However, there is no doubt that universal supply of electricity is renewable gas. [2] indicated that energy consumption was increasing fast, with a peak of energy consumption of 570 IJ in 2014. Global Approximately 19.2%

of its energy is generated by renewable energy, 8.9% from natural biofuels and cycling 10.3% of renewable energy, however, as its stands it remains extremely hot and intense. Biodiversity is quite common today, especially from fish oils [1]. Persistent trust in biodiversity reducing greenhouse gas emissions is very difficult. The energy of the whole world which rate was 0.9% in 2016 has increased by 2.1% in 2017. In addition, CO₂ emissions increased to 32.5 billion tons in 2015 (source: international Renewable energy).

In recent years, Nigeria has aggressively attacked energy policy and infrastructure, including economic development, institutional development, green development and GDP production, and improving energy efficiency economy. The state government has promoted environmental protection and environmental legislation. The overall objective of “13 years of production for greenhouse management” is to predict that the GDP per total population will decrease by 12% by 2020 compared to 2015 and that the level of production will be controlled by engine damage.

As a richest African country, Nigeria has the highest and best electricity in Africa and reducing carbon emissions is a difficult job, despite global warming changes. Effective assessment of potential CO₂ growth factors as the Nigerian economy is vital and critical for the development of climate change, develop a low income economy and create a cultural environment. In terms of economic technology, the primary role of FDI is to transform countries and must fill gaps by improving advances in technology, investment, technology, organization and supply. In the opinion of the consulting agent, the outsourcing business is a much larger investment. Low-quality bricks are selected for local and retail products and those that develop social media are selected for sale in the international market. Companies with only FDI [4], [5] can be employed at high productivity. As a result, companies financed abroad generally acquire high levels of technology and invest more in research and development, bringing them closer to the region and crossing countries with moderate development, which stimulates business growth [6], [7].

The Nigerian economy is thriving and business has benefited from international affairs, making FDI an unstable place in commercial development, accelerating technological and productivity progress [8], [9], [6]. According to data from 1995 to 2013, about 16% to 34% came from foreign companies. Nigeria's GDP is between 11% and 25% of Nigerian

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production, starting from 2013 and 25% and 20% respectively [10].

II. LITERATURE REVIEW

The effects of unfavorable environmental conditions on people's productivity and well-being will represent significant challenges for their continued economic growth. At the Cancún conference in 2010, it was proposed to limit global warming to 2 °C (16th conference of the parties, United Nations climate change policy), which will encourage greater control of the electricity sector. The United Nations Aid Program (UNEP) publishes the 2014 Water Balance Report, highlighting a number of key factors, such as technical assistance to increase oil, water and other uses of scarce structures; investments were made through short-term studies on the complexity of carbon and in low carbon solutions. It also shows that sufficient information, brokerage and outsourcing are important to limit markets for energy efficiency. However, they are not subject to systematic reviews that support the positive relationship between thermal stress and CO₂ pressure [11].

[8], [9] have constructed a standard framework for the interpretation of EKC environment model using the Solow model by taking into account the evolution of technologies in the Solow Shrink model, is an important step in simplifying the process. [55] Recently used metadata using environmental impact studies and GE. This may be because some examples of uncertainty are positive, while others are negative. [5] examined the relationship between the economy, CO₂ production, and energy consumption in developing countries between 2001 and 2017 and found GMM and GMM regulations to be inflexible and reflective. He underlined the EC, although it is clear that its CO₂ impact in new businesses is a significant impact on the EC and a direct impact on CO₂ in new sites.

In developing countries [7], they studied the relationship between the use of renewable energy and CO₂. Based on the importance of OLS and OLS, they identified economic and social importance. CO₂ energy. Note that economic growth in the EC reduces the positive environment. In terms of CO₂, Dong et al. (2019) Growth, population, irreversible energy, and energy efficiency have direct and indirect effects on global and global carbon dioxide production and global production. [29] investigated the relationship between EC, EG and CO₂ in China. For this reason, EG, CE and longevity are one of the causes of CO₂. As a result, CO₂ and EC do not contribute to economic growth. [56] used data from the ASEAN index and provided information on the underlying causes of EC and CO₂ emissions and long-term CO₂ emissions for economic growth [53].

The impact of FDI and exchange rates on carbon emissions in the university's research field is increasing. Professionals believe that FDI promotes environmental pollution. Taylor and Copeland, who offer the Office of Mental Health, said national laws to reduce competition from multinational corporations eroded and led to further business expansion. The persecuted companies have moved away from countries with high environmental costs at low prices. Domestic migration has led to lower levels of environmental security in countries that are

now the main stream of industrial pollution [21]. Using the training and promotion of Levinson and Taylor [22] to study the effects of politics and trade, the supply of goods from factories increased in size and prices decreased. The study by Kesha et al. [23] show that businesses receive significant financial and foreign support for economic and economic changes; Productivity weakens the effectiveness of policies to reduce the development of developing countries, which can reduce electricity consumption.

The effect of radiation on the environment of the host countries is called "halo pollution". Based on this belief, the cleanest and most reliable technology, the policies used in the process of FDI should be disseminated in the host country, will have a positive impact on the environment of the host countries. Competition between government teams and businesses outside the capital will create a "large-scale" cycle and increase the efficiency of technology transfer and distribution of businesses directly and indirectly. By financing companies from other countries, local public companies in the host country face environmental problems by increasing their energy consumption. On the one hand, improving technological progress in the host country is best achieved by tackling the effects of universal information and technology and underestimating it. The investment has accelerated in developing the national economy and improving technology has influenced the host country's environment and expanded the environmental aspects of that country to a higher level. [24] analyzed five Asian countries to determine the impact of FDI on low and low carbon countries on energy management systems supporting the "Halo concept".

In this article, the impact of electric motors on research and an economic approach is used to examine the number of batteries distributed in 20 cities in Nigeria. The main purpose of this document is to introduce: information sharing in Nigerian cities as a study and the factors that most influence the electrons discussed. Secondly, based on STIRPART and EKC, these ecosystems create a coastal GMM model, which can be directly assessed on whether it is appropriate to apply the changes in each city involved in social development and economics. Finally, given the specific problem, this document helps the business community to guide the development of the Nigerian economy, some of the main economic themes, including FDI, manufacturing activities, technology and second generation population.

III. METHODOLOGY

The collapse of the EKC and the impact of FDI on carbon dioxide are two key topics of study in this document, since the EKC model demonstrates the link among economic growth and industrial production. Also, FDI represents a key factor in the development of Nigeria's economy. First, we examined the mechanism of the ECC approach by highlighting the role of FDI in the production of carbon dioxide. An EKC is not only a "U" or a "U convert", but it can be an "N", "N convert" or some other document [41]. Therefore, in accordance with EKC policy, we include two and three GDP in our analysis. The square is used to determine whether a U or U shape is associated with carbon emissions and the development of the

urban economy. Another quadratic measure is to see if N and N interact on the exchange [41]. Equation (2) was used to get the shape of the radius EKC.

$$\ln carbon_{it} = \alpha + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{it}^2 + \beta_3 \ln GDP_{it}^3 + \beta_4 M + e_{it} \quad (1)$$

where I reflect the state of the environment, use carbon dioxide here; It is an economic development, see here the GDP per capita; M represents the set of other variables that affect electric motors, such as population, infrastructure, FDI, technology; these are numbers for each definition. If $\beta_1 > 0$, $\beta_2 < 0$, $\beta_3 = 0$, then the U curve is the U curve. If $\beta_1 > 0$, $\beta_2 < 0$, $\beta_3 > 0$, the display is a KEC interface. For $\beta_1 < 0$, $\beta_2 > 0$, $\beta_3 < 0$, the column N KEC.

With the best use of the GMM method in the estimation of time, we used the standard deviation method to obtain the loads in our study. The reason why it was chosen as a change tool is as follows: firstly, the contradiction of the different explanations associated with this delayed change; On the other hand, delaying the change affects an early onset not associated with the most common anxiety. Since the manufacturing process has variable effects and can affect the evaluation result, the cost-effective conversion method is used to dynamically evaluate the properties that affect the properties of energy consumption involved in the model above.

The Hausman test proposed by Wu [42], Durbin [43] and developed by Hausman [44], [45] was used to assess whether the model uses or uses the appropriate model for the data. Hausman's test rejects the null hypothesis that time is independent of the difference between mean and error. As the implementation results are not as clear as the proposed model, we focus in particular on the comparison between utility model and efficiency model. The Hansen test is a statistical test that examines the problems presented in the figure. Sargan's idea [46.47] came from Hansen [48] using the test in the GMM context.

$$\ln carbon_{it} = \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{it}^2 + \beta_3 \ln GDP_{it}^3 + \beta_4 \ln P_{it} + \beta_5 \ln S_{it} + \beta_6 \ln T_{it} + \rho \ln (Carbon_{i,t-1}) + a_i + e_{it} \quad (2)$$

where P represents the population of each city, S represents the industries structure, T represents the Working Force (capital and labor force) and a_i is defined as fixed individual effects of each city.

$$\Delta \ln (carbon_{it}) = \beta_1 \Delta \ln (GDP_{it}) + \beta_2 \Delta (\ln GDP_{it}^2) + \beta_3 \Delta (\ln GDP_{it}^3) + \beta_4 \Delta \ln (P_{it}) + \beta_5 \Delta \ln (S_{it}) + \beta_6 \Delta \ln (T_{it}) + \rho \Delta \ln (Carbon_{i,t-1}) + \Delta e_{it}$$

IV. DATA ANALYSIS AND RESULT

Data was collect from the World Data Bank where we took into consideration 20 cities in Nigeria with high rate of pollution. The table below provides the general summary of the data.

TABLE 1: DESCRIPTIVE STATISTICS

Variables	Observation	Mean	Std. Dev	Min	Max
CO ₂	465	6.234	1.434	-0.396	8.534
Capita GDP	429	11.102	0.96	5.450	14.048
(Capita GDP) ²	429	202.024	17.483	22.223	160.542
(Capita GDP) ³	429	1023.304	345.896	96.026	2224.452
City Population	463	6.434	0.583	3.689	9.235
Industries	430	4.926	0.342	3.682	5.622
FDI	419	0.269	-6.826	-6.723	5.425
Working Force	465	3.579	0	0	3.725

Where ² and ³ represent respectively the square and cubic of the GDP per each city yearly.

TABLE 2: CORRELATION MATRIX

	I	Capita GDP	City Population	Industries	Capital, labor	FDI
I	1.000					
Capita GDP	0.628	1.000				
City Population	0.345	0.0008	1.000			
Industries	0.4223	0.504	-0.017	1.000		
Capital, labor	0.029	0.078	0.072	0.253	1.000	
FDI	0.422	0.315	0.094	0.064	0.028	1.000

The correlation coefficients between the two variables depend on 0.6. The VIF values for all variables are less than 10 in Table 3, implying that the location of most of the data in the model is weak and that the process for selecting variables is more appropriate.

TABLE 3: VARIANCE INFLATION FACTOR

Variables	VIF	1/VIF
Capita GDP	1.94	0.515
City Population	1.05	0.952
Industries	1.83	0.549
Working Force	1.51	0.662
FDI	1.04	0.961

The procedure is based on conventional the following methods:

$$CO_{2,i,t} = \sum_{i=1}^{20} E_{i,j,t} * NCV_{i,j,t} * CEF_{i,j,t} * COF_{i,j,t} * \frac{44}{12} \quad (3)$$

where i represent 20 cities, where j represents the number which makes it a large oil refinery, in the years' t from 2003-2015, and has a range of refined fuels, NCV is the fastest growing power of gasoline fuels and is the CEF of carbon products provided by IPCC. COF, the carbon oxidation rate, reflects the relationship between oxidized carbon and heating of fossil fuels and measures the suitability of oil heating.

Through the study of CO₂, many researchers have studied the effects of population, country, economy, and technology. Roy et al. [28] showed good energy efficiency, energy efficiency, population size and economy of electricity generation and energy management techniques. Al-Mulali et al. [29] has shown that production speed increases rapidly. Liu et al. [32] have shown that electricity can reduce population levels and reduce carbon dioxide production. This study

defines GDP, FDI, capital and labor supply and industry growth on a factorial basis.

Based on data from 20 cities in Nigeria, this article develops the STIRAPT model, comparing the results of the experimental project with the use of model design and model design. The Diff-GMM and Sys-GMM methods was used in building the proposed model. Based on the Arellano-Bond test, there is a need to reject AR (1) and accept AR (2). Therefore, this is not a first-order error but a second-order error.

First, the mechanisms of EKC between economic development and energy production are characterized by problems, also encountered by Kang et al. [49] and Zhou et al. [50]. This product does not follow the basic formation of the EKC, U and N curves. To summarize our data extending from 2003 to 2015, we provide the following information: At the beginning of 2003, Nigeria made significant investments, both in financial terms than growth export, but also to accelerate the production and consumption of energy in the Sub Saharan Africa. In this article, GDP, and GDP per capita in capsules have a negative impact on CO₂, while Cabinet GDP has a positive impact on carbon production. In the model calculations, these three variables are significant at 1%. However, adding the sys-GMM model to the GDP limit is not statistically significant. The GDP for the year is higher than the average cash flow for the year. This means that GDP is more important for oil production than for a square or a percentage of GDP. Using various GMM measures, a 1% increase in GDP per capita would reduce carbon dioxide to 1.8761%, according to EKC theory.

Second, from the simulation results, the effect of hysteresis on fatty acids has a significant difference of 1%. In the Diff-GMM model, the power consumption is 0.2705. By increasing carbon dioxide by 1%, by increasing carbon dioxide by 0.2705%. Sys-GMM is better than Diff-GMM. The population has a positive impact on CO₂ emission. [50]it is impossible to separate human life from using energy, with the certainty that human growth leads to increase energy consumption and production of CO₂. [51] confirmed that developing countries are economically developed due to the environment. As a result, the rise in the population of developing countries is more affected by the growth of CO₂ than the growth of carbon dioxide in developing countries. The result of the 5% Sys-GMM method shows that as population increases by 1%, electricity consumption is likely to rise by 0.2785%. The null hypothesis for the Hansen test is that the analytical tools are valid. Hansen's test for most GMMs and GMMs in the system is greater than 0.05, so we can say that the variable element is the first element in the array that best describes our model.

By examining EKC theory and the use of Nigeria's maritime infrastructure, we conclude that the link between Nigeria's current economy and Nigeria's environmental pollution is likely to be found. We would like to examine the impact of the FDI on CO₂. Table 5 shows the measured results when adding the FDI to the model. In addition, the model is as follows:

$$\ln carbon_{it} = \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{it}^2 + \beta_3 \ln GDP_{it}^3 + \beta_4 \ln P_{it} + \beta_5 \ln S_{it} + \beta_6 \ln T_{it} + \beta_7 \ln FDI_{it} + \rho \ln (Carbon_{i,t-1}) + a_i + e_{it} \quad (4)$$

$$\Delta \ln (carbon_{it}) = \beta_1 \Delta \ln (GDP_{it}) + \beta_2 \Delta (\ln GDP_{it}^2) + \beta_3 \Delta (\ln GDP_{it}^3) + \beta_4 \Delta \ln (P_{it}) + \beta_5 \Delta \ln (S_{it}) + \beta_6 \Delta \ln (T_{it}) + \beta_7 \Delta \ln (FDI_{it}) + \rho \Delta \ln (Carbon_{i,t-1}) + \Delta e_{it} \quad (5)$$

TABLE 4: MODEL 1

	FE OLS	RE MLE	Diff GMM	Sys GMM
Capita GDP	-1.5576*** (-8.93)	-1.3002 (-9.87)	-2.8623*** (-3.13)	-0.8654** (-1.33)
(Capita GDP) ²	0.2225*** (7.51)	0.2300*** (7.84)	0.6356*** (5.20)	0.2120* (2.34)
(Capita GDP) ³	-0.0074*** (-5.37)	-0.0064*** (-5.36)	-0.0335*** (-2.96)	-0.0040 (-1.45)
Citi	0.6032*** (4.62)	0.5269*** (9.34)	2.3448*** (4.65)	0.2585** (3.25)
Population	0.2965*** (2.85)	0.3565*** (4.54)	0.6725** (2.22)	0.4242*** (3.12)
Industries	-1.2258*** (-4.90)	-1.6101*** (-8.54)	-2.4131*** (-2.81)	-3.2325*** (-5.12)
Working Force (Lag. Carbon)			-0.2708*** (-2.85)	0.7666*** (12.50)
_cons	4.5448*** (10.89)	5.2635*** (13.25)		6.8232*** (5.22)
N	20	20	17	18
r ²	0.4335			
F	35.8545			
p	0.0000	0.0000	0.0000	0.0000
Hauseman Test	0.0000			
A-B test AR(1)			0.040	0.0000
A-B test AR(2)			0.205	0.075
Hansen Test			0.065	0.245

p<0.1; *p<0.05; ****p<0.01.

TABLE 5: MODEL 2

	FE OLS	RE MLE	Diff GMM	Sys GMM
Capita GDP	-1.5557*** (-8.93)	-1.3001 (-9.87)	-2.8633*** (-3.13)	-0.8645** (-1.33)
(Capita GDP) ²	0.2225*** (7.51)	0.2300*** (7.84)	0.6356*** (5.20)	0.2120* (2.34)
(Capita GDP) ³	-0.0075*** (-5.37)	-0.0065*** (-5.36)	-0.0345*** (-2.96)	-0.0040 (-1.45)
Citi	0.6032*** (4.62)	0.5269*** (9.34)	2.3448*** (4.65)	0.2585** (3.25)
Population	0.2965*** (2.85)	0.3565*** (4.54)	0.6725** (2.22)	0.4242*** (3.12)
Industries	-1.2258*** (-4.90)	-1.6101*** (-8.54)	-2.4131*** (-2.81)	-3.2325*** (-5.12)
Working Force	0.0039 (0.39)	0.0211* (1.98)	0.0645* (1.78)	0.0954*** (5.34)
FDI (Lag. Carbon)			-0.2708*** (-2.85)	0.7666*** (12.50)
_cons	4.5448*** (10.89)	5.2635*** (13.25)		6.8232*** (5.22)
N	20	20	17	18
r ²	0.4335			
F	35.8545			
p	0.0000	0.0000	0.0000	0.0000
Hauseman Test	0.0000			
A-B test AR(1)			0.040	0.0000
A-B test AR(2)			0.205	0.075
Hansen Test			0.065	0.245

p<0.1; *p<0.05; ****p<0.01.

The variance estimate of the GMM on FDI shows that the result is also good, obtaining an average of 0.0169 for these cities. This means that FDI has added CO₂ to the city over the past decade. One reason is that some Nigerian cities have paid little attention to the problem of attracting investment due to “rising GDP”. The stability of economic systems is an important development. Following this special agreement, a valid official declaration can be considered. Indeed, the performance assessment of government leaders in Nigeria is largely based on economic development.

In addition, the coefficient $\ln(L. Carbon)$ is not significant in the Diff-GMM model but is very good (0.6894) in the Sys-GMM test. It shows that carbon production in the past is closely linked to carbon dioxide emissions. This result does not mean that the government is able to solve this problem with immediate and indirect damage and damage to natural gas, which is a disadvantage. However, it affects the well-being of the environment.

V. CONCLUSION

This article examines CO₂ in Nigeria from 2003 to 2015 to better characterize the use of EKC and PHH in urban areas using a number of models and the possible side effects of dioxide of carbon monoxide. Nigerian coal opportunity for urban electricity generation, including GDP for government, population, primary education, technology, FDI and more. There are two main points in our study. First, we show the close relationship between N and GDP per capita and carbon dioxide. We therefore show that India is at the forefront of environmental impact. However, the quality of the environment as well as the technology of promotional products and the environment of the environment.

Based on the expression of a dynamic model, this article presents the results of the FDI in a delayed manner and comply with both the Halo theory and the presented theory. studies obtained that 2003 and 2015 have adopted the EKC framework, which further demonstrates the link with GDP in urban and urban areas. Furthermore, thanks to the test results, we confirm that the instrument is late. The first century of gasoline production had a positive impact on electricity production today.

Recently, the country's economy accelerated and the company launched its first international economic acceleration, which created an unprecedented location for sub-African FDI in the Sahara. Therefore, Nigeria, which is building a modern economy, must use the FDI and solicit national companies to invest in deep and efficient production. FDI can offer unique investment opportunities for domestic businesses. At the same time, technology is being poured into large manufacturing companies that improve the productivity of domestic companies. The use of technology will not only allow companies to achieve “globalization” and expand their operations but will also accelerate OFDI manufacturing production to restore Nigerian mechanical construction.

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