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Trade and CO_2 emission in Nigeria

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Abstract

The study examines the influence of trade expansion, GDP, energy resources use, financial sector performance and foreign investment on environmental pollution in Nigeria using ARDL method from 1980 to 2019. The findings from the cointegration test illustrate a long-run connection among the variables for the model. In the Short-run, the analysis shows that trade reduce the capacity of environmental pollution, thereby increases the level of environmental quality in the nation. It also shows that GDP, energy resources use and financial sector performance accelerate the level of environmental pollution. Nevertheless, FDI does not influence environmental pollution. The long-run estimate indicates that trade also increase environmental quality. However, economic progress, energy, financial sector performance upsurge the capacity of environmental pollution in the country. Nonetheless, FDI has no influence on environmental pollution. Therefore, the study suggests that since trade expansion is associated with increased level of environmental quality in the nation, policymakers should design more appropriate policies toward provision of enabling and conducive conditions for international trade. This could be done through enhancement and respect of bilateral trade agreements. Also policies regarding to the control of environmental pollution should redesign with respect to economic and financial performance as well as energy regulations measures and the facilitation of the use lower emissions energy alternatives.

Keywords: Trade, environmental pollution, GDP, ARDL, Nigeria

1. INTRODUCTION

For many years international communities have intensify effort to reduce CO2 explosion in all the nations of the world (UNDP, 2016).

The upsurge of CO2 discharge have reached a critical stage in which appropriate measures need to be initiated. For instance, the global CO2 growth increased by 32.3 billion kilotons from 1980 to 2010 and it is projected to grow by 50.1 percent in 2035 (IPCC, 2018). It is acknowledged that high level of CO2 explosion deteriorate environmental settings, ecosystem, earth temperature, climate and sea levels (Meratizaman et al., 2015; Nejat et al., 2015). This adversely affects economic performance, welfare and increased level of poverty among the world's nations. Several factors like trade performance, energy utilization and population growth contributes immensely to the increased level of CO2 explosion (Danlami, Applanaidu, & Islam, 2018). The capacity of CO2 discharge in the emerging nations such as China, India and Sub Saharan Africa contribute to about 62 percent of the global CO2 discharge (Hansen & Sato, 2016; IPCC, 2014).

In Nigeria CO2 growth have increased by 27 percent from 2010 to 2016. For instance, the nation have recorded 786 million kilo tonnes of CO2 explosion in 2010 and 1080 million kilo tonnes in 2016. In this regard, explosion of CO2 in the nations possess a positive trend. Trade expansion in the country have received a tremendous progress in the recent time especially with the openings of the bilateral trade agreement among Nigeria and developed economies (WTO, 2020). The level of oil and agricultural produce exportations have risen by 40 percent in a decade. Similarly, imports have increased by 37 percent in the nation (World Bank, 2019). This situation illustrates that trade expansion might have linked with the increased level of CO2 explosion in Nigeria. Hence, the study examine the influence of trade expansion on environmental pollution in Nigeria.

2. LITERATURE REVIEW

The link among trade, GDP, energy resource, financial sector performance, FDI and CO2 explosion have discussed in the literature. For instance, Al-Mulali et al. (2015) analyze the effect of trade expansion on CO2 explosion in Europe. Result shows trade reduce CO2. Dogan and Turkekul (2016) studied the influence of trade on CO_2 discharge in USA. The findings reveals a negative link among trade and CO2. Jebli et al. (2017) examine the connection among

trade and carbon discharge in 25 OECD economies by employing FMOLS and DOLS techniques for the period of 1980 to 2010. The study finds negative link among trade and CO2. Zhang (2018) reaffirms that trade influenced CO2 negatively in newly industrialized countries. The finding of this study is in line with result documented by Asongu (2018) that trade reduce CO2 in `44 SSA nations. Liobikienė and Butkus (2019) investigate the influence of international trade on CO2 by utilizing system GMM technique in 147 nations from 1990 to 2012. Outcome indicates trade reduce the level of CO2.The outcome is similar with studies of Zafar, Mirza, Zaidi, and Hou (2019) that trade expansion reduces CO2 in emerging nations. However, Yasmeen, Li, and Hafeez (2019) studied influence of international trade on CO_2 in 39 nations. The study concludes that trade has positive influence on CO_2 explosion. Moreover, study by Riti et al. (2017) use ARDL technique to assess the role of economic performance on CO_2 and find that GDP increases CO_2 in China from 1979 to 2015. Cetin and Ecevit (2017) noted that GDP influenced CO_2 positively in Turkey. Salahuddin et al. (2018) also confirms positive link among GDP and CO_2 in Kuwait.

In addition, Nguyen and Kakinaka (2019) studied the effect of energy on CO2 for 107 nations from 1990 to 2013. The result indicates that renewable energy use reduces CO2 in these countries. Hanif, Raza, Gago-de-santos and Abbas (2019) explain that use of fossil fuel increases CO2 for 15 Asian nations from 1990 to 2013. Gokmenoglu and Sadeghieh (2019) emphasized that financial performance, energy and GDP accelerates the capacity of CO2 explosion in Turkey. Based on the reviewed literature linkage among trade, GDP, energy, financial performance and FDI have been analyzed. However, the influence of trade expansion by measuring portion of GDP on environmental pollution have not been studied. Therefore, this study investigates the influence of trade expansion on environmental pollution in Nigeria.

3. DATA AND ESTIMATION TECHNIQUE

3.1 Data

Yearly data on CO_2 (kt), trade (total export and import), economic progress (GDP, current USD), energy (kt of oil equivalent), financial sector performance (credit % of GDP) from 1980 – 2019. All the data

are retrieved from WDI database and were changed to log form for simplicity of interpretation. Statistics of the variables used are illustrated in table 1. The outcome of the statistics shows that FD has the highest mean value of 9.11 compared to the other variables. Similarly it obtained a maximum value of 1.96 and a minimum value of about 4.95. However, CO2 got the lowest mean value of 0.63 compared to the other variables. It has a maximum value of 0.92 and 0.32 minimum value.

Table 1 statistics of the variables

Variables	Mean	SD	Min	Max
LCO_2	0.632	0.185	0.312	0.928
LTR	3.283	1.297	9.135	5.327
LGDP	1.234	8.734	2.702	3.098
LEN	7.181	3.684	6.654	7.986
LFD	9.112	3.617	4.957	1.962
LFDI	1.547	1.322	-1.150	5.790

3.2 Model Specification

In this study a changed model by Dogan and Turkekul (2015) is used for analyzing the link among the variables in the model.

$$LCO_2 = \propto_0 + \propto_1 LTR_t + \propto_2 LGDP_t + \propto_3 LEN_t + \propto_4 LFD_t + \propto_5 LFDI_t + \varepsilon_t \qquad (1)$$

In equation 1 LCO_2, LTR, LGDP, LEN, LFD and LFDI illustrate Carbon explosion, trade, economic progress, energy, financial sector performance and foreign investment. In this regard the study used ARDL technique for the model estimation. This approach possessed various benefit such as analyzing variables in a mix order (Pesaran et al, 2001). Hence, the model expressed as:

$$\Delta LCO2 = \beta_0 + \sum_{j=1}^{n} \beta_1 LCO2_{t-j} + \sum_{j=0}^{n} \beta_2 TR_{t-j} + \sum_{j=0}^{n} \beta_3 GDP_{t-j} + \sum_{j=0}^{n} \beta_4 EN_{t-j} + \sum_{j=0}^{n} \beta_5 FD_{t-j} + \sum_{j=0}^{n} \beta_6 FDI_{t-j} + \alpha_1 LCO2 + \alpha_2 TR_t + \alpha_3 GDP_t + \alpha_4 EN_t + \alpha_5 FD_t + \alpha_6 FDI_t + \varepsilon_t \qquad (2)$$

From equation 2, t shows the time, Δ symbolizes the change term and ε is the disturbance term.

4. RESULT

In this segment the stationarity results and estimation analysis outcome are discussed. Table 2 reveals a mix level of stationarity is found among the variables using ADF and PP tests.

Table 2. Stationarity tests outcome

Variable	ADF LEVEL		PP LEVEL		ADF First Diff		PP First Diff	
LCO2	-1.63742*	(0.0002)	-2.91536*	(0.0007)	-	-	-	-
LTR	-3.62153	(0.0614)	-2.56451	(0.2351)	-	-	-4.53254*	(0.0008)
LGDP	-2.16521	(0.4351)	-1.56783	(0.3382)	-2.31026*	(.00002)	-5.54755*	(0.0003)
LEN	-3.46782	(0.7683)	-0.35782	(0.2165)	-6.25671*	(0.0000)	-3.89626*	(0.0219)
LFD	-1.41284	(0.5172)	-3.20571	(0.4233)	-3.02426*	(0.0000)	-9.58015*	(0.0000)
LFDI	-2.6523	(0.8267)	-1.75343	(0.1493)	-4.03574*	(0.0000)	-5.38012*	(0.0000)

Notes: * Shows significance at one percent level.

Table 3 illustrates cointegration among the variables exists as the value of F-statistics is bigger than the critical value.

Table 3. Outcome of the cointegration test

	1%		5%	
F-statistics	I(0)	I(1)	I(0)	I(1)
4.85	3.41	4.68	2.26	3.79

The estimate for the model is illustrated in table 4. The outcome for the short-run analysis reveals that trade decelerates environmental pollution in Nigeria. It implies that trade expansion in the nation cause environmental pollution to reduce by 0.01 percent. However, economic progress, energy resource use and financial sector performance increase the level of environmental pollution in the country by 0.005, 0.017 and 0.08 respectively. In addition, the value of speed of adjustment found significant in explaining the convergence of variables at long run. Moreover, analysis of the long-run estimate indicates that the trade expansion in Nigeria accelerates environmental quality. This signifies that a percent rise in trade expansion in the country results to 0.01 percent decrease in environmental degradation. The implication of this outcome is decline in environmental pollution is associated with trade expansion. Hence, policymakers should design more appropriate policies toward provision of enabling and conducive conditions for international trade. This could done through enhancement and respect of bilateral trade agreements. The outcome is in line with outcome reported by earlier studies (Jebli et al. 2017). Nonetheless, economic progress, energy use

and financial sector performance upsurge the level of environmental dilapidation. This shows that a percent rise in these variable caused environmental degradation to increase by 0.05, 0.08 and 0.04 respectively. However, foreign investment have no influence on environmental pollution in Nigeria.

Table 4. Estimated outcome for the model

ARDL estimation	Coefficients	SD Errors	t-Statistics	Prob
Short run estimates				
ΔLTR	-0.014409**	0.005565	-2.589243	0.0413
ΔLGDP	0.005198**	0.000201	2.970528	0.0249
ΔLEN	0.017660*	0.005153	3.427014	0.0140
ΔLFD	0.081193**	0.030824	2.634126	0.0388
ΔLFDI	-0.014971	0.020577	-0.727536	0.4943
ECT(-1)	-0.991366*	0.249572	-3.972270	0.0073
Long run estimates				
LTR	-0.010763*	0.003398	-3.167149	0.0194
LGDP	0.050378***	0.000249	2.020533	0.0898
LEN	0.008945**	0.005186	-1.724888	0.0353
LFD	0.040277***	2.584028	-0.015587	0.0877
LFDI	-0.057814	0.041349	-1.398174	0.2116
C	7.104618***	3.552164	2.000082	0.0924

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

Table 5 point out the result of the model validation test. It reveals that the model is valid for policy analysis as it is confirm no heteroscedasticity, serial correlation, and the non-normality problems of the disturbance term.

Table 5. Model's validation tests

Test Type	F-statistics	Probability	Result
Breusch-Pagan Test.	0.237021	0.2836	No Heteroskedasticity
Breusch-Godfrey Test	0.995978	0.4021	No Serial Correlation
Jarque-Bera	0.578849	0.6543	Normally Distributed

5. CONCLUSION

This study investigates the performance of trade expansion, GDP, energy resources use, financial sector performance and foreign investment on environmental pollution in Nigeria using ARDL method from 1980 to 2019. The findings from the cointegration test illustrates a long-run connection among the variables for the model. In the Short-run, the analysis shows that trade reduce the capacity of environmental pollution, thereby increase the level of environmental quality in the nation. It also shows that GDP, energy resources use and financial sector performance accelerate the level of environmental

pollution. Nevertheless, FDI does not influence environment pollution. The long-run estimates indicates that trade also increase environmental quality. However, economic progress, energy, financial sector performance upsurge the capacity of environmental pollution in the country. Nonetheless, FDI have no influence on environmental pollution. Therefore, the study suggests that since trade expansion is associated with increased level of environmental quality in the nation, policymakers should design more appropriate policies toward provision of enabling and conducive conditions for international trade. This could done through enhancement and respect of bilateral trade agreements. Also policies regarding the control of environmental pollution should redesign in respect to economic and financial performance as well as energy regulations measures and the facilitation of the use lower emissions energy alternatives. The limitation of this study may be with regard to the inability to incorporate other factors like energy price, urbanization in the model. Hence futures studies should incorporate this factors for further policy analysis.

REFERENCES

1. Al-Mulali, U., Ozturk, I., & Lean, H. H. (2015). The influence of economic growth, urbanization, trade openness, financial development, and renewable energy on pollution in europe. *Natural Hazards*, *79*(1), 621–644. https://doi.org/10.1007/s11069-015-1865-9
2. Cetin, M., & Ecevit, E. (2017). The impact of financial development on carbon emissions under the structural breaks : Empirical evidence from Turkish economy. *International Journal of Economics Perspective*, *11*(1), 64–78.
3. Danlami, A. H., Applanaidu, S.-D., & Islam, R. (2018). Movement towards a low Carbon Emitted Environment: A test of some factors in Malaysia. *Environment, Development and Sustainability*, *20*(3), 1085–1102. https://doi.org/10.1007/s10668-017-9927-7
4. Dogan, E., & Turkekul, B. (2015). CO2 emissions , real output , energy consumption , trade , urbanization and financial development : Testing the EKC hypothesis for the USA. *Environmental Science and Pollution Research*, *23*(2), 1203–1213. https://doi.org/10.1007/s11356-015-5323-8
5. Dogan, E., & Turkekul, B. (2016). CO2 emissions, real output, energy consumption, trade, urbanization and financial development: testing the EKC hypothesis for the USA. *Environmental Science and Pollution Research*, *23*(2), 1203–1213. https://doi.org/10.1007/s11356-015-5323-8
6. Gokmenoglu, K. K., & Sadeghieh, M. (2019). Financial development , CO 2 emissions , fossil Fuel consumption and economic growth : The case of Turkey.

Strategic Planning for Energy and the Environment, *38*(7), 7–28. https://doi.org/10.1080/10485236.2019.12054409

7. Group World Bank. (2019). *Global economic prospects*.
8. Hansen, J., & Sato, M. (2016). Regional climate change and national responsibilities. *Environmental Research Letters*, *11*(3), 034009.
9. IPCC. (2014). *Climate change 2014: Synthesis report. contribution of working groups I, II and III to the fifth assessment report of the intergovernmental panel on climate change*. Geneva, Switzerland.
10. IPCC. (2018). Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the . In *IPCC* (pp. 541–562).
11. Meratizaman, M., Monadizadeh, S., Pourali, O., & Amidpour, M. (2015). High efficient-low emission power production from low BTU gas extracted from heavy fuel oil gasification, introduction of IGCC-SOFC process. *Journal of Natural Gas Science and Engineering*, *23*, 1–15. https://doi.org/10.1016/j.jngse.2015.01.023
12. Nejat, P., Jomehzadeh, F., Taheri, M. M., Gohari, M., & Muhd, M. Z. (2015). A global review of energy consumption, CO2 emissions and policy in the residential sector (with an overview of the top ten CO2 emitting countries). *Renewable and Sustainable Energy Reviews*, *43*, 843–862. https://doi.org/10.1016/j.rser.2014.11.066
13. 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. https://doi.org/10.1002/jae.616
14. Riti, J. S., Song, D., Shu, Y., & Kamah, M. (2017). Decoupling CO2 emission and economic growth in China: Is there consistency in estimation results in analyzing environmental Kuznets curve? *Journal of Cleaner Production*, *166*, 1448–1461. https://doi.org/10.1016/j.jclepro.2017.08.117
15. Salahuddin, M., Alam, K., Ozturk, I., & Sohag, K. (2018). The effects of electricity consumption, economic growth, financial development and foreign direct investment on CO2emissions in Kuwait. *Renewable and Sustainable Energy Reviews*, *81*(June), 2002–2010. https://doi.org/10.1016/j.rser.2017.06.009
16. UNDP. (2016). *Human development report 2016 human development for everyone*.
17. WTO. (2020). *Annual report*.
18. Yasmeen, R., Li, Y., & Hafeez, M. (2019). Tracing the trade–pollution nexus in global value chains: evidence from air pollution indicators. *Environmental Science and Pollution Research*, *26*(5), 5221–5233. https://doi.org/10.1007/s11356-018-3956-0