ECONOMIC IMPLICATIONS OF ENVIRONMENTAL DEGRADATION IN NIGERIA: IS THE ENVIRONMENTAL KUZNETS CURVE RELEVANT TO NIGERIA?

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ABSTRACT: *Challenges of environmental degradation have been an impediment to the level of economic progress in Nigeria. The major objective of the paper is to establish the economic consequence of environmental degradation drawing from the Environmental Kuznets Curve (EKC) framework. The research covered the period between 1986 and 2017. The Ordinary Least Squares and Granger Causality were used to analyze the data. The result indicates that per capita income has a positive and insignificant relationship with carbon emission. An indication of the absence of the EKC. The square of the per capita income has a positive and insignificant relationship with carbon emission. A further confirmation of the absence of the EKC in Nigeria. Population has a significant and positive impact on the level of carbon emission. Openness and FDI have positive and significant impact on carbon emission. The result of the granger causality test indicates no causal relationship between carbon emission and per capita income. Increase in per capita income that is not followed by a rise in inflation rate as well as strong regulatory measures are recommended.*

KEYWORDS: EKC, per capita income, carbon emission, population, FDI, trade openness Ordinary Least Squares,

INTRODUCTION

The natural and social conditions surrounding mankind both in the present and future constitute the environment (World Bank (1991). Thus, the water, land and air constitute the environment. Sustainability indicates the inclination of striking a balance between economic progress and environment preservation (Ominyi and Abu, 2017). This is important since over half of the citizens in Nigeria who are actively involved in the production process live in the rural areas and partake mainly in animal rearing, crop farming, fishing and hunting. Thus a sustainable environment will guarantee the survival of over half of the citizens in Nigeria. This highlights the importance of environmental quality. Environment and growth affects each other, thus indicating a trade-off between both. The less developed countries seem to permit more environmental degradation due to their level of economic growth. They are of the view of growing the economy first and strive for a clean environment later. This is in contrast to the developed countries that have attained a high level of income and hence have less tolerance for environmental degradation (Fidel, 2015).

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For example, Thomas and Belt (2017) found in their study that the achievement of high growth in East Asia and China were at the expense of the environment. Another example is that of Japan. The 12 percent annual growth rate recorded at the end of the Second World War in the 1960s was accompanied almost instantly by massive environmental degradation in major cities like Yokohama, Tokyo and Osaka (Adeleye, 2012). This strong connection between the environment and economic growth is due to the feedback mechanism between both. Naturally, the environment performs important functions relating to economic growth. In the first instance, it generates natural resources which serve as inputs in the production process. Secondly, the natural environment absorbs air, water and solid pollutants which are generated by the production and consumption process (Anders and Emelie, 2008). The degradation of the environment is the depletion of the natural environment mostly through the activities of humans (Ogboru and Anga, 2015).

Environmental degradation compromises the environment mostly by man. This is why the function of the environment in the process of economic development of any nation is a serious issue. In addition to being the physical surrounding for the natural habitats, the environment provides the foundation for human exploits for the purpose of agriculture, industrialization, technology, commerce and tourism (Ityavyar and Thomas, 2015). Challenges from the environment have bedeviled lots of countries on earth including Nigeria. For example, the drying up of Lake Chad is causing economic losses and security problems for countries in the Lake Chad Basin. The first major attempts in revamping the environment is the Kyoto Protocol of 1992 intended to significantly reduce carbon dioxide (CO_2) emission. CO_2 is the target because, even though there are various environmental pollutants, it contributes 58.8 percent of greenhouse gases (Lau, 2015). Environmental challenges made the United Nations to put in place various agreement including the Paris Agreement on Climate Change signed by 147 countries in 2016. The agreement amongst others was aimed at curbing global greenhouse emission (Oganesyan, 2017).

The Paris agreement has been faced with lots of challenges, a major one being the decision of the current American government to pull out of the agreement or renegotiate the agreement. With the increase in the population of Nigeria to over 180 million people, the problem of environmental degradation has worsened. A major cause of the degradation in Nigeria has been the activities of the rich multinational oil companies as well as the poor people residing in their areas of operation. The over-reliance of the Nigerian economy on the revenue from the oil sector has made successive governments to sometimes ignore the massive environmental hazards committed by multinationals. This has affected farming and other economic activities in the area leading to loss of supposedly stable source of foreign exchange. The health of the people in the area has also been affected negatively. Indiscriminate dumping of refuse by the citizens, destruction of oil pipelines as well as noise pollution exists in Nigeria on a daily basis. Carbon emission from old cars, generators and industrial machines has also contributed to the depletion of the environment. Most processes in the production chain in Nigeria are pollution intensive.

This has even been deteriorated by the weak regulatory institutions and the high level of poverty in the society. establish the economic consequence of environmental degradation drawing from the Environmental Kuznets Curve (EKC) framework. Since, a trade-off exists between environmental degradation and economic growth; our results will provide a better understanding of this relationship and assist policy makers in developing viable environmental policies. Thus,

policy makers can make a better choice between a degraded environment and economic growth. The study is thus more important at this point in the country because there have been lack of consensus by various studies on the relationship between environment degradation and economic growth. Thus, the study will further highlight whether or not an increase in per capita income leads to environmental degradation. There are five sections in this paper. The second section is the literature review and the third section is the theoretical framework/model specification. The fourth section is on the result and findings while the fifth section concludes the paper

LITERATURE REVIEW

Literature on the relationship between economic growth and environmental degradation has produced mixed results.

Olusegun (2009) examined environmental quality and economic growth in Nigeria with the aid of the Environmental Kuznet's Curve (EKC) between the periods of 1970 to 2005. The Ordinary Least Squares (OLS) and granger causality were adopted in analyzing the data. The result revealed no causal or long run relationship between CO_2 emission and per capita income. The result rejected the presence of the EKC in Nigeria. Omojolabi (2010) assessed the effect of environmental quality on economic growth in West African countries from 1970 to 2006. The panel data regression was used. The pooled least squares result confirmed the existence of the EKC. The Fixed Effect (FE) result was at variance with the EKC in West Africa. Drabo (2011) attempted an evaluation of the relationship between health, environmental quality and economic growth. Using the EKC framework, the study found that environmental degradation has inverse relationship with economic growth. Akpan and Chuku (2011) investigated the link between economic growth and environmental degradation in Nigeria. The study covered the period between 1960 and 2008. The Autoregressive Distributed Lag (ARDL) technique was adopted. The result did not support the EKC hypothesis in Nigeria. Adeleye (2012) investigated the impact of economic growth on the quality of the environment. The study covered the period between 1998 and 2013. The panel Least Squares was used for the analysis. The result indicated that a slight improvement in economic growth was followed by an episode of environmental degradation. Alege and Ogundipe (2013) examined environmental quality and economic growth. The study used the fractional cointegration technique on data from 1970 to 2011. The result revealed that weak institutions and unrestricted trade openness increases environmental degradation. Awan (2013) investigated the connection between the environment and economic development. The study showed that both developed and developing countries are responsible for environmental hazards. Karsalari (2014) examined the link between economic progress, international trade and the quality of the environment. The study covered the period between 1970 and 2011. Using the panel least squares regression, the result revealed that CO_2 emission has a long run relationship with per capita income and international trade. Ogboru and Angu (2015) investigated the relationship between environmental degradation and economic progress. The study adopted a theoretical approach and found that a large number of cases of illnesses such as cancer, tuberculosis, viral infections etc are as a result of polluted environment. The study by Fidel (2015) focused on environmental quality and economic development in low income countries. Using the Environmental Quality Trajectory (EQT) model, the findings support the Ruttan-Kuznets proposition about the relationship between income and environmental quality. Omotor (2016) examined the relationship between economic progress and

emission under the EKC framework. The study used the panel least squares regression technique. The study found the existence of EKC for CO_2 and Sulfur Dioxide (SO_2). Ominyi and Abu (2017) examined sustainable economic development and environmental degradation in Nigeria. The Vector Autoregression (VAR) was applied to data that covered 1986 to 2015. The result indicated that the environment improves at low income levels while it worsens at high income level. The result rejects the emergence of EKC. Ogaresyan (2017) assessed carbon emission, energy consumption and economic growth. The data used were from Brazil, Russia, India, China and South Korea (BRICs) and covered the period between 1980 and 2015. The panel cointegration result did not support the EKC. Aye and Edoja (2017) assessed the effect of economic growth on CO_2 emission in developing countries. The panel least squares regression was used to analyze the data for 31 developing countries. The result revealed that economic growth has negative impact on CO_2 emission in periods of low economic growth but positive effect in the period of high economic growth. This finding does not support the EKC hypothesis. Sepehrdoust and Zaman (2017) examined the developing countries case of economic growth and environmental protection. The study used the data covering the period between 2001 and 2012. Using the panel least squares regression, the result shows that population growth, renewable energy and the size of internet users have a positive and significant relationship with CO_2 emission per capita while industrial sector value added has a positive impact on CO_2 per capita.

Theoretical Framework/Model Specification

The EKC was originally a relationship between income inequality and per capita income in both developed and developing countries. It posits that at the early stages of development, income inequality tends to worsen; it reached a threshold after which further increase in per capita income reduces income inequality. This was extended by Grossman and Krueger (1991) to a relationship between per capita income and environmental quality known as the EKC. It posits that at the early stages of economic progress, environmental degradation and pollution increases with increment in per capita income, but after some level of per capita income, there will be reversal in the trend and environmental degradation will thus reduce with increases in per capita income. The EKC has an inverted U shape.

Following Grossman and Krueger (1991), an augmented environmental degradation-income model is thus developed below:

$$CE = b_o + b_1YPC + b_2YSQ + b_3POP + b_4OPEN + b_5FDI + Ut$$

Where:

CE   =   Carbon emission in metric tons. CO_2 emission was used as a measure of environmental quality since it constitutes most of the greenhouse gas emitted (Alege and Ogundipe, 2015).

POP   =   Population. This is important since a huge population with high density breeds degradation to the environment

YPC   =   Per capita income

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YSQ   =   Square of the YPC

OPEN =   openness of the economy to external trade computed as the ratio of export plus import to Gross Domestic Product (GDP).

FDI   =   Foreign Direct Investment

Both OPEN and FDI could be used for control for environmental degradation through dumping of harmful substances into the environment by multinational companies.

The data will thus be subjected to the unit root test. The Augmented Dickey Fuller (ADF) unit root test will be used to analyze whether the data are stationary or not and their order of integration. The ADF is preferable to the Dickey Fuller (DF) since it amongst others automatically corrects for possible serial correlation in the variables. The Johansen cointegration test will be used to analyze the long run equilibrium relationship among the variables. Among the reasons for preferring the Johansen technique to others like the Engel-Granger is that it allows for more than one cointegrating equation. The signs and magnitudes will be analyzed with the long run static result. The granger causality test will also be used to test the causal relationship among the variables.

RESULTS AND FINDINGS

The result of the ADF unit root test is shown in the table below:

Table1: Summary of ADF Unit root test

Variables	Level data	First difference	Order of integration
YPC	-3.81	-6.24	I(0)
YSQ	-4.42	-1.91	I(0)
FDI	-2.02	-6.48	I(1)
OPEN	-1.02	-4.11	I(1)
POP	-0.81	-5.30	I(1)
CE	-1.21	-4.34	I(1)

NB: 1% critical value is -3.86

The result indicates that per capita income and the square of per capita income were stationary at the level but the other variables were not stationary and became stationary only after the first difference was taken.

The result of the Johansen cointegration test is shown below:

Table2: **Summary of Johansen Cointegration test result**

Trace Statistic	0.05 Critical Value
86.46546	95.75366
66.36606	69.81889
44.64605	47.85613
27.61829	29.79707
13.60212	15.49471
0.559512	3.841466

Max-Eigen Statistic	0.05 Critical Value
39.08858	40.07757
32.72001	33.87687
23.02775	27.58434
20.01617	21.13162
13.04261	14.26460
0.559512	3.841466

The result of both the trace statistic and the Max-Eigen statistic did not show evidence of a long run relationship between per capita income, carbon emission and the other variables.. This suggests no long run equilibrium relationship among the variables. This result therefore shows no evidence of the EKC for Nigeria. What exists in Nigeria is not an inverted U shaped EKC but a u shaped EKC.

The result of the OLS is shown below:

$$LCE = 0.42 + 0.63YPC + 0.22YSQ + 0.68POP + 0.25FDI + 0.02OPEN$$

$$(1.43)\ (0.18)\ (1.11)\ (4.17)\ (6.02)\ (3.36)\ R^2 = 0.82\ DW = 2.11$$

NB: Figures in parenthesis are t values

The R^2 which is the coefficient of determination indicates that 82

 percent of the total variation in carbon emission has been explained by per capita income, the square of per capita income, population, openness and FDI taken together. This is good for our model since only 18 percent of the total changes were explained outside the model. The sign of the per capita income is positive and not statistically significant. This indicates the non existence of the EKC in Nigeria. This is further confirmed by the square of the per capita income which has a positive sign and not statistically significant. This indicates that the growth in Nigeria has not reached a point when better environmental quality will be given priority. The result indicates that population has positive and significant impact on carbon emission. An increase in population by 1

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unit increased carbon emission by 0.68 units. This result indicates that areas with a high population density have more environmental degradation than areas with low population density. The statistical significance of the openness of the Nigerian economy to the outside World through international trade and the statistical significance of the FDI provide an indication that the activities of the multinational companies and global trade have worsened the level of environmental degradation in Nigeria.

The result of the granger causality test is shown below:

Table3: Granger causality Test Result

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
YSQ does not Granger Cause LCE	30	0.75355	0.4811
LCE does not Granger Cause YSQ		1.28538	0.2942
YPC does not Granger Cause LCE	30	0.85877	0.4358
LCE does not Granger Cause YPC		0.58651	0.5637
OPEN does not Granger Cause LCE	30	2.23712	0.1277
LCE does not Granger Cause OPEN		0.67884	0.5163
LFDI does not Granger Cause LCE	30	0.16937	0.8452
LCE does not Granger Cause LFDI		0.20766	0.8139
LPOP does not Granger Cause LCE	30	8.69332	0.0014
LCE does not Granger Cause LPOP		27.8884	4.E-07
YPC does not Granger Cause YSQ	30	1.03886	0.3686
YSQ does not Granger Cause YPC		1.41212	0.2624
OPEN does not Granger Cause YSQ	30	0.82696	0.4490
YSQ does not Granger Cause OPEN		1.30349	0.2894
LFDI does not Granger Cause YSQ	30	0.06725	0.9351
YSQ does not Granger Cause LFDI		2.78533	0.0809
LPOP does not Granger Cause YSQ	30	1.70603	0.2021
YSQ does not Granger Cause LPOP		0.92335	0.4103
OPEN does not Granger Cause YPC	30	2.06518	0.1479
YPC does not Granger Cause OPEN		2.04501	0.1505
LFDI does not Granger Cause YPC	30	1.06677	0.3593
YPC does not Granger Cause LFDI		0.56162	0.5773

LPOP does not Granger Cause YPC	30	1.92895	0.1663
YPC does not Granger Cause LPOP		0.81116	0.4557
LFDI does not Granger Cause OPEN	30	1.70888	0.2015
OPEN does not Granger Cause LFDI		3.79184	0.0365
LPOP does not Granger Cause OPEN	30	0.23869	0.7894
OPEN does not Granger Cause LPOP		0.09352	0.9110
LPOP does not Granger Cause LFDI	30	0.04257	0.9584
LFDI does not Granger Cause LPOP		0.10802	0.8980

The result of the pairwise granger causality test indicates that per capita income and carbon emission did not granger cause each other. This indicates the non-existence of the EKC in Nigeria. The result further indicates that the square of the per capita income and carbon emission does not granger cause each other. This further confirms the nonexistence of the EKC in Nigeria. Bilateral causality however exists between population and carbon emission.

CONCLUSION

The study concludes that the type of growth in Nigeria has not reached the level at which environmental degradation will be reduced. It is concluded that the growth in the Nigeria's per capita income has been a false or pseudo growth. This might be also attributed to the high inflation rate which has eroded the purchasing power of the per capita income in Nigeria. The study concludes further that the liberalization of trade and the inflow of FDI have worsened the level of environmental degradation through unchecked polluting activities of the multinationals. This has been worsened by weak regulatory institutions. It is thus recommended that the government should put in place policies to increase the per capita income and such an increase should not be accompanied by an increase in the general price level to enable the desired impact to be felt on the environment through a reduction in its degradation. The payment of not just a new national minimum wage but a living wage to workers is also vital in this regard. Increment in the productive capacity wil also increase the purchasing power of the per capita income which will ensure a cleaner environment in Nigeria.

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