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IMPACT OF OIL PRICE VOLATILITY AND TRADE OPENNESS ON A GROWING ECONOMY

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ABSTRACT

This study investigates the interplay between oil price volatility, economic growth, and openness using data spanning from 1980 to 2020. Bound cointegration and regression methods were employed to analyze both short and long-term effects. The results indicate that in the short run, oil price volatility negatively impacts economic growth. However, as the economy becomes more resilient over time, oil price volatility begins to have a positive effect on economic growth in the long run. Additionally, trade openness is found to have a positive and significant impact on economic growth in the short term. Nevertheless, the influence of trade openness and exchange rates on long-term economic growth is statistically weaker. This suggests that the adverse impact of oil price volatility is more pronounced in the short run and diminishes over the long term. Consequently, policymakers should focus on managing exchange rates and leveraging comparative trade advantages to promote economic growth.

Keywords: oil price, growth, volatility, openness
JEL Code: O40, O24

Introduction

The global oil market has exhibited increasing volatility in recent times, primarily due to a combination of factors. This includes a surge in demand from developing nations and an uptick in oil production from advanced countries, notably the United States. The situation was further exacerbated by a significant reduction in oil demand in China during the COVID-19 pandemic, leading to a 20% decline. Projections indicate that major oil-producing nations like Iraq, Nigeria, and Angola may witness a substantial drop in their net income, ranging from 50% to 85% compared to 2019 levels. This would mark the lowest income generated from the oil sector in these countries over the past two decades, with the possibility of further revenue decline depending on future market conditions.

Nigeria, a prominent global crude oil producer and a significant player within OPEC, has experienced a substantial economic downturn primarily attributable to oil price fluctuations. Notably, the sharp decline in crude oil prices during the COVID-19 pandemic, dropping below $25 per barrel, resulted in a fiscal deficit for the Nigerian government's budget. Consequently, the country's economic growth rate experienced negative values of -6.1% and -3.2% during the second and third quarters of 2020, according to the National Bureau of Statistics (NBS) in 2020. These adverse growth rates have pushed the Nigerian economy into a state of fiscal hardship.

Moreover, Nigeria heavily relies on the exportation of crude oil as a primary revenue source for the government, hindering efforts to achieve a diversified and balanced economic growth. This reliance on oil exports has led to uneven growth in various sectors of the economy, making it challenging for the government to successfully diversify its economic base, as discussed by Kawai in 2016.

This paper makes several notable contributions to the existing body of research. Firstly, it integrates up-to-date data on oil price fluctuations, economic growth, and trade openness. Secondly, it adds value to the ongoing debate concerning the complex relationship between oil prices, economic growth, and trade openness, particularly in the context of a pandemic. Thirdly, the study holds significant relevance for policymakers by shedding light on the consequences of excessive dependence on crude oil for economic growth. In essence, this research investigates the connection between oil price volatility, economic growth, and trade openness in Nigeria.

Literature review

A growing body of research has explored the intricate relationship between oil price volatility, economic growth, and trade openness. The findings from this literature are diverse, encompassing variations across countries and research methodologies. Additionally, the research in this area appears to be divided into two main categories. One group investigates the connection between oil prices and economic growth, while the other delves into the relationship between trade openness and economic growth. It's worth

noting that many of these studies have not taken into account the impact of exchange rates in their analyses.

Several studies have reported a positive influence of oil price volatility on economic growth, as evidenced by research conducted by Oyeyemi (2013), Foudeh (2017), and Bediako (2018). Despite differences in how economic growth is measured, the time frames considered, the countries studied, and the levels of statistical significance (ranging from the conventional 5% to 1%), all of these studies have consistently demonstrated a statistically significant connection between oil price volatility and economic growth. In contrast, another set of studies has presented evidence indicating a negative impact of oil price volatility on economic growth, as observed in the work of Elmi and Jahadi (2011), Nwonu (2017), and Nwoba et al. (2017).

There are also studies that have found a neutral or insignificant relationship between oil price volatility and economic growth, such as those conducted by Jawad (2013) and Okoye and Ndifreke (2018). Although some of these studies have introduced additional variables like agriculture and construction into their analyses, they have not included the control of exchange rates through cointegrating regression analysis. Taken together, these additional findings underscore the ongoing debate surrounding the nexus between oil prices and economic growth. Therefore, there is ample room to contribute empirically to this debate.

Moreover, existing literature has extensively explored the influence of trade openness on economic growth, yielding varied conclusions. Some studies have reported a positive correlation between trade openness and economic growth. Conversely, others have identified a negative association, and some have even suggested a neutral impact of trade openness on economic growth. Noteworthy studies supporting the positive impact of trade openness on economic growth include works by Freund and Bolaky (2008), Das and Paul (2011), Marelli and Signorelli (2011), Nowbutsing (2014), Zarra-Nezhad et al. (2014), and Keho (2017).

In contrast, Rigobon and Rodrik (2005) found a negative and substantial relationship between trade and economic growth, while Fenira (2015) discovered a relatively weak connection between trade openness and economic growth. Similarly, Sarkar (2007) reported an insignificant relationship

between growth indicators and trade openness. Ulaşan (2015) also provided evidence in support of the idea that trade-led growth hypothesis may not hold.This paper employs up-to-date data, including the COVID-19 era, and utilizes cointegrating regression analysis, while also accounting for exchange rates, to investigate the intricate relationship between oil price volatility, economic growth, and trade openness in the context of Nigeria.

Methods

Estimation technique

This study employs the Autoregressive Distributed Lag (ARDL) method developed by Pesaran et al. in 2001 as its chosen estimation approach. The rationale behind this selection is multifaceted: first, unlike the Vector Autoregressive (VAR) method, ARDL allows for the inclusion of both endogenous and exogenous variables in the model; second, it offers flexibility in handling variable integration, accommodating purely stationary (I(0)), purely non-stationary (I(1)), or mixed orders of integration; and third, it possesses the unique capability to simultaneously estimate both short-term and long-term models. The research commences by specifying the general econometric form of the model in equations 1, subsequently formulating the unrestricted and error correction model in equations 2 and 3.

$$GDP_t = \pi_0 + \pi_1 OPV_t + \pi_2 EXR_t + \pi_3 TOP_t + \mu_t \quad (1)$$

The econometrics specification is transformed into an unrestricted ARDL model to show the dynamic nature of the model in equation 2

$$\Delta GDP_t = b_0 + \sum_{i=1}^{k} b_1 \Delta GDP_{t-i} + \sum_{i=1}^{k} b_2 \Delta OPV_{t-i} + \sum_{i=1}^{k} b_3 \Delta EXR_{t-i} + \sum_{i=1}^{k} b_4 \Delta TOP_{t-i} + a_1 GDP_{t-1} + a_2 OPV_{t-1} + a_3 EXR_t + a_4 TOP_t + \mu_t \quad (2)$$

The next step is to develop the error correction model to show the speed of adjustment of convergence as specified in model 3.

$$\Delta GDP_t = b_0 + \sum_{i=1}^{k} b_1 \Delta GDP_{t-i} + \sum_{i=1}^{k} b_2 \Delta OPV_{t-i} + \sum_{i=1}^{k} b_3 \Delta EXR_{t-i} + \sum_{i=1}^{k} b_4 \Delta TOP_{t-i} + nECT_t + \mu_t \quad (3)$$

Before estimating equation (1-3) we need to find out the presence of cointegration which establishes equilibrium among the variables. Once cointegration exists, then we can proceed with the estimations

Data source and variable measurements

The data used in this study were obtained from the World Bank database and cover the period from 1980 to 2020. Oil price volatility is quantified using Brent crude oil prices, economic growth is assessed through per capita gross domestic product, exchange rate is gauged by the official exchange rate, and trade openness is determined by the percentage of trade relative to gross domestic product.

Results and discussions

The discussion of the results commences with the assessment of the unit root tests, which utilize the ADF and PP methods, while taking into account the presence of both a constant and trend component. The objective is to determine the stationarity status of the variables under consideration. The outcomes of the unit root tests, as displayed in Table 1, indicate that all the variables exhibit stationarity. While a few of these variables demonstrate stationarity at the level, the majority of them exhibit stationarity at the first difference.

Table 1: Result of unit root test

Variables	ADF Test Statistics				PP Test Statistics			
	Constant		Trend		Constant		Trend	
	Level	1st difference	Level	1st Difference	Level	1st Difference	Level	1st difference
GDP	-1.508 (0.519)	-4.210 (0.002) ***	-2.113 (0.5226)	-2.548 (0.304)	-0.959 (0.759)	-4.230 (0.002) ***	-3.858 (0.024)	-3.755 (0.030) ***

OPV	-1.330 (0.606) **	-6.151 (0.000) ***	-1.987 (0.590)	-6.039 (0.000) ***	-1.341 (0.601)	-6.171 (0.000) ***	-2.037 (0.564)	-6.031 (0.000) ***
EXR	-2.820 (0.065)	-4.793 (0.000) ***	-2.771 (0.216)	-4.795 (0.002) ***	-2.261 (0.189) **	-4.656 (0.000) ***	-2.194 (0.480)	-4.624 (0.003) ***
TOP	-2.239 (0.196)	-7.503 (0.000) ***	-2.743 (0.226)	-7.351 (0.000) ***	-2.515 (0.120)	-7.620 (0.000) ***	-3.093 (0.121)	-7.683 (0.000) ***

Note: * **, **, * denote 1%, 5% and 10% level of significance.

After establishing the level of integration of the variables, a cointegration test that assess the equilibrium and long-run relationship of the variables was conducted. In this instance null hypothesis of no cointegration $a_{1-4} = 0$ was tested against the alternative hypothesis $a_{1-4} \neq 0$. The result as presented in Table 2 shows that equilibrium and long-run relationship exist among economic growth and the explained variables namely: oil price volatility, official exchange rate and trade openness. As such, we reject the null hypothesis and accept the alternative hypothesis. The existence of cointegration is justified by (i) the presence of F-statistics (4.033) which is greater than the upper bound critical value (3.67) at conventional 5% level of significance (see Table 2) (ii) the coefficient of error correction term (n) as contained in Table 3 is negative, less than one in absolute terms and significant.

Table 2: Cointegration test

Model				Critical Bound Test	
	Lag	F-Stats	Level of significance	Unrestricted intercept and no trend	
	3	**4.033**		1(0)	1(1)
			1%	3.65	4.66
			5%	**2.79**	**3.67**
			10%	2.37	3.2

Upon establishing the equilibrium relationship among the variables, the study

presents the results of short-term, long-term, and diagnostic tests in Table 3. In the short run, the findings indicate that there is a negative and statistically significant impact of oil price volatility on economic growth. This outcome aligns with expectations, particularly for countries like Nigeria, which heavily rely on crude oil as a primary source of foreign exchange earnings and government revenue. Short-term oil price shocks, such as those experienced during the COVID-19 period when oil prices plummeted to $20 per barrel, have had adverse fiscal repercussions, especially for oil-dependent economies.

Furthermore, the results, as indicated by the coefficient of the error-correction term, reveal a persistent tendency to converge to equilibrium following an initial oil price shock. This observation corroborates the findings of previous empirical studies (Elmi and Jahadi, 2011; Nwonu, 2017; Nwoba et al., 2017). However, in the short run, trade openness is found to be statistically significant and positively associated with economic growth, while the impact of the exchange rate is observed to be neutral. The implication of these findings is that if the government continues to heavily rely on oil as its primary source of income, short-term shocks may lead to fiscal deficits that take an extended period for the economy to recover from.

Table 3: Results of oil price volatility and trade on growing economy

Dependent Variable; GDP		
Regressors	Coefficients	T-statistics (p-value)
Short-run results		
ΔOPV (-1)	-0.080	-3.607 (0.001) ***
ΔTOP (-1)	0.064	4.166 (0.000) ***
ΔEXR	0.006	0.425 (0.674)
nECT$_{t-1}$	-0.225	-4.800 (0.000) ***
Long-run results		
OPV	0.384	10.619 (0.000) ***
TOP	0.033	0.474 (0.639)
EXR	-0.057	-1.041 (0.307)
Constant	6.2718	14.676 (0.000) ***
Diagnostics		
Test Stats	LM Version	F Version
Serial	0.975 (0.216)	0.046 (0.986)
Funct.	1.683 (0.103)	0.001 (0.998)
Norm.	0.009 (0.996)	N/A
Hetero.	6.198 (0.798)	0.529 (0.855)

Note: * **, **, * denote 1%, 5% and 10% level of significance. *p*-values are in bracket

Additionally, the long-run results, as depicted in the middle section of Table 3, reveal a positive and substantial impact of oil price volatility on economic growth. While this outcome differs from the short-run findings, it aligns with practical expectations. Economies heavily reliant on crude oil often develop resilience to oil price shocks over the

long term by diversifying their revenue sources away from oil dependency. In the case of Nigeria, the oil price shocks during the COVID-19 period prompted the government to implement an Economic Sustainability Plan, aiming to rejuvenate the economy through various stimulus packages directed at various sectors, including agriculture, manufacturing, construction, ICT, energy, and more. This result is consistent with recent empirical research (Foudeh, 2017; Bediako, 2018; Folajimi et al., 2019).

However, the study did not find evidence of exchange rate and trade openness influencing economic growth in the long run. The policy implication of these findings is that an economy like Nigeria, heavily reliant on oil as its primary revenue source, will continue to face short-term oil price volatility shocks until it achieves full economic diversification in the long run. This diversification will help shield the economy from negative growth episodes, such as those experienced during the second and third quarters of 2020.

Conclusion and policy implications

This study examines the relationship between oil price volatility, economic growth, and trade openness in Nigeria, employing bound tests and regression analysis on data spanning from 1980 to 2020. The results indicate that in the short run, oil price volatility exerts a negative and significant impact on economic growth. However, as the Nigerian economy diversifies and becomes more resilient over the long term, oil price volatility begins to positively affect economic growth. Additionally, trade openness is found to have a positive and significant impact on economic growth in the short term, although the effects of exchange rate and trade openness on long-term economic growth are observed to be neutral. These findings imply that in the short run, Nigeria, heavily dependent on oil for foreign earnings, will continue to be influenced by oil price volatility. However, with sustained diversification and development in other sectors, the economy will become less susceptible to short-term oil price shocks. Given that the negative impact of oil price volatility is more pronounced in the short run and diminishes over time, the study

recommends that policymakers fully implement the government's economic recovery and growth plan. Additionally, policymakers should address the persistent issue of exchange rate instability in the country to capitalize on the benefits associated with trade.

References

Bediako, E. B. (2018). Economic effect of oil price volatility on developing countries: A case study of an oil exporting country. *International Journal of Economics & Management Sciences.* DOI, 10.4172/2162-6359, 1-5.

Das, A. & Paul, B. P. (2011). Openness and growth in emerging Asian economies: Evidence from GMM estimations of a dynamic panel. *Economics Bulletin*, 3(31), 2219–2228.

Elmi, Z. & Jahadi, M. (2011). Oil price shocks and economic growth: Evidence from Organization of the Petroleum Exporting Countries (OPEC) and Organization for Economic Co- operation and Development (OECD) countries. *Australian Journal of Basic & Applied Science,* 5(6), 627-635.

Fenira, M. (2015). Trade openness and growth in developing countries: An analysis of the relationship after comparing trade indicators. *Asian Economic and Financial Review, 5(1)*, 468–482.

Freund, C. & Bolaky, B. (2008). Trade, regulations and income. *Journal of Development Economics*, 87(2), 309–321.

IEA (2020). Oil Market Report. Available at: https://www.iea.org/topics/oil-market-report

Jawad, M. (2013). Oil price volatility and its impact on economic growth in Pakistan. *Journal of Finance and Economics,* 1(4), 62-68.

Kawai, V. (2016). An Analysis of the Impact of Non-Oil Exports and Economic Growth in Nigeria. *International Journal of Innovative Research in Social Sciences & Strategic Management Techniques* 4(1), 5-13.

Keho, Y. (2017). The impact of trade openness on economic growth: The case of Cote d'Ivoire. *Cogent Economics & Finance*, 5(1), 1-14.

Marelli, E. & Signorelli, M. (2011). China and India: Openness trade and effects on economic growth. *The European*

Journal of Comparative Economics, 8(2), 129–154.

Musa Foudeh. (2017). The Long Run Effects of Oil Prices on Economic Growth. *International Journal of Energy Economics and Policy,* 32(2), 4-11.

Nowbutsing, B. M. (2014). The impact of openness on economic growth: Case of Indian Ocean Rim countries. *Journal of Economics and Development Studies*, 2(2), 407–427.

Nwoba, M. O. E., Nwonu, C. O. & Agbaeze E. K. (2017). Impact of fallen oil price on the Nigerian economy. *Journal of Poverty, Investment & Development,* 33(1) 75-82.

Nwonu, C. (2017). Impact of fallen oil prices on the Nigeria economy. *Journal of Poverty, Investment & Development.* 33(2), 75-82.

NBS (2020). National Bureau of Statistics. Available at: https://www.nigerianstat.gov.ng/

Okoye, P.U., Mbakwe, C.C. & Igbo, E.N (2018). Modeling the construction sector and oil prices toward the growth of the Nigerian economy: An econometric approach. *Economies,* 6(1), 1-19.

OPEC (2020). Organization of Petroleum Exporting Countries. Available at: https://www.opec.org/opec_web/en/

Oyeyemi, M. A. (2013). The growth implications of oil price shock in Nigeria. *Journal of Emerging Trend in Economic and Management Sciences,* 4(3), 343-349.

Pesaran, H., Shin, Y. & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(2) 289–326.

Rigobon, R. & Rodrik, D. (2005). Rule of law, democracy, openness, and income: Estimating the interrelationships. *The Economics of Transition, 13(2)*, 533–564.

Sarkar, P. (2007), Trade Openness and Growth: Is There Any Link? *International Journal of Economics & Management Sciences*, 12(2), 2-14.

Ulaşan, B. (2015). Trade openness and economic growth: Panel evidence. *Applied Economics Letters, 22(2)*, 163–167.

Zarra-Nezhad, M., Hosseinpour, F. & Arman, S. A. (2014). Trade-growth nexus in developing and developed countries: An application of extreme

bounds analysis. *Asian Economic and Financial Review, 4(1)*, 915–929.