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Does Crude Oil Price, Financial Development, and Trade Openness Reflect on African Oil-Rich Countries' Economic Growth?

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Abstract

This study investigates empirically the long- and short-run impact of crude oil price and financial globalization on economic growth and financial development in selected oil-rich African countries. The data usage covers 1980 to 2021 by applying the autoregressive distributed lag (ARDL) modeling to determine the short- and the long-run estimates, and the ARDL-ECM Granger causality to discover the causalities direction. The empirical results reveal that crude oil price and financial globalization have no significant effect on restructuring the economic sustainability patterns in either the long or the short run. There are various causality directions found for those countries involved in this study within the

short- and long-run periods. This study recommends that the Republic of Congo and Nigeria should always maximize oil revenue during periods of oil price boom to offset the economic severity during periods of oil price reduction. Further, Algeria and Nigeria's policymakers should avoid protectionism against financial globalization, economic growth, and trade to mobilize the resources required to be at the fulcrum of future economic restructuring. The empirical findings will be useful for policymakers to design a suitable growth model for African countries that highly depend on crude oil resources as an engine of economic growth.

Keywords: African oil-rich countries, crude oil price, financial development, financial globalization, trade

JEL classification: C50, C59, E70

1 Introduction

The African continent is a vast region and has a wide variety of experiences, but a lack of financial scope has led to limited efficiency of the financial system in this region. The situation may vary in emerging market economies such as South Africa, Egypt, and Nigeria, compared with Ghana, Kenya, Uganda, and the Republic of Congo, as an example of financially growing markets on the other side. Compared to the rest of the world, credit to the private sector, in terms of growth and lending intermediation, indicates relatively shallow financial depth (World Bank, 2020). Although there is a lot of inflow of oil revenue to the economy in African oil-rich countries, the development of the financial system is less advanced and is not able to promote economic growth. Fiscal policy in oil-centered economies is facing numerous obstacles, both in the long-term period, as regards fiscal sustainability, and in the short-term period, as regards macroeconomic stabilization and fiscal planning. Past studies considered the financial development–economic growth nexus in oil-rich countries (Samargandi, Fidrmuc, & Ghosh, 2014; Nwani, 2016).

In short, financial globalization, theoretically, can help to achieve potential growth rates for the economy through various channels, but as of yet there is no convincing empirical evidence either supporting or refuting that this causal relationship is quantitatively very important. As mentioned by Coulibaly, Erbao, and Metuge Mekongcho (2018), globalization or economic integration has a crucial influence across regions, nations, and communities on living standards, also leading to free trade and capital flows. There will be significant shifts in macroeconomic activity because economic integration and globalization make local economies more susceptible to economic shocks or crises (Javid & Katircioglu, 2017). Albrow (1997) claims that globalization speeds up the flow of people, ideas, and technologies and alters the economic, political, and cultural infrastructure of societies. Existing research on the impacts of oil prices and financial globalization on economic growth and financial development has produced conflicting findings. Consequently, most research has studied and examined the effects of economic growth, oil prices, and financial globalization independently. Loganathan, Streimikiene, Mursitama, Shahbaz, and Mardani (2018) and Škare, Sinković, and Porada-Rochoń (2019), for instance, attempted to model the impact of economic growth on financial development, but they left out key factors such as oil prices and financial globalization.

The four African oil-producing countries are at various stages of economic development and have different endowments of natural resources. The economic reforms that have been undertaken in all these countries over the past two decades have generally achieved macroeconomic stability and contributed to raising growth in some countries. However, the growth rate has been relatively modest: growth in GDP per capita in African oil-rich regions has accelerated somewhat during the past decade, but it has been weaker than in some other emerging economies (Figure 1). Given that aggregate growth performance conceals essential differences between the sampled countries, this reflects not only differences in initial economic, social, and political conditions but also differences in the pace

and strength of economic reform and success in addressing the resource curse as well as using oil revenues in the development of new industries and sectors.

Figure 1: *GDP Per Capita Performance for Oil-Producing Countries From Africa*
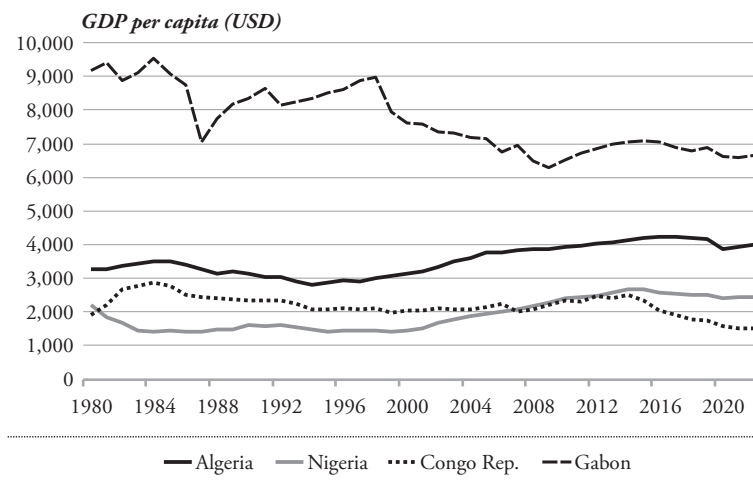
Source: World Bank (2023).

Therefore, there are three reasons for conducting this research and adding to the existing body of knowledge. Firstly, this research fills a gap in the existing literature by assessing the effect of rising oil prices and globalization on the economies and financial systems of a few key oil-producing nations in Africa. This makes this research unique since previous studies have focused on only one country or a small group of nations in Africa, ignoring the distinct characteristics of these leading African economies. The remaining sections of this research are organized as follows. After the literature review section, we present the data and methodology. This is followed by the results and discussion, and the article ends with the conclusion and policy implication section.

2 Literature Review

The existing literature contains numerous studies that investigate the causal and effect relationship between financial development and its potential determinants. We have divided the literature review section into three nexuses, based on our research interests; oil price–financial development: oil prices–economic growth nexus, financial globalization–economic growth, and nexus between financial globalization and financial development. Oil prices and their effects on economic growth are empirically investigated. Few studies are available on the oil price–growth nexus, with conflicting outcomes emerging among them. For example, Aka's (2020) empirical findings found that changes in oil prices affect Turkey's economy. Akinsola and Odhiambo (2020) tested the influence of oil prices on economic growth for Sub-Saharan African oil-importing countries (low-income countries), and the results indicate that a decrease in oil price has a positive impact on overall economic growth and whenever the oil price increases, there will be a negative impact on the economic performance. On the other hand, in a study on the macroeconomic effects of oil price movements in Pakistan over three decades, Liaqat, Ashraf, Nisar, and Khursheed (2022) found that the movements in oil prices do not contribute to the economic progress of Pakistan. Alkhateeb and Sultan (2019) analyzed the effect of the price of oil on India's economic growth, and the findings suggest that oil price, capital formation, and inflation cause economic growth. Moreover, for Ghana, there is a unidirectional causality running from oil prices to economic growth (Awunyo-Vitor, Samanhyia, & Addo Bonney, 2018).

Furthermore, Brini, Amara, and Jemmali (2017) investigated the link between Tunisia's economic growth, renewable energy consumption, international trade, and oil price. They found that oil prices positively affect the real GDP in the long run and the short run. Foudeh (2017) evaluated the long-term implications of oil price growth rates on Saudi Arabia's economic growth and revealed a strong positive direct impact of oil prices on GDP growth. In the case of OECD countries, Katircioglu, Sertoglu, Candemir, and Mercan (2015) found that long-

run integration and oil price rises generally cause a decrease in momentum for the macroeconomic variables. Mensah et al. (2019) explored the effects of oil price instability on the economies of oil exporters and non-oil exporters and revealed a unidirectional causality running from the oil price instability to the economic growth. Interestingly, this study highlighted that those African economies received more economic benefits from the global oil price rising.

The most recent study by Wang et al. (2022) illustrated a negative correlation between oil price volatility and economic growth for oil-exporting and oil-importing regions using dynamic panel estimates. In contrast, Alhamran, Loganathan, Sethi, and Golam Hassan (2022) found that the oil price supported by globalization has boosted the real growth of Gulf Cooperation Council (GCC) countries' economies. Moreover, van Eyden, Difeto, Gupta, and Wohar (2019) estimate panel data models for a sample of 17 member countries of the OECD, showing that fluctuations in oil prices have a negative and statistically significant impact on economic growth. The correlation between crude oil prices and economic growth has been the subject of a small number of studies. They suggest that financial system development is divided into financial intermediaries (bank-based systems) and financial markets (market-based systems).

Agbanike, Nwani, Uwazie, Anochiwa, and Enyoghasim (2019) conducted a study to investigate the causality between Nigeria's energy usage and banking sector development and indicated a long-term association between oil prices and banking sector development with one-way causality running from crude oil prices to banking sector development. Alshubiri, Tawfik, and Jamil (2020) noted that a long-term relationship was established between oil and non-oil indices, and financial development existed for Oman. Atil, Nawaz, Lahiani, and Roubaud (2020) found a weak relationship between oil prices, economic growth, and financial development in Pakistan and concluded that oil prices and financial development have a strong relationship. For the case of GCC countries, Gazdar, Hassan, Safa, and Grassa (2019) highlight that oil price volatility positively affects the development of Islamic finance. The quantile ARDL approach was adopted

by Jiang, Zhang, Razi, and Kamran (2022) to investigate the asymmetric effect of COVID-19, oil prices, and other commodities prices on financial development in China and found that the oil prices supported the financial development in the short- and long-run period. However, Sulong and Farouq (2021) studied the energy–finance nexus in top African oil-rich countries (Algeria, Angola, Gabon, and Nigeria) and found an adverse effect on financial development in all African regions. Similarly, Gaies (2021), in a study covering low- and middle-income net oil-rich countries, indicated that the financial system does not benefit from the positive movement in global oil prices. By adopting the causality mechanism, Elian and Kisswani (2018) show that there is a bidirectional causality between financial market returns and oil price in Kuwait.

Raghutla (2020) examined the relationship between trade openness and economic growth in emerging market economies. He found a significant and positive impact of trade on growth; also, he provided evidence of unidirectional causality running from economic growth to trade. Banday, Murugan, and Maryam (2021) used the pooled mean group (PMG) ARDL model and concluded that economic growth in BRICS countries is negatively influenced by trade openness in the long run, while in the short run, trade promotes economic growth. The link between trade and economic growth in the BRICS economies is also shown by Soomro, Kumar, and Kumari (2022). The empirical results of this study show that economic growth relies heavily on international trade. Based on causality analysis, Mtar and Belazreg (2023) revealed two-way causal connections exist between economic growth and trade in European countries. Concerning India, however, Singh (2023) argued for the existence of a strong unidirectional causal relationship running from trade openness to economic growth. Furthermore, the study of Sunde, Tafirenyika, and Adeyanju (2023) for Namibia found that trade openness positively influences economic growth.

Kwabena Twerefou, Danso-Mensah, and Bokpin (2017) conclude that the globalization effect harms economic growth. Indeed, Hassan, Xia, Huang, Khan, and Iqbal (2019) also highlighted the importance of globalization as a

determinant of growth for Pakistan. Meanwhile, 42 Sub-Saharan African countries were selected by Zahonogo (2018) to reinvestigate the association between globalization and economic growth, and globalization was found to positively impact economic growth to a threshold condition. Kılıçarslan and Dumrul (2018) examined the impact of economic globalization on economic growth for Turkey, and growth responded negatively to economic globalization. In a recent study, Santiago, Fuinhas, and Marques (2020) divided globalization into three categories, namely social, political, and economic, and revealed that both social and economic globalization indices have a positive and significant effect on Latin America and Caribbean countries in the long run, while the political index has an effect in both the short- and long-run conditions.

Dabwor, Iorember, and Yusuf Danjuma (2022) looked at the effect of stock market volatility on economic growth and found that the Nigerian economy benefits positively from globalization. Also, Sahoo and Sethi (2023), in the case of India, found that the economy is driven by openness and financial globalization in the long run, with a unidirectional causal relationship that exists between growth and financial globalization. Additionally, Jun et al. (2021) observed a bidirectional causality relationship mainly existed between globalization and economic growth for selected South Asian economies, which is supported by Awosusi et al. (2022) findings with a unidirectional causality from economic growth to globalization covering the period from 1970 to 2018 in Colombia. Globalization also plays a vital role in attracting foreign capital inflows to raise capital market globalization, where the recipient countries' growing financial sectors can benefit from this channel (García, 2012).

Surprisingly, Kandil, Shahbaz, and Nasreen (2015) argued that globalization positively promotes the growth of the economy although the study does not find the contribution of globalization to financial development. Interestingly, Baloch, Ozturk, Bekun, and Khan (2021) also found that globalization does not cause financial development in OECD countries. Ahmed, Zhang, and Cary (2021) detected a bidirectional causality running between financial development and

globalization in the short run for Japan. Nasreen, Mahalik, Shahbaz, and Abbas (2020) used the volume of a country's foreign assets and liabilities as a measure of financial globalization. They collected data for European countries, and the results showed that financial globalization has a positive effect on economic growth and institutional quality, while it hinders financial sector development.

As can be seen from the literature, there are deep divides on which factors contribute most to, hinder, or have no discernible impact on the growth of the economy and financial development across countries. We observe that although existing studies on the relationship between the studied variables at the country level are numerous, few studies have focused on time series models, especially among oil-rich countries in Africa.

3 Data and Empirical Strategies

This study examines the role of oil price and financial globalization in economic growth and financial development in the top African oil-exporting countries, namely Nigeria, Algeria, the Republic of Congo, and Gabon. Since the Angola and Libya data are unavailable, these countries were excluded from the analysis. The analysis is conducted using the latest available annual data covering the period from 1980 to 2021. The selection of these countries is based on the value of petroleum exports capability. For example, Nigeria has the largest share of oil exports in the continent, accounting for 0.88 percent of all exports, followed by the Republic of Congo (0.79 percent), Gabon (0.78 percent), and Algeria (0.53 percent). The FD, GDP, and Trade variables are gathered from the World Bank's (2023) World Development Indicators, while data for ROIL and FG are extracted from the OPEC Annual Statistical Bulletin (2022) and KOF Index of Globalization (2023), respectively. The study period covers most financial crisis occurrences, including the 2008 global financial crisis and the series of oil price fluctuations. The data descriptions are summarized in Table 1.

Table 1: *Variable Descriptions*

Variable	Symbol	Definition	Data source
Real oil price	ROIL	Crude oil based on the deflectors effect (in USD per barrel)	OPEC Annual Statistical Bulletin (2022)
Financial globalization	FG	Financial globalization index	KOF Index of Globalization (2023)
Economic growth	GDP	Gross domestic product per capita (at constant 2010 USD)	World Bank (2023)
Financial development	FD	Domestic credit to the private sector (as % of GDP)	World Bank (2023)
Total trade volume	Trade	Total of exports and imports (at current 2010 USD)	World Bank (2023)

Source: Authors' compilation.

The main aim of this study is to determine and compare the impact of ROIL, FG, and Trade of African oil-rich countries incorporated with economic and financial sustainability simultaneously. As a fundamental approach, we use the Cobb-Douglas 4-input model as part of the production function based on the GDP and FD performances. The usage of the production function of this study can be shown as:

$$GDP_t = f\left(ROIL_t, FG_t, FD_t, Trade_t\right) \tag{1}$$

$$GDP_t = A_t\, ROIL_t^{\alpha}\, FG_t^{\beta}\, FD_t^{\varphi}\, Trade_t^{\gamma} \tag{2}$$

where α, β, φ, and γ show the elasticities coefficients, and the Cobb-Douglas function can be used to express the long- and short-run cointegration to denote the variable's input contributions.

It is crucial to check the stationarity of the variable before beginning any econometric analysis to avoid incorrect conclusions. Generally, the economic system of developing economies is under the impact of external factors or regime changes in economic events, which influence the economic development of almost all countries. Thus, using the structural break(s) unit root tests is the best solution

to capture the time trend of the break date, as described in Zivot and Andrews (1992) and Perron (1989; 1997). After exploring the order of integration among the variables used, the ARDL bound test by Pesaran, Shin, and Smith (2001) is found to be the most suitable estimation technique to discover the long- and short-run relationship and reliability for small-size time series models. The ARDL model used in this study can be expressed as follows:

$$\Delta FD_t = \beta_0 + \sum_{i=1}^{p} \delta_{11i} \Delta FD_{t-i} + \sum_{i=0}^{p} \delta_{12i} \Delta ROIL_{t-i} + \sum_{i=0}^{p} \delta_{13i} \Delta GDP_{t-i} +$$

$$\sum_{i=0}^{p} \delta_{14i} \Delta FG_{t-i} + \sum_{i=0}^{p} \delta_{15i} \Delta Trade_{t-i} + \pi_1 FD_{t-1} + \pi_2 ROIL_{t-1} + \qquad (3)$$

$$\pi_3 GDP_{t-1} + \pi_4 FG_{t-1} + \pi_5 Trade_{t-1} + \varepsilon_{it}$$

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^{p} \sigma_{11i} \Delta GDP_{t-i} + \sum_{i=0}^{p} \sigma_{12i} \Delta FD_{t-i} + \sum_{i=0}^{p} \sigma_{13i} \Delta ROIL_{t-i} +$$

$$\sum_{i=0}^{p} \sigma_{14i} \Delta FG_{t-i} + \sum_{i=0}^{p} \sigma_{15i} \Delta Trade_{t-i} + \pi_1 GDP_{t-1} + \pi_2 FD_{t-1} + \qquad (4)$$

$$\pi_3 ROIL_{t-1} + \pi_4 FG_{t-1} + \pi_5 Trade_{t-1} + \varepsilon_{it}$$

where Δ represents the first difference operator, α_i stands for the short-run elasticities, π_i shows the long-run elasticities, and ε_t shows the normal white noise. The estimated F-statistic, also known as the bounds test, should be compared with the critical bound values. The null hypothesis of the level relationship is H_0: $\pi_2 = \pi_3 = \pi_4 = \pi_5 = 0$ and the alternative hypothesis can be expressed as H_1: $\pi_2 \neq \pi_3 \neq \pi_4 \neq \pi_5 \neq 0$. In the second part of the ARDL approach, the ARDL-ECM framework is employed with mixed order of $I(0)$ and $I(1)$ conditions to capture the causality condition. Therefore, we examine the short-run causality relationship, taking into account the error correction term which indicates the speed of adjustment from the short-term disequilibrium to the long-term equilibrium, based on the joint causality test rooted in chi-square (χ^2) statistics

in line with Granger's (1969) application. Next, the causality test is applied by computing the χ^2-statistics under the null hypothesis that the coefficients on the lagged values of the independent variables are not statistically different from zero. The ARDL-ECM Granger causality test can be derived as follows:

$$
\begin{bmatrix} \Delta FD_t \\ \Delta ROIL_t \\ \Delta GDP_t \\ \Delta FG_t \\ \Delta Trade_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \\ \alpha_5 \end{bmatrix} + \begin{bmatrix} \delta_{11,1} & \delta_{12,1} & \delta_{13,1} & \delta_{14,1} & \delta_{15,1} \\ \delta_{21,1} & \delta_{22,1} & \delta_{23,1} & \delta_{24,1} & \delta_{25,1} \\ \delta_{31,1} & \delta_{32,1} & \delta_{33,1} & \delta_{34,1} & \delta_{35,1} \\ \delta_{41,1} & \delta_{42,1} & \delta_{43,1} & \delta_{44,1} & \delta_{45,1} \\ \delta_{51,1} & \delta_{52,1} & \delta_{53,1} & \delta_{54,1} & \delta_{55,1} \end{bmatrix} \begin{bmatrix} \Delta FD_{t-1} \\ \Delta ROIL_{t-1} \\ \Delta GDP_{t-1} \\ \Delta FG_{t-1} \\ \Delta Trade_{t-1} \end{bmatrix} +
$$

$$
\begin{bmatrix} \delta_{11,1} & \delta_{12,1} & \delta_{13,1} & \delta_{14,1} & \delta_{15,1} \\ \delta_{21,1} & \delta_{22,1} & \delta_{23,1} & \delta_{24,1} & \delta_{25,1} \\ \delta_{31,1} & \delta_{32,1} & \delta_{33,1} & \delta_{34,1} & \delta_{35,1} \\ \delta_{41,1} & \delta_{42,1} & \delta_{43,1} & \delta_{44,1} & \delta_{45,1} \\ \delta_{51,1} & \delta_{52,1} & \delta_{53,1} & \delta_{54,1} & \delta_{55,1} \end{bmatrix} \begin{bmatrix} \Delta FD_{t-1} \\ \Delta ROIL_{t-1} \\ \Delta GDP_{t-1} \\ \Delta FG_{t-1} \\ \Delta Trade_{t-1} \end{bmatrix} \begin{bmatrix} \rho_1 \\ \rho_1 \\ \rho_1 \\ \rho_1 \\ \rho_1 \end{bmatrix} \times ect_{t-1} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \varepsilon_{4,t} \\ \varepsilon_{5,t} \end{bmatrix} \qquad (5)
$$

Based on the elaborated ARDL-ECM Granger causality model through Equation (5), the Δ symbol indicates the first difference operator and ect_{t-1} defines the error correction term with a lag, while ε represents the random errors in the serial order of the estimated model.

4 Empirical Results

Univariate descriptive analysis of the variables is displayed in Table 2, where the total trade has the uppermost mean value between 22.601 and 24.487, followed by economic growth for all countries. From the table, the distributions of financial development in the Republic of Congo are negatively skewed, while those in Algeria, Gabon, and Nigeria are positively skewed. Likewise, this positively skewed situation appears in the distributions of real oil prices and economic growth for all selected countries. Unlike the distributions of ROIL, the FG variable is

negatively skewed in all the regions under consideration, and trade has positive skewness. Results from the kurtosis for these series are platykurtic since values of the kurtosis are less than 3, except the variables of FD and ROIL in the Republic of Congo and FG in Nigeria which are leptokurtic, and the values of kurtosis are found to be greater than 3. After verifying that no kurtosis or skewness value for the mentioned variables meets the normality requirements, we conclude the series does not follow a normal distribution.

Table 2: *Descriptive Statistics*

Variable		Algeria	Gabon	Congo Rep.	Nigeria
FD	Mean	-0.052	-2.25E-15	0.000	-0.041
	Median	-0.300	-0.213	0.015	-0.468
	Std. dev.	1.605	1.477	1.593	1.683
	Skewness	0.042	0.285	-1.325	0.320
	Kurtosis	1.879	2.411	5.852	1.802
ROIL	Mean	0.356	-0.952	-0.639	0.756
	Median	-0.017	-0.941	-0.600	-0.013
	Std. dev.	1.036	0.388	0.368	1.651
	Skewness	0.961	0.320	0.687	0.904
	Kurtosis	2.618	2.680	3.430	2.689
GDP	Mean	8.143	8.990	7.723	7.504
	Median	8.119	8.971	7.722	7.421
	Std. dev.	0.131	0.115	0.115	0.239
	Skewness	0.125	0.187	0.211	0.398
	Kurtosis	1.660	1.666	2.423	1.536
FG	Mean	3.640	4.028	4.167	3.759
	Median	3.683	4.022	4.151	3.812
	Std. dev.	0.205	0.136	0.135	0.332
	Skewness	-0.567	-0.092	-0.556	-1.897
	Kurtosis	2.170	1.451	2.785	6.964
Trade	Mean	24.535	22.548	22.328	24.323
	Median	24.159	22.320	21.962	24.206
	Std. dev.	0.695	0.551	0.888	1.108
	Skewness	0.441	0.448	0.331	0.016
	Kurtosis	1.468	1.699	1.431	1.748

Source: Authors' compilation.

The Shapiro and Wilk (S-W) (1965), Shapiro and Francia (S-F) (1972), and Jarque and Bera (JB) (1987) tests for normality were used to determine the normality condition. The test results are shown in Table 3. For Algeria, the null hypothesis that the variables FD and GDP were normally distributed was accepted, while this hypothesis was rejected for the variables ROIL, FG, and Trade. The evidence from Gabon and the Republic of Congo shows that FD, ROIL, Trade, and GDP follow a normal distribution, but FG does not. With Nigeria, the empirical distribution of FD and Trade follows the normal distribution. However, ROIL, GDP, and FG do not. Also, it has been noticed from SW and SF tests that most of the studied series are not normally distributed in all countries.

The time series unit root tests have been performed on all variables as a preliminary stage in the empirical analysis. As shown in Table 4, the unit root tests by Perron (1989; 1997) and Zivot and Andrews (ZA) (1992) are employed, which allow one break in the series. The results show that all the variables for all studied countries have a unit root and are not stationary at their level $I(0)$ form, except for FG in Algeria. After taking the first difference form for all series, the time series becomes stationary at the 1 percent level of significance. Mixed results are provided by unit root tests for the variables of this study. Furthermore, the ZA test was used to explore the unknown break of the unit root. For example, Algeria's break date in 2002 occurred mainly because the central bank reduced the interest rate to 5.5 percent in January 2002, down from 7.5 percent before October 2000, because of the waves of inflation that worsened due to expansionary fiscal policies and the loosening of monetary policy in 2001 (Akacem, 2004). There was a contraction of imports of more than 20 percent in dollar terms and a fall in output because of a failure in materializing a part of the external financing program for 1991 that was supported by the IMF report (Nashashibi et al., 1998).

Table 3: *Normality Tests Results*

	FD			ROIL			GDP			FG			Trade		
	JB	S-W	S-F	JB	S-W	S-F	JB	S-W	S-F	JB	S-W	S-F	JB	S-W	S-F
Algeria	2.102	1.915**	0.988	6.405**	4.476*	3.357*	3.094	2.899*	1.659**	3.290	3.482*	2.284**	5.205***	4.926*	3.553*
Gabon	1.121	0.706	0.206	0.854	0.467	0.705	3.197	2.893*	1.754**	4.056	8.174*	6.465*	4.162	4.013*	2.743*
Congo Rep.	25.271*	3.398*	2.989*	3.462	1.826**	1.204	0.853	0.290	1.754	2.142	8.192*	6.482*	4.833	3.848*	6.396*
Nigeria	3.074	2.700*	2.034**	5.611***	3.602*	3.067*	4.631	4.644*	3.301*	50.186*	7.353*	5.824*	2.611	2.498*	1.413

Note: * $p < 0.01$, ** $p < 0.05$, and *** $p < 0.10$.
Source: Authors' compilation.

The Congolese economy was hit hard by the global financial crisis of 2008; many companies in the mining industry reduced their workforce in 2008 by around 300,000 people, and forty-four small mining companies stopped their operational activities, which resulted in a reduction in their economic growth (Marysse & Geenen, 2009). In relation to Gabon, during the early 1990s, France loaned funds to cover the annual budget deficits and to support a new Structural Adjustment Program (SAP), but these efforts were complicated when Gabon defaulted on implementing the SAP, which resulted in the suspension of further loans from the IMF in May 1992 (Gardinier, 2000). Gabon's economy suffered a recession in 1998 and a sharp contraction of -8.9 percent in 1999 due to oscillations in the oil price (Zafar, 2004). In the case of Nigeria, in the year 2002, there were reforms and policies launched as an economic recovery attempt to insulate the country from the fallout of the country's previous military government. Additionally, the performance of the financial sector was affected due to the decline in stock prices and the value of the naira because of the global economic and financial crisis in 2007 (Salisu & Mobolaji, 2013).

Mixed results were provided by unit root tests, leading to the conclusion that the regressors have a mixed order of integration. Notably, the outcomes of unit root tests show that the dependent variables are integrated of order one, $I(1)$, for all countries. Therefore, bounds tests can be now started to examine the long-run equilibrium relationship between FD and GDP and their regressors. In this test, the critical bounds are used as proposed by Narayan (2005) for small data. The results presented in Table 5 indicate that the application of the bounds using the ARDL approach reveals level relationships in the model. According to the findings of the bounds tests with unknown break effect, the null hypothesis was rejected and indicates a long-run relationship between the series for all countries involved in this study as dependent variables. This confirms that in the case of all regions, FD and GDP have a long-run relationship with oil prices and financial globalization. Table 5 indicates the optimal lag order selection used for each oil-exporting country involved in this study.

Table 4: *ZA and Perron Unit Root Test With a Single Break*

	ZA				Perron			
	I(0)	T_{Break}	*I(1)*	T_{Break}	*I(0)*	T_{Break}	*I(1)*	T_{Break}
Algeria								
FD	-4.122	1991	-5.256**	1989	-4.653	1991	-5.239**	1988
ROIL	-2.987	1991	-7.185*	1999	-2.972	2003	-7.063*	1998
GDP	-3.601	2002	-5.765*	1995	-3.112	2002	5.631**	1994
FG	-9.415*	1991	-5.816*	1991	-8.520*	1990	-9.290*	1991
Trade	-3.278	2003	-5.925*	2009	-3.335	2003	-5.936*	2008
Gabon								
FD	-3.773	1992	8.505*	1988	-3.637	1991	-8.535*	1987
ROIL	-3.913	2004	-6.298*	2013	-4.006	2003	-6.351*	2013
GDP	-3.572	1999	-7.082*	1999	-3.715	1987	-9.231*	1987
FG	-2.968	1991	-7.948*	1990	-3.396	1990	-10.350*	1991
Trade	-3.792	2004	-6.207*	2012	-3.763	2004	-6.234*	2011
Congo Rep.								
FD	-2.790	2011	-9.881*	2007	-3.596	2011	-9.744*	2007
ROIL	-4.268	2003	-6.516*	2012	-4.234	2002	-6.399*	2013
GDP	-3.302	2008	-4.960**	2000	-3.015	2004	-5.213**	2013
FG	-3.657	2010	-6.847*	1997	-3.764	2009	-6.877*	1995
Trade	-3.231	2003	-6.541*	2012	-2.951	2002	-6.433*	2011
Nigeria								
FD	-4.890	2007	-5.916*	2010	-4.832	2006	-6.054*	2007
ROIL	-4.312	1992	-7.529*	1999	-4.424	1991	-7.365*	1998
GDP	-3.729	2002	-5.197**	2000	-3.477	2001	-4.973***	2014
FG	-1.596	1987	-7.507*	1995	-1.796	1986	-8.683*	1995
Trade	-3.625	2000	-7.066*	1987	-3.641	2014	-6.804*	1986

Note: * $p < 0.01$, ** $p < 0.05$, and *** $p < 0.10$.
Source: Authors' compilation.

Looking at the optimal lag criteria and values, we found a mixed condition. To overcome the mixed optimal lag order selection, we decided to use the Hatemi-J criteria (2003), well-known as HJC. The HJC is based on the VAR estimates by determining the minimum value of HJC by measuring the average optimal lag order combining the Hannan and Quinn (1979) criteria (HQC) and the SBC

lag order selection introduced by Schwarz (1978). Based on the optimal lag order results reported in Table 5, we found there is a mixed optimal lag order, therefore we measure the HJC and apply the ARDL estimates of this study.

Table 5: *Optimal Lag Order Selection*

	AIC	SC	HQ	HJC
Algeria	-11.653 [5]	-7.317 [5]	-9.659 [5]	-7.767 [5]
Gabon	3.096 [4]	5.409 [4]	2.399 [4]	4.513 [4]
Congo Rep.	-1.264 [3]	1.222 [1]	0.363 [1]	1.885 [2]
Nigeria	-2.918 [3]	1.617 [1]	-0.922 [3]	0.938 [2]

Note: Values in [ ] indicate the optimal lag order selection.
Source: Authors' compilation.

After examining the presence of a long-run relationship between the variables of this study, we examine the marginal impact of real oil prices and financial globalization on economic growth and financial development. Table 7 summarizes the results, with FD as the dependent variable suggesting that the coefficients of real oil price and financial globalization are negative and positive but statistically insignificant in both long- and short-run periods. The economic growth effect is only positive and significant in Algeria, but this indicator did not appear to have significant effects on the financial sector of other nations. This finding is similar to the total trade effect, where insignificant cointegration was found for all countries except Algeria; its trade sector will lead to reducing banking sector development in the long and short terms. The lagged value of the error correction term (ect_{t-1}) represents the speed of adjustment of financial development from short-run disequilibrium to its long-run equilibrium condition. We found that the Republic of Congo has the fastest correction mechanism, which amounts to -0.936 and is negative and significant at the 1 percent level, followed by Nigeria (-0.575), Gabon (-0.498), and Algeria (-0.451). These outcomes point to the existence of a stable long-run relationship between ROIL, FG, GDP, and Trade. This means that a deviation from the long-run equilibrium level of financial development in

1 year is corrected by 9.36 percent for the Republic of Congo, 5.75 percent for Nigeria, 4.98 percent for Gabon, and 4.51 percent for Algeria in the next year.

Table 6: *The ARDL Bounds Test Estimates With Structural Break Effect*

	Model-1 FD=f(ROIL, FG, GDP, Trade, T_{Break})		Model-2 GDP=f(ROIL, FG, FD, Trade, T_{Break})	
Country	*F-statistic*	*Decision*	*F-statistic*	*Decision*
Algeria	12.038*	Cointegrated	5.847*	Cointegrated
Gabon	4.128*	Cointegrated	3.001**	Cointegrated
Congo Rep.	4.469*	Cointegrated	7.047*	Cointegrated
Nigeria	5.561*	Cointegrated	15.689*	Cointegrated
Significance level	I(0)	I(1)		
10%	2.08	3.00		
5%	2.39	3.38		
1%	3.06	4.15		

Notes: * $p < 0.01$, ** $p < 0.05$, and *** $p < 0.10$. The break date (T_B) is based on the ZA unit test on GDP series (Algeria-2002, Gabon-1999, Congo Rep.-2008, and Nigeria-2002; FD: Algeria-1991, Gabon-1992, Congo Rep.-2011, and Nigeria-2007). The Hatemi-J criteria (HJC) was used to select the number of lags required.

Source: Authors' compilation.

The outcomes from the growth model show that oil price positively promotes economic growth in the Republic of Congo and Nigeria in the long run, by 0.345 percent and 0.045 percent, respectively, while having insignificant effects for Algeria and Gabon. Short-run results point to a positive impact of the real oil price on GDP in only two countries: Nigeria and the Republic of Congo, while it is negative in Gabon and has a statistically insignificant effect in Algeria. Interestingly, financial globalization in the long run exerts a similar positive effect on economic growth only in Algeria and Nigeria, but it did not show any significant impact in the short run for all studied countries. Furthermore, the financial sector also positively boosts GDP in Algeria in the long and short term, while the Republic of Congo benefits from this sector only in the long run. Meanwhile, Gabon and Nigeria recorded insignificant relationships between these two variables in both the short and long run. Total trade is good for economic growth in Algeria and Nigeria, while it has an insignificant influence on growth in

Gabon and the Republic of Congo in the long and short run. The error correction term shows that the coefficient is negative and statistically significant at the 1 percent level for all countries, where Gabon and the Republic of Congo have the highest levels of adjustment pace toward equilibrium, amounting to 0.360 and 0.358, respectively, followed by Algeria (-0.327) and Nigeria (-0.256). This indicates that there is a stable relationship between ROIL, FG, FD, and Trade. Meanwhile, the variation from the short-term disequilibrium to the long-term equilibrium level of economic growth in 1 year is modified by 3.60 percent for Gabon, 3.585 percent for the Republic of Congo, 3.27 percent for Algeria, and 2.56 percent for Nigeria.

The Chow test uses an *F*-statistic, whereby the rejection of the null hypothesis indicates no breakpoint. Based on the CUSUMSQ stability curve, we found the Republic of Congo and Nigeria facing the rejection of the null hypothesis at the 1 percent significance level with the breakpoint period of 2014–2018 and 2016–2018, respectively, caused by financial development instability. This is due to the balance sheet deterioration in the Republic of Congo from 2014 to 2016, which reflected negatively on the banking sector. The percentage of non-performing loans rose dramatically from 2.5 percent in 2014 to around 15 percent in 2016 and reached 22.5 percent in 2018, but this ratio started to decline due to low credit demand in the last two years (International Monetary Fund, 2022). In the case of Nigeria, the domestic economy slid into recession in early 2016 by 1.5 percent, which led to a deterioration in finances due to constraints on access to foreign exchange by the Central Bank of Nigeria (CBN). Unfortunately, the Structural Adjustment Program (SAP) does not appear to have significantly contributed to developments in the financial sector regarding the liberalization of interest rates, removal of direct government intervention, strengthening the role of market forces in the allocation of resources, and improving the capacity of financial institutions for domestic resource mobilization efforts. At the same time, these reforms led to an increase in inflation rates and a depreciation of the exchange rate, followed by a rise in the cost of goods. Looking at the breakpoint

effect causes by GDP instability, Gabon faced unstable conditions due to bad trade in 1998 coupled with substantial budgetary indiscipline, and the Gabonese economy went through a serious economic crisis in 1999. The sharp drop in the price of oil following the Asian crisis dealt a heavy blow to export revenues, and as a result, the economy slid back into a great recession with lower growth rates.

Table 7: *ARDL-ECM Long- and Short-Run Estimates*

	Dependent variable: FD				Dependent variable: GDP			
	Algeria	*Gabon*	*Congo Rep.*	*Nigeria*	*Algeria*	*Gabon*	*Congo Rep.*	*Nigeria*
Long-run estimation								
ROIL	-0.421 (0.240)	-0.996 (0.315)	-0.717 (0.576)	-0.305 (0.163)	-0.003 (0.807)	0.042 (0.515)	0.345* (0.003)	0.045** (0.051)
FG	1.070 (0.564)	-3.851 (0.218)	-4.936 (0.181)	-0.299 (0.732)	0.294*** (0.069)	0.045 (0.209)	-0.279 (0.285)	0.271* (0.011)
FD					0.050* (0.001)	-0.017 (0.308)	-0.050** (0.047)	0.018 (0.352)
GDP	13.722* (0.000)	-0.865 (0.800)	-1.237 (0.718)	-4.081 (0.1414)				
Trade	-1.276*** (0.065)	1.560 (0.196)	-0.904 (0.071)	0.603 (0.264)	0.139* (0.000)	-0.004 (0.954)	-0.093 (0.175)	0.104* (0.010)
T_{Break}	-4.088* (0.008)	-2.907** (0.051)	1.854 (0.129)	3.383* (0.000)	0.056 (0.303)	-0.185** (0.019)	-0.149 (0.281)	0.348* (0.000)
Short-run estimation								
ΔROIL	0.552 (0.206)	1.369 (0.119)	-0.671 (0.568)	-0.175 (0.163)	-0.001 (0.815)	-0.113** (0.051)	0.123* (0.000)	0.012** (0.051)
ΔFG	0.483 (0.528)	0.321 (0.100)	-4.621 (0.159)	1.047 (0.123)	-0.023 (0.530)	0.016 (0.163)	-0.100 (0.297)	0.033 (0.283)
ΔFD					0.016** (0.011)	-0.006 (0.311)	-0.006 (0.240)	0.005 (0.378)
ΔGDP	6.197* (0.001)	-0.431 (0.804)	-1.158 (0.720)	1.685 (0.526)				
ΔTrade	-3.055* (0.000)	-3.632* (0.000)	0.846 (0.120)	-0.454 (0.151)	0.045** (0.040)	0.090 (0.236)	-0.033 (0.178)	0.029** (0.019)
T_{Break}	-1.846* (0.000)	-1.450** (0.038)	1.735 (0.174)	1.945* (0.001)	-0.018 (0.265)	-0.066** (0.017)	-0.015 (0.768)	0.097* (0.000)
ect_{t-1}	-0.451* [-10.056]	-0.498* [-5.888]	-0.936* [-6.095]	-0.575* [-6.854]	-0.327* [-6.989]	-0.360* [-5.007]	-0.358* [-7.694]	-0.279* [-11.449]

Diagnostic test results

χ^2_{Serial}	1.449 (0.265)	17.121 (0.151)	0.611 (0.551)	0.604 (0.554)	0.931 (0.432)	1.948 (0.395)	2.001 (0.138)	0.009 (()991)
χ^2_{Hetero}	0.803 (0.65)	0.794 (0.697)	0.814 (0.641)	0.983 (0.484)	0.371 (0.978)	1.414 (0.499)	1.128 (0.295)	1.002 (0.481)
$\chi^2_{Normality}$	1.458 (0.482)	0.634 (0.728)	7.571** (0.022)	0.04 (0.968)	0.100 (0.951)	0.464 (0.792)	10.091* (0.000)	0.489 (0.782)
CUSUMSQ stability	Stable	Stable	Unstable	Unstable	Stable	Unstable	Stable	Stable
Breakpoint period			2014-2018	2014-2016		1999-2002		
Chow breakpoint test			11.019* (0.000)	7.167* (0.000)		10.671* (0.000)		
Breakpoint effect	No	No	Yes	Yes	No	Yes	No	No

Notes: * $p < 0.01$, ** $p < 0.05$, and *** $p < 0.10$. The values in ( ) and [ ] indicate p-values and t-statistics, respectively. The heteroskedasticity test is based on the Breusch-Pagan-Godfrey (BPG) test and the normality test is based on the Jarque-Bera (JB) test.

Source: Authors' compilation.

Finally, to determine the direction of causality between oil price, financial globalization, financial development, and economic growth, we employ the ARDL-ECM Granger causality. If the variables are cointegrated, then there must be causality between them, at least in one direction. The results in Table 8 report that in the weak causal condition in the short run, there is a bidirectional causality relationship determined for Algeria between ROIL, FG, and FD, as well as between FG and GDP, while no evidence was found for a causal relationship between ROIL and GDP. In the case of Gabon, there is also a two-way relation between ROIL and FD, but we could not find any causal relation running between FG and FD. Additionally, the test has given evidence of unidirectional causality running from FG to ROIL and GDP. For the Republic of Congo, a unidirectional causal effect was found in the test extending from FD to ROIL and FG, and from FD to ROIL; again, we find a one-way relation running from GDP to FG and from ROIL to GDP. Lastly, for Nigeria, there is no causal relationship between ROIL and FD, FG, and GDP. However, a bidirectional causal relationship was found between FG and FD and between ROIL and GDP. Based on the error correction coefficients in the long-run weak causal condition, our results confirm

that there is causality running between FD, ROIL, and GDP for Algeria, while there is no significant long-run causality for Trade and FG. This is because Algeria recorded a trade deficit of USD 12.62 billion in 2015 because of a fall in energy earnings, which account for about 94 percent of total sales abroad, followed by a drop in the value of Algerian imports from France, which is one of its major trading partners, by 12 percent in 2016 (Middle East Monitor, 2017).

Table 8: *ARDL-ECM Causality Test Results*

Dependent variable	Short-run causality (χ^2-statistics)					Long-run causality
	ΔFD	ΔGDP	$\Delta ROIL$	ΔFG	$\Delta Trade$	
Algeria						
ΔFD		9.268* (0.002)	11.163* (0.001)	11.808* (0.003)	31.179* (0.000)	-0.561* [-5.920]
ΔGDP	9.839* (0.002)		1.749 (0.186)	5.826** (0.015)	2.320 (0.128)	-0.342* [-2.788]
$\Delta ROIL$	3.250*** (0.071)	0.105 (0.745)		0.013 (0.908)	8.679* (0.000)	-0.142* [-3.410]
ΔFG	14.420* (0.000)	7.568* (0.006)	14.096* (0.000)		3.365*** (0.067)	-0.111 [-1.004]
$\Delta Trade$	25.524* (0.000)	2.274 (0.132)	16.60* (0.000)	6.836** (0.033)		0.005 [0.062]
Gabon						
ΔFD		0.055 (0.814)	15.779* (0.000)	0.835 (0.361)	16.863* (0.000)	-0.564* [-4.392]
ΔGDP	3.974** (0.049)		1.491 (0.222)	0.624 (0.429)	3.043*** (0.081)	-0.265** [-2.095]
$\Delta ROIL$	7.523* (0.006)	5.488** (0.019)		4.156** (0.041)	15.879* (0.000)	-1.140*** [-1.712]
ΔFG	0.234 (0.628)	2.214* (0.000)	0.782 (0.376)		18.468* (0.000)	-0.345* [-3.090]
$\Delta Trade$	18.758* (0.000)	7.392*** (0.060)	12.879* (0.000)	21.807* (0.000)		-0.277* [-4.779]
Congo Rep.						
ΔFD		8.345* (0.000)	3.433*** (0.064)	7.415* (0.006)	0.005 (0.943)	-1.238* [-8.985]
ΔGDP	2.230 (0.132)		2.680 (0.102)	13.184* (0.001)	1.714 (0.190)	-0.036 [-0.333]
$\Delta ROIL$	0.139 (0.709)	4.357** (0.037)		0.010 (0.892)	13.419* (0.000)	-0.321** [-2.368]
ΔFG	1.367 (0.242)	1.870 (0.171)	2.519 (0.112)		7.992* (0.005)	-0.490* [-4.055]
$\Delta Trade$	3.043*** (0.081)	9.373* (0.002)	9.784* (0.002)	4.053** (0.044)		0.009 [0.356]

Nigeria						
ΔFD		0.056 (0.813)	0.262 (0.609)	6.766** (0.034)	0.001 (0.966)	-0.648* [-5.185]
ΔGDP	7.019*** (0.071)		4.026** (0.046)	0.784 (0.376)	13.431* (0,000)	-0.104* [-3.003]
ΔROIL	1.629 (0.202)	3.792*** (0.051)		12.678* (0,002)	25.202* (0.000)	-0.032 [0.678]
ΔFG	5.192** (0.023)	1.120 (0.290)	6.340** (0.012)		16.250* (0.001)	-0.337* [-3.603]
ΔTrade	1.003 (0.317)	8.446* (0.004)	35.878* (0.000)	8.774** (0.012)		-0.606* [-3.975]

Notes: * $p < 0.01$, ** $p < 0.05$, and *** $p < 0.10$. Values in ( ) and [ ] indicate the p-value and t-statistics, respectively. The optimal lag selection is based on the Hatemi-J criteria (HJC).

Source: Authors' compilation.

Furthermore, the financial sector's instability due to the changes over the last two decades prevented financial globalization from getting a foothold in its economy (Benahmed-Daho, Bouteldja, & Bendob, 2015). As for Gabon, the empirical results show that there are causal effects between all selected variables. Similarly, in Nigeria, there is a long-run weak causality between the variables of this study, except for the ROIL series. The results also suggest that ROIL, FG, and FD have long-run causal effects for the Republic of Congo, but we did not identify any significant effect related to GDP and Trade. Consequently, official data show that over the past decade, the over-reliance on oil revenue by the Republic of Congo has become costly and painfully apparent, and has led to a seven-year recession, resulting from the end of the recent oil boom, which has led to a significant decline in income per capita, shrunk the economy, and dampened long-term growth prospects. Overall, the causal relationships among the variables indicate that the price of crude oil affects the economy's drivers and development in both direct and indirect ways.

5 Conclusion

Crude oil prices and globalization have gained great importance in today's world due to their effect on the growth rates and economic stability of countries. Because

of the limited studies on this topic, the present analysis investigates the short- and long-run impact of crude oil prices and financial globalization on economic growth and financial development. The evaluation is done on a set of four individual African oil-producing countries using the ARDL-ECM Granger causality approach. The findings of the study suggest that crude oil price and financial globalization have no significant effect on the development of the financial sector in both long- and short-run terms for all four countries. Whereas Nigeria and the Republic of Congo benefit from oil prices in terms of economic growth in the long run, Algeria and Gabon do not. In the short run, growth is influenced positively by oil prices in Nigeria and the Republic of Congo, but negatively in Gabon. Financial globalization increases the economic growth of the main oil-exporting countries in Africa: Algeria and Nigeria, but it does not increase the economic growth of Gabon and the Republic of Congo, while the short-run effects are insignificant for all countries.

The ARDL-ECM Granger causality results in the short term suggest that financial development in Algeria has a bivariate causal relationship with oil price and financial globalization, while economic growth does not have a causal relationship with oil price, but a bidirectional causal relation was found with financial globalization. Also, only a bidirectional causality effect between oil price and financial sector development was found in Gabon, whereas oil price and financial globalization cause the Gabonese economic growth but not vice versa. Moreover, a unidirectional causal effect was found running from financial development to oil price, from oil price to economic growth, and from financial development and economic growth to financial globalization in the Republic of Congo. For Nigeria, the existence of two-way short-run causality was found between financial development and financial globalization, but no causality was reported for oil price. However, economic growth has a bidirectional causality with oil price, but financial globalization does not. In the long-run causality test, the findings proved that oil price has a dramatic causal effect (except for Nigeria); similarly, financial globalization has a significant causal impact for all countries, except for Algeria.

The study's findings suggest that crude oil price and financial globalization have no significant effect on the development of the financial sector in both long- and short-run terms for all four countries. Whereas Nigeria and the Republic of Congo benefit from oil prices in terms of economic growth in the long run, Algeria and Gabon do not. So, maximizing oil revenue during periods of oil price increases is recommended for Nigeria and Congo's energy policies. On the other hand, Algerian and Nigerian economies gain more from global integration in trade and capital flows. It is also recommended that foreign investments that rely on technology and international investors should be encouraged in sustainable areas. This requires better institutional quality, legal systems, financial information quality, etc. Trade activities are not a favorable solution for Gabon and the Republic of Congo. At the same time, the largest oil producers in Africa, i.e., Algeria and Nigeria, should increase trade activities with other countries to enhance their growth levels. Financial development strategies have been geared toward non-lucrative investments rather than productive investments that might stimulate or contribute to economic growth. Therefore, it appears that during the studied period, most oil-rich countries' financial systems suffered from inefficiency in allocating financial resources.

Reaping the benefits from different resources like oil and globalization is not possible without high-quality institutions. Therefore, financial development requires good hands-on experience, local knowledge, and experimentation to develop institutions. The African oil-producing nations are financially and economically underdeveloped countries and have weak institutional structures, which prevent them from channeling and allocating revenues into profitable investments as well as attracting foreign investment. These countries should have adequate policy measures to tap oil markets and trade and capital flows efficiently, which can help improve financial development and economic growth. This study was limited in its assessment of the role of oil price and financial globalization by using only two variables that affect financial development and economic growth in African oil-producing countries. Future studies may include additional

determinants of financial development and growth in their analyses, such as tourism, manufacturing, financial inclusion, technology, and institutional quality in the context of achieving the Sustainable Development Goals (SDGs).

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