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Dynamic Relationship between Environment, Taxation and Economic Growth in the Saharan Africa: Case Study of Nigeria

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ABSTRACT

Background: Worldwide environmental pollution has called for overwhelming concern of researchers and stakeholders in the last twenty years because of the menace it unlashes on man's life. The aim of this research work is to ascertain the causation among economic advancement, Carbon emission, energy consumption and taxation. The study focused on the Nigerian economic and the period under review is thirty-three (33) years.

Methods: Test was performed to explain the accurate transmission among the dependent and the independent variables. This study employed Granger estimation to ascertain the direction of the connection amongst the variables.

Result: Results revealed that tax has unidirectional connection with economic advancement. The result also showed that Carbon emission has unidirectional relationship with economic growth. The result further revealed that energy consumption has a unidirectional association with taxation. This study suggests that economic growth does not affect energy consumption, taxation and carbon emission. This study recommended that for future study, intending researchers should use fuel consumption to proxy energy consumption. The study also recommended that the Nigerian government should increase tax paid by oil companies in order to curtail their excesses and generate more revenue.

Key words: Carbon dioxide, Coal consumption, Gross domestic product, Tax.

INTRODUCTION

Global warming has drawn the attention of scholars and stakeholders in the last two decades due to the hazard it poses on the ecosystem. Man's activities are said to be responsible for the unpredictable climatic drift experienced globally in recent time. Most nations of the world have vouchsafed to maintain the global warming at an appreciative level via the declination of greenhouse gas emissions, especially carbon. This pledge was articulated at the Kyoto Protocol in 1997 and the 21st conference of the Parties in Paris held in 2015. Espousal of this Memorandum of Understanding (MOU) is aimed at creating new international climatic protection laws. The misconception that the ecosystem dilapidation is the challenge faced only by developed countries, is no longer tenable because the spillover effects are felt by both developed and developing nations (Ighodaro *et al.,* 2021).

The deposit of greenhouse gases (GHGs) on the earth's surface is currently undesirably disturbing the countries all over the globe, both specialized economies and emerging economies alike, regardless of who is liable for such accretion. The burn out of fire in Russia, the eruption of flood in Pakistan and Australia, the earthquake in Haiti and the tsunami in Japan are foremost catastrophes witnessed in the last two decades as a result of ecological dilapidation. These events damaged substructure, resources given by nature such as forestry and consequential wild life, agricultural land and produce and most notably, they pose threat to inhabitants in the ecosystem (Gumula *et al*., 2014; Ghute and Babar, 2021). Ecological dilapidation has become a foremost concern, for ecologists and natural science because of the feedback effect economic growth has on the ecosystem (Chiu *et al.,* 2013; Anoman *et al.,* 2021).

Most previous studies on carbon emission and economic growth relationship were aimed at either to verify the Ecological Kuznets Curve (EKC) theory of fiscal inequality or to elucidate the long-run equipoise amid GHG emissions and economic advancement. In emerging economies, energy consumed and GHG emanations escalate as revenue rises. As revenue echelons rises, humanity has the consciousness and means to enact expensive ecological policies, resulting in declination in carbon emissions. So the echelon of emanations carbon whittles down at a given bracket of income (Chiu *et al*., 2013).

Some studies (Akahmat *et al*., 2014; Amadeh and Kafi, 2015) show that there is positive association amid carbon emanated and economic advancement. Their results suggest that rise in carbon emissions connotes an upswing

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in industrial activities which will in turn result in unprecedented advancement of the economy. Some other studies (Anwar and Nasareen, 2015; Arouri *et al.*, 2012) reveal that emissions of carbon has negative impact on economic growth, while others argued that carbon discharges affect the wellbeing of employees and lead to a drop in productivity of both labour and land.

Adesina and Adejuwon (2008) argue that even though the emerging West- African nations contribute marginally to environmental alteration, there is an allowable obligation for these countries to uphold environmental sustainability rule giving to the probable adversative effect of environmental pollution on the advancement of food security, wellbeing, poverty reduction, inequity, as well as future economic growth and development. The authors further report that Nigeria in particular has suffered quantum losses and imaginable environmental degradation as a result of carbon emission.

The evidence and catastrophic effects of ecological contamination in Saharan Africa are felt more in industrial cities and oil producing communities (like, the Niger Delta) where oil production is carried out on daily basis at the expense of the inhabitants of these communities. Proponents of environmental protection advocated that introduction of environmental-taxes/carbon tax will help to control the emission of carbon and in turn, revenue generated from these taxes will boost the GDP of the nation. Other scholars on the contrary, argued that introduction of high tax will whittle down the profits made by the operating companies which may lead to the demise of some of these companies. They argued that imposition of carbon tax will have negative effect on industrial development and by extension the economy (Eteng, 2012). Their argument is that economic development and environmental growth are adversative to each other. From their standpoint, they contended that when a country desiderates economic development, such a nation should be ready to tolerate certain hazards that come with industrialization. In rebutting this argument, it must be noted that anything that seems to be a "development" which, in fact, causes enormous hardship on the people and society strictly speaking should not be perceived as development.

From foregoing the aim of this study to ascertain the causation among Carbon emission, tax and economic growth of Nigeria. This study tested the following hypotheses

Ho_1: Carbon emission has no significant relationship with economic growth.

Ho_2: Coal consumption has no significant relationship with economic growth.

Ho_3: Tax has no significant relationship with relationship with economic growth.

MATERIALS AND METHODS

Research area

This research was performed in Edo State University Nigeria in 2021. The study used archival data extracted from World Bank data base and National Bureau of Statistical data base. The period under review is thirty-three years, 1987-2020.

Model specification

The model for the study is the modified version of Carson and Fargher Simon, (2005) that scrutinizes the effect of coal used up, carbon emitted and economic advancement elucidated by limit theory structure. The model is stated below:

$$GDP = f(CO_2EM, COSUM \text{ and } TAX) \quad .....(i)$$

This can mathematically expressed as;

$$GDP = a + \beta_1 CO_2EM_{it} + \beta_2 COSU + \beta_3 TAX_{it} + U \quad .....(1)$$

Where,

GDP = Gross domestic product.

CO_2EM = Carbon dioxide emission.

COSUM = Coal consumption.

TAX = Petroleum tax.

Estimation technique

The strength properties of the variables were ascertained with an assessment of ascertaining their stochastic characteristics, to expedite the determination of the apposite econometric context. Two amalgamated unit root assessments were performed in this work, that is *i.e.* Fisher, PP-Fisher and Kwiatkowski-Phillips-Schmidt-Shin test statistic.

The stationary test for variable S is grounded on this equivalence:

$$\Delta S = \delta_0 + \delta_{it} + \delta_2 + S_{t-1} + \sum_{i=0}^{p} \lambda_{1\Delta} 1 + A_{t-i} + \epsilon_t \quad .....(2)$$

Where,

δ_0, δ_1, δ_2 and λ_1, .. λ_p are factors to be approximated and εt is the Gaussian white sound disruption term.

The assessment of co-integration employing the Johansen Fisher panel co-integration test structure precede the unit root assessments, after which the co-integration is tested. The presence of co-integration amid a given sequence variables suggests the presence of a modified device. This modification was performed via VECM linking three causation tests, that is, the short-run and long-run.

To exam a futuristic non-causation, the null hypothesis that the measurement of ECMt-1 is nil is verified alongside the alternative hypothesis ECMt-1≠0, in order to decide whether the regressors Granger cause CO_2.

Testing for short-run. An examination for short-run non-causality from GDP to CO_2 is conceded out by examining whether the constants of the insulated variances of the GDP are all equivalent to nil. The over-all causation is piloted by jointly displaying all the constants of the regressors including the coefficient of the ECT to zero. All assessments of causation were piloted through the Wald test. The study estimated the equivalence on basis of 2 lags applying SBC as a guide.

Evaluations technique

The multivariate Granger recommended by Granger (1969) and promoted by Sims (1972) approach was used to ascertain the direction of causativeness amongst the subject

matter, that, carbon emission, taxation and GDP. Nevertheless, there is the likelihood that variables of this study are trending.

The multivariate regression inquiry was employed as the data analysis technique. The study used panel data. In order to ascertain the causation amidst the tested variables, we employed Engle-Granger approach in VECM framework based on transformed wald (MWALD) test in case of the augmented VAR. For the approximation, we employed seemingly unrelated regression (SUR) method. In this setting, we advance as follows. Firstly, the study will adopt the conventional approach like Engle-Granger for causation. Secondly, employed Dolado and Lütkepohl (1996) and Toda and Yamamoto (1995) approach to exam the rectilinear interconnection between company tax and GDP to crisscross the strength of the causation gotten by the conventional method used for the analysis.

After checking the co-integrating link amid variables tested, VEC archetypal test was performed which will help us to know the path of causation amongst the couple of variables employed in examining the amount of co-integration trajectories. This because co-integration does not only explain the direction of causation but also reveals the point at which long run equilibrium of variable is met. Conversely, VECM is said to also help to elucidate the route of causation amid some couple of variables in both short and long run causation as described by the momentous (employing t-test) insulated error alteration term while the short run causation is elucidated by first variance of dependent variables.

The Granger technique of inquiry to if X affects Y is meant to ascertain the extent to which to which existing Y can be explicated by preceding values of Y and to further establishes if added values of lagged X will increase the description. Y is assumed to Granger-caused by X when X aids in the forecast of Y. For dual variable like X and Y the Granger-causation VECM structure is calculated with the equations, as long as X and Y are joined in order one. The F-tests of the differenced dependent variables suggest, short-run causation influence of the variables. Contrarily, the impact of the insulated error-correction term(s) suggest long-run causation. The value of the insulated error-correction figure, conversely, is a short-run correction coefficient and represents the portion of long-term uncertainty (or inequity) in the dependent variable that is being adjusted in each short run. The non-emblematic or slightest removal of insulated error-correction figure will upsets the inferred long-term link and might lead to the disruption of the theory.

RESULTS AND DISCUSSION

Table 2 reveal that unit root test at levels and with interrupt. As displayed in the Table 2, all variables seem to be smaller than the acute values at 5% levels via Kwiatkowski-Phillips-Schmidt-Shin assessment statistic and PP-Fisher examination statistics. Precisely, GDP (KP=0.315, PP=1.08.633), TAX (KP=0.338, PP=0.527), COEM (KP=0.403, PP=-3.6) and ENSUM (KP=0.25, PP=-1.468) are all smaller than their bench mark at 5% and therefore we reject the hypothesis that the data is non-stationary.

The outcome further confirms that unit root at 1st variance single-handedly intercept of all variables are smaller than the critical value at 1% for Kwiatkowski-Phillips-Schmidt-Shin test statistic. As observed GDP (KP=0.67, PP=1.08), TAX (KP=0.247 PP=-8.87), COEM (KP=0.500, PP=6.437), COSUM (KK=0.621, PP= 8.631). Consequently, null hypothesis of non-stationarity is rejected. The results imply that every series is non-stationary at the 5% level.

Table 1: Measurements and sources of data.

Variables	Meaning	Measurement	Source
GDP	Gross domestic product	Gross domestic product	National bureau of statistics
CO_2 EM	Carbon de emitted	Metric tons per capita	International energy statistic monthly update
COSUM	Coal consumption	Metric tons capita	National bureau of statistics
TAX	Petroleum tax	Tax rate	Central bank of Nigeria bulletin

Source: Researcher's compilation (2021).

Table 2: Unit root test for the variables at levels at 5% sig level with intercept.

Variable	KP value	Critical value	PP test value	Critical value
GDP	0.315	0.7930	-1.08	-3.633
TAX	0.338	0.4631	0.527	-2.948
CO_2EM	0.403	0.347	-3.613	-2.613
COSUM	0.249	0.347	-1.468	-2.613
GDP	0.679**	0.739	-8.979**	-3.633
TAX	0.247	0.463	-8.797**	-2.948
COEM	0.500	0.347	-6.437**	-2.613
ENSUM	0.621	0.347	8.631**	-2.613

Source: Authors' results (2021).

**Significant at 5%.

Table 3a: Co-integration test (Engle and Granger procedure).

Unrestricted cointegration rank test (Trace)				
Hypothesized No. of CE(s)	Eigen value	Trace statistic	0.05 Critical value	Prob.**
None *	0.640659	58.17628	40.17493	0.0003
At most 1	0.265179	23.37786	24.27596	0.0646
At most 2	0.245076	12.90149	12.32090	0.3990
At most 3	0.093639	3.342797	4.129906	0.0800
Table 3b				
Hypothesized		Max-Eigen	0.05	
None *	0.640659	34.79842	24.15921	0.0013
At most 1	0.265179	10.47637	17.79730	0.4363
At most 2	0.245076	9.558690	11.22480	0.0968
At most 3	0.093639	3.342797	4.129906	0.0800

Source: Authors' results 2021.

**MacKinnon-Haug-Michelis. p-values Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level.

Table 4: Pairwise granger causality tests.

Null hypothesis	F-statistic	Prob.
TAX does not granger cause GDP	6.63967	0.0018**
GDP does not granger cause TAX	0.76093	0.5262
COEM does not granger cause GDP	3.31342	0.0355**
GDP does not granger cause COEM	1.06361	0.3815
ENSUM does not granger cause GDP	2.05396	0.1309
GDP does not granger cause ENSUM	1.96942	0.1433
COEM does not granger cause TAX	5.75836	0.0037**
TAX does not granger cause COEM	0.19659	0.8978
ENSUM does not granger cause TAX	-	-
TAX does not granger cause ENSUM	0.43171	0.7320
ENSUM does not granger cause COEM	2.28405	0.1025
COEM does not granger cause ENSUM	1.11440	0.3612

It is obvious from the Table 3a and Table 3b that Trace and Eigen value did not meet the benchmarks hence the null hypothesis of none co-integrating vector was reject contrary to alternative.

Authors' results 2021

Table 4 reveals that there is unidirectional relationship between Tax and economic growth in Nigeria. This implies that tax Granger-causes economic growth while economic advancement does not lead to significant changes in taxation in the period under review. This result is line with the findings of Neog and Gau (2020) which reveal that taxation significantly influences economic advancement in India. However the result is at variance with extant negative of Yelwa, Awe and Mohammed (2018). The outcome of study similarly reveal that carbon emission has a unidirectional causation with economic advancement. This implies that upsurge in carbon emission will lead to economic advancement while change in GDP will not lead to any significant changes in carbon emission. This result is in line with Zheng *et al.* (2016). Additionally, the result reveals energy consumption has no causation with economic growth while economic growth also has no causation with energy consumption. This result is in line with Oyaromade *et al.* (2014). Finally, the result reveals that energy consumption has unidirectional causation with taxation.

CONCLUSION

The study examines the causation among economic advancement, tax, carbon emission and energy consumption. The result shows that a change in tax will lead to a significant change in economic growth in Nigeria. The result connotes that change in economic growth does not significantly influence tax revenue collected in Nigeria. The result further shows that energy consumed has no causation with economic advancement. This infers that energy consumption has no emblematic effect on economic advancement and economic growth has no emblematic effect on energy consumed. Additionally, the outcome of this study shows that Carbon emission has causation with economic advancement in elongated period and in the mediate period. The outcome of this research also reveals that change in energy consumption will lead to a significant change in taxation. This study recommended that the Nigerian government should enact tax policies that will curtail the excesses of manufacturing and oil companies with regards to carbon emission.

An additional course for forthcoming research would be to investigation the causation among economic growth, pollution and other hypothetically pertinent variables such as vehicle use, health expenditure and suburbanization.

Conflict of interest: None.

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