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Industrial growth and CO_2 explosion in Nigeria

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Abstract

This study analyzes the influence of industrial growth, financial performance, trade, FDI and energy use on CO_2 explosion in Nigeria by utilizing ARDL technique from 1980 to 2019. From the outcome of cointegration test, it is confirm that the variables have long run linkage in the model. From the short run estimates, industrial growth, financial performance, trade, FDI and energy use increase the capacity of CO_2 explosion. In addition, the estimated long run analysis also reveals that industrial growth, financial progress, FDI and energy utilization accelerates the level of CO_2 explosion in the country. Nevertheless, trade does not influence CO_2 discharge. Hence, as shown by the estimated analysis of the model that industrial growth positively increase CO_2 explosion in Nigeria, policymakers in the nation should emphasize on the policies that would simultaneously mitigates the explosion of CO_2 and increase the level of industrial growth for the nation's development. This can achieve through provision of other forms of energy resources like wind, solar and thermal for industrial use at least cost so as to progress industrial production and CO_2 mitigation. Moreover, there is a need to enhance measures on financial instruments and foreign relation on the CO_2 mitigation and development of the nation's economy.

Keywords: CO_2 explosion, industrial growth, financial performance, Nigeria, ARDL

1. INTRODUCTION

The release of the global CO_2 discharge has been intensified in the recent years (IPCC, 2018). This has led to the serious environmental defects such as deterioration of ecosystem, climate and the world's

temperature (Danlami, Applanaidu, and Islam 2018). It is argued that global temperature have reached to more than 2°C and also projected rise up to 5°C in 2030 (IPCC, 2018; Tiwari, 2011). Hence, this may adversely affect agricultural produce, human and economic performance (Asongu, 2018). Developing nations today are in the forefront in discharging CO_2 which believe it constitute over 67 percent of the total global explosion (Shahzad et al., 2017). Similarly, the trend of CO_2 discharge in the African nations has been increased to the unexpected capacity due to the intensification of the nations to develop their production and energy use capacity (WDI 2017). This resulted to continue agitations by united nation on mitigating the level of CO_2 explosion.

In Nigeria, the level of CO_2 explosion have upsurge and reached a threat level with regard to climate nature and the settings of the ecosystem (WDI 2017). It affect agricultural production, seasonal rain fall, sea level alteration that cause many social and economic menace, like farmers herders crisis and Boko haram issues in the nation (Iyekekpolo 2020). In this regard, appropriate measures need to be considered for the purpose of tackling the situation. Industrial growth in the nation is currently contributing to the national development due to the government support with the need for economic diversification (World Bank, 2019). This have led to the rise in energy demand by almost 56 percent as well as increase in the capacity of GDP growth by 15 percent from 2016 to 2019 (CBN, 2020). Therefore, this condition may directly linked to the increased level of CO_2 explosion in the nation. Hence, the study investigates the influence of industrial growth on CO_2 discharge in Nigeria.

2. LITERATURE REVIEW

The linkage among industrial growth, financial performance, trade, FDI and energy are essentially discussed in the literature. For instance study by Asici (2015) stressed that industrial value accelerates the capacity of CO_2 explosion in emerging nations. Similarly, Heidari et al. (2015) reveal that industrial performance positively influence CO_2 discharge in 5 ASEAN nations. Abdouli and Hammami (2017) studied the influence of economic performance on CO2 in MENA economies by applying GMM method from 1990 to 2010. The outcome indicates that GDP growth upsurge the capacity of CO_2 explosion. This outcome if

found in the analysis obtained by earlier studies (Alvarado and Toledo, 2017). Moreover, study by Salahuddin et al. (2018) confirm a positive link among GDP performance and CO_2 explosion in Kuwait. Chen et al. (2019) study the effect industrial growth on CO_2 explosion in China. The finding reveals that industrial growth increase the level of CO_2. Zheng-xin Wang and Li (2019) analyze the influence of economic performance on CO_2 discharge in China. Outcome indicates that economic performance upsurge the level of CO_2. Bekun et al. (2019) documented that industrial growth accelerates the capacity of CO_2 explosion in EU nations. In another development, study by Javid and Sharif (2016) investigate the role of financial performance, GDP, energy utilization and trade on CO_2 explosion in Pakistan. The estimates reveals that financial performance, GDP and energy increase CO_2 explosion. Charfeddine and Kahia (2019) stressed that financial performance upsurge the level of CO_2 discharge in MENA nations. Gokmenoglu and Sadeghieh (2019) analyze the influence of financial progress, energy and GDP performance on CO2 in Turkey from 1960 to 2011. Outcome reveals that financial progress increased CO2 explosion. Wang et al. (2018) argued that energy utilization upsurge CO_2 in 170 economies. Sarkodie and Strezov (2019) proved a positive link among energy use and CO_2 explosion in emerging nations. Bekun, Alola and Sarkodie (2019) studied the influence of energy resources on CO_2 in 16 EU economies from 1996 to 2014. Outcome shows that energy resources increase CO_2 explosion. In another dimension, Zhang (2018) confirm that trade reduce CO_2 in industrialized nations. The outcome of this study is in line with findings documented by Asongu (2018) that trade decrease the level of CO_2 in `44 SSA nations. Liobikienė and Butkus (2019) investigate the performance of trade on CO_2 using GMM approach for 147 nations from 1990 to 2012. The study confirms that trade decrease the capacity of CO_2. From the literature reviewed it is shown that relations among the variables exists. However, studies on industrial growth on the CO_2 explosion are very little especially in less developed nations, like Nigeria. There the study examine the effect of industrial growth on CO_2 explosion in Nigeria.

3. Data and technique of the model's analysis

3.1 Data

Based annual data for CO_2, industrial growth (industrial value % GDP), trade (sum of export and import), financial performance (% of

credit), FDI (net inflow), energy utilization (kg of oil equivalent) are utilized for the study estimation from 1980 to 2019. The data were sourced from WDI and all changed to the log value for clear interpretation. Table 1 shows result of the variables statistical nature. It indicates that IG recorded the largest mean value of 4.2, 7.1 and 4.3 maximum and minimum values. Nonetheless, CO_2 explosion has the least mean value of 0.2, 0.76 and 0.41 as maximum and minimum values.

Table 1 variables statistical nature

Variables	Mean	SD	Min	Max
LCO_2	0.272	0.126	0.412	0.768
LIG	4.213	2.217	7.125	4.362
LFD	2.631	4.732	1.602	1.091
LTD	1.461	6.613	4.651	2.942
LFDI	3.112	5.607	2.952	2.182
LEU	0.747	3.522	1.752	4.810

3.2 Specification of the model

The study utilize a changed model used by Jebli et al. (2017) in analyzing the linkage among the study's variables as shown in the in equation 1

$$LCO_2 = \propto_0 + \propto_1 LIG_t + \propto_2 LFD_t + \propto_3 LTD_t + \propto_4 LFDI_t + \propto_5 LEU_t + \varepsilon_t \qquad (1)$$

In equation 1 LCO_2, LIG, LFD, LTD, LFDI and LEU indicates CO_2 explosion, industrial growth, financial performance, FDI and energy. Therefore, the employed ARDL method for the estimation and it is expressed in equation 2.

$$\Delta LCO2 = \beta_0 + \sum_{j=1}^{n} \beta_1 LCO2_{t-j} + \sum_{j=0}^{n} \beta_2 IG_{t-j} + \sum_{j=0}^{n} \beta_3 FD_{t-j} + \sum_{j=0}^{n} \beta_4 TD_{t-j} + \sum_{j=0}^{n} \beta_5 FDI_{t-j} + \sum_{j=0}^{n} \beta_6 EU_{t-j} + \alpha_1 LCO2 + \alpha_2 IG_t + \alpha_3 FD_t + \alpha_4 TD_t + \alpha_5 FDI_t + \alpha_6 EU_t + \varepsilon_t \qquad (2)$$

In equation 2, t denotes the time, Δ illustrates the change and ε shows the disturbance term.

4. RESULT

This fragment illustrates the outcome for the stationarity tests as well as the estimation of the model. It is indicated that the variables have both level and first different stationarity nature from table 2 illustration under ADF and PP tests.

Table 2. Outcome for Stationarity

Variable	ADF LEVEL		PP LEVEL		ADF First Diff		PP First Diff	
LCO2	-2.63382*	(0.0004)	-1.91465*	(0.0002)	-	-	-	-
LIG	-1.42181	(0.3162)	-2.31673	(0.4731)	-2.42103*	(0.0000)	-6.53742*	(0.0000)
LFD	-3.16543	(0.2561)	-2.83261	(0.1456)	-1.73410*	(0.00003)	-2.54735*	(0.0004)
LTD	-1.46756	(0.1783)	-3.52142	(0.4107)	-7.37871*	(0.0000)	-1.89642*	(0.0002)
LFDI	-3.41272	(0.3782)	-1.20571	(0.5329)	-2.02362*	(0.0000)	-3.56715*	(0.0000)
LEU	-1.4523	(0.6217)	-3.85632	(0.3216)	-6.07274*	(0.0000)	-4.38017*	(0.0000)

Notes: * denotes significance at one percent.

From Table 3 it is revealed that long run nature association occur on the variables as indicated by F-statistics value.

Table 3. Result for cointegration test

	1%		5%	
F-statistics	I(0)	I(1)	I(0)	I(1)
4.76	3.41	4.68	2.26	3.79

Table 4 came up with the analysis of the model's estimation. The outcome from the short run estimates shows that industrial growth positively accelerates the capacity of CO_2 explosion in Nigeria. It indicates that a percent upsurge in industrial growth leads to a rise in CO_2 discharge by 3.2 percent. Similarly, financial progress, trade, FDI and energy resources increase the level of CO_2 explosion in the country by 0.5, 1.0, 2.0 and 2.0 respectively in the nation. In another development, the model obtained fit value of ECT which confirms the long run connection of the variables. In the long run estimated the analysis shows that industrial growth increases the level of CO_2. This means that a percent rise in industrial growth caused CO_2 explosion to increase by 4.0 percent. Economically, the implication of this outcome is that 4.0 percent increase in CO_2 discharge in Nigeria is linked with rise in industrial growth. Therefore, policymakers in the country should emphasize on the policies that would simultaneously mitigates the explosion of CO_2 and increase the level of industrial growth for the nation's development. This can achieve through provision of other forms of energy resources like wind, solar and thermal for industrial

use at least cost so as to progress industrial production and CO_2 mitigation. The outcome is consistent with result found by earlier studies (Asici, 2015). Furthermore, financial performance accelerates the explosion of CO_2. It is reveals that a percent increase in financial performance result to upsurge in CO_2 discharge by 1.2 percent. Similarly, FDI and energy use increase the capacity of CO_2 discharge in the nation by 2.1 and 1.4 percent. However, trade have no influence on CO_2 explosion in Nigeria.

Table 4. Estimated outcome for the model

ARDL estimation	Coefficients	SD Errors	t-Statistics	Prob
Short run estimates				
ΔLIG	3.201704**	0.006321	-2.143721	0.0004
ΔLFD	0.586142**	0.026190	1.970534	0.0142
ΔLTD	1.013520*	0.001452	4.425730	0.0602
ΔLFDI	2.081178**	0.030824	3.634271	0.2388
ΔLEU	2.014791*	0.066477	-0.727358	0.0043
ECT(-1)	-0.921300*	0.349571	-3.972246	0.0081
Long run estimates				
LIG	4.010765*	0.007698	-2.167675	0.0092
LFD	1.208547**	0.002632	3.020511	0.0098
LTD	0.720162	0.105179	-1.726520	0.1326
LFDI	2.140267**	1.584478	-0.018973	0.0077
LEU	1.457642***	0.078251	-1.963420	0.0118
C	4.104871***	2.558462	2.070086	0.0627

Notes: ***. ** and * shows significant at 1, 5, and 10 percent

The validation checks for the model estimation is illustrated in Table 5. The outcome shows that the model is fit for policy suggestions as there is absence of heteroscedasticity, serial correlation, and normality hitches of the disturbance term in the model.

Table 5. Model's validation tests

Test Type	F-statistics	Probability	Result
Breusch-Pagan Test.	0.629015	0.3108	No Heteroskedasticity
Breusch-Godfrey Test	0.367102	0.2673	No Serial Correlation
Jarque-Bera	0.197003	0.5093	Normally Distributed

5. CONCLUSION

This study analyze the influence of industrial growth, financial performance, trade, FDI and energy use on CO_2 explosion in Nigeria by utilizing ARDL technique from 1980 to 2019. From the outcome of cointegration test, it is confirm that the variables have long run linkage in the model. From the short run estimates, industrial growth, financial performance, trade, FDI and energy use increase the capacity of CO_2

explosion. In addition, the estimated long run analysis also reveals that industrial growth, financial progress, FDI and energy utilization accelerates the level of CO_2 explosion in the country. Nevertheless, trade does not influence CO_2 discharge. Hence, as shown by the estimated analysis of the model that industrial growth positively increase CO_2 explosion in Nigeria, policymakers in the nation should emphasize on the policies that would simultaneously mitigates the explosion of CO_2 and increase the level of industrial growth for the nation's development. This can achieve through provision of other forms of energy resources like wind, solar and thermal for industrial use at least cost so as to progress industrial production and CO_2 mitigation. Moreover, there is a need to enhance measures on financial instrument and foreign relation on the CO_2 mitigation and development of the nation's economy. From the basis of this study non incorporation of some essential factors of CO_2 discharge like gas and fossils energy use in the estimated model are termed as the limitation of the study. Thus, futures studies should use this essential factors for better policy suggestions.

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