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Article

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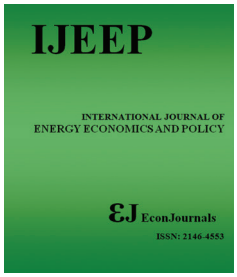

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A Panel Analysis of Crude Oil Exports and Poverty Reduction in African Oil Producing Countries: Implication for the Sustainable Development Goal One

Lawrence Imeokparia[1], Olaoye Olusegun Peter[2], Bahiru Akande Bello[3], Romanus Osabohien[4,5], Timothy Ayomitunde Aderemi[1,6]*, Obindah Gershon[4,6], Disi Aaron[1], Alejo Abidemi[4,6]

[1]Department of Economics, Accounting and Finance, Bells University of Technology, Ota, Nigeria, [2]Academic Planning Unit and Centre for Economic Policy and Development Research (CEPDeR), Covenant University, Ota, Nigeria, [3]Department of Business Administration, Bells University of technology, Ota, Nigeria, [4]Department of Economics and Development Studies, Covenant University, Ota, Nigeria, [5]Development Research (CEPDeR), Covenant University, Ota, Nigeria, [6]Centre for Economic Policy and Development Research (CEPDeR), Covenant University, Ota, Nigeria. *Email: aderemi.timothy@gmail.com

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ABSTRACT

The objective of this research is to determine the impact of oil exports on poverty reduction in African oil exporting countries. The study spanned over 30 years, from 1991 to 2020, and relied on secondary data extracted from ten (10) highest oil-producing countries in Africa. The human development index (HDI) was used as a proxy for poverty reduction. The Panel ARDL technique was used to analyse the data. According to the findings of this study, the oil exports using revenues from oil exportation and total annual barrels of oil produced had a beneficial impact on human capital development and thus reduced poverty in the selected African oil-exporting countries. The impact of total revenue from oil exports, on the other hand, was statistically insignificant, although the impact of total annual barrels of oil produced was not. As a result of these findings, the study finds that in the long run, oil revenues had a positive impact on poverty reduction in oil-exporting African countries, although not to a significant extent. This implies that the study does not provide empirical evidence to support the existence of resource curse hypothesis. In view of the above findings, this study recommends that the policymakers in African oil exporting countries should utilize the proceeds from the oil exports for the human development oriented programmes that have trickle down effects on poverty reduction in these countries.

Keywords: Oil Exports, Poverty, Human Development Index, SDG 1, African Countries
JEL Classifications: Q15, Q17, Q37

1. INTRODUCTION

Despite fact that Africa is enormously blessed with natural resources, the continent still suffers from the problem of acute poverty (Mohseni, 2019). Meanwhile, poverty in African nations has not only been attributed to lack of food but also poor human development, low income, low literacy, and short life expectancy as enunciated in Economic Reports on Africa (UNDP, 2019; Ebraham, 2018). Currently, African continent houses the largest number of people living in abject poverty in the world alongside 640 million people living without electricity (World Bank, 2021). The African poverty paradox in the midst of oil wealth has generated a lot of concerns among policymakers which beg for the empirical answer to the question whether the "resource curse" phenomenon is applicable to African oil exporting countries. Against this backdrop, this study provides a novel empirical evidence by investigating the nexus between crude oil exports and poverty reduction in African oil producing countries. This study is

very paramount because revenues from oil exports have not only economic value but also overwhelming influence over poverty reduction and other developmental issues in oil-rich economies.

However, over the past decades, natural resource endowment and its negative implications on economic development in a country has been the popular submission of the earlier writers of resource curse hypothesis (Auty and Warhurst, 1993; Matsuyama, 1992; Sachs and Warner, 1995). In the recent times, studies investigating the existence or otherwise of resource curse hypothesis is very scarce, especially within the panel context of African oil exporting countries. Recent studies such as Kakanov et al. (2018) and Bazilian et al. (2013) which are similar to this current study focused on twenty (24) oil exporting countries and ECOWAS countries respectively. It is imperative to reiterate that these past studies have examined the context of poverty from narrow perspective by adopting GDP capita as its measurement. Also, this current study is very unique from the previous studies because it employs a comprehensive and composite measurement of poverty-human development index which provides these three (3) parameters, namely educational status, economic status and health status as the basic measurement poverty (UNDP, 2019; Fayyaz et al., 2019; Aderemi et al., 2021:a). Consequently, this study examined the trends of revenues from oil exports and poverty using human development in African oil exporting nations. In addition, methodologically, this study is novel in examining the nexus between revenues from oil exports and poverty within the heterogeneous panel analysis of African oil exporting countries.

The structure of this paper is enunciated as follows; introduction of the paper focuses on background information regarding the subject matter of this study and identification of empirical gap for the study to fill. Section two provides the review of relevant empirical studies focusing on the subject matter of the study. The latter part of the study addresses the methodology, discussion of results and policy implications of the study.

2. EMPIRICAL REVIEW

Detailed review of empirical studies have been carried out in this section of the study as follows; While providing a comprehensive information regarding "resource curse" phenomenon, Kakanov et al. (2018) used a panel data alongside the technique of error correction model to verify whether the existence of resource curse syndrome existed in 24 oil exporting nations from 1982 to 2012. It was evident in the study that the resource curse hypothesis was supported by the study because higher quality institutions did not have the capacity to salvage the curse. In another view, Bazilian et al. (2013) explored the linkage that exists between the implications of macroeconomic and governance oil and gas in the countries under West Africa sub region. The study reported that the long term instability or prosperity was critically connected with the early emergence of institutions employed to manage the inflows of new revenues from oil and gas in the sub region. Whereas Andersen and Aslaksen (2013) assessed how political survival could be made possible through oil money. The study established that the wealth generated via natural resources had serious negative implications on political survival in both the autocratic and intermediate societies and autocratic, but it showed otherwise in democratic and polity societies because positive implications of oil money was associated with political office in these societies. Wiens (2014) applied a theoretical construct to assess the nexus between institutional quality and natural resources with the submission that there would be a high tendency of overcoming the problem of the resource curse if the policies coming from the policymakers were initially restrained by relevant institutions before the advent of resource dependence. If not the revenues from would be used in stabilising bad institutions.

A study by Ebraham (2018) examined the impact of oil and non-oil exports on Iranian economic development. The time series and the Vector Autoregressive technique were used (VAR). They discovered that an increase in oil exports had a favorable impact on real GDP, but the response took place two lags later. Real GDP, on the other hand, reacts favorably to a shock in non-oil exports, although the delays are longer. According to their findings, oil is Iran's primary source of government funding, and the country's budget is heavily reliant on estimates of future oil export revenues. Non-oil exports had a favorable long-term impact on the economy, demonstrating that effective policies may boost government income and that long-term development initiatives must be understood and studied to make policy changes. The high price of oil and the relative stability of oil prices at the time of the research were cited as reasons for Iran's GDP growth. To maintain revenues, the additional cash generated by a rise in the price of oil should be utilized to promote the growth of non-oil exports.

Ekperiware (2018) used the Ordinary Least Square (OLS) approach to study the impact of oil and non-oil FDI on Nigeria's economic development. Both oil and non-oil foreign direct investment (FDI) are statistically significant at the 5% level of freedom, according to their findings. Oil FDI generates a 3.24% rise in economic growth, whereas Non-oil FDI causes a 3.5% gain in GDP with a one-unit shift. Non-oil FDI, on the other hand, is more statistically significant and has a larger favorable impact on Nigeria's economy. To increase Nigeria's foreign investment, the report suggests that efforts be made to attract FDI into the non-oil FDI sector. According to empirical findings, the oil industry's contribution to economic growth is very tiny compared to the non-oil sector, even though it has a greater trend in the economy. This might be because the oil industry, which is dominated by foreign workers, does not employ the majority of the country's workforce.

3. METHODOLOGY

3.1. Theoretical Framework

This study is built on Levitt (1983) globalization theory as its theoretical foundation. The major motivation for anchoring this research work on this theory is that, globalization has been categorised into three phenomena, namely, economic, political and social. Trade openness is one of the strong proxies of globalisation from the economic point of view according to "KOF Globalization Index" (Dreher et al., 2008; Aderemi et al., 2020). Hence, the relevance of this theory to the subject matter of this study. Consequently, the theory of globalization has a critical objective in interpreting current international events through the lens of development, economic conditions, social scenarios, and political and cultural influences. It

refers to the integration of economies, most notably the movement of goods, services, and capital across borders. The term is occasionally used to refer to the cross-border movement of people (labour) and knowledge (technology). It is worth of note that globalisation has the ability to foster development in African oil exporting countries by increasing income and living standards via increased cross-border economic engagement such as crude oil exports and other oil minerals.

3.2. Model Specification

Nexus between oil exports and poverty reduction in this study is estimated using an adapted model from the work of Osabohien et al. (2020), Aderemi et al. (2022) and Aderemi et al. (2021: b) as follows:

$$HDI_{it} = \beta_0 + \beta_1 INN_{it} + \beta_2 GWT_{it} + \beta_3 EXP_{it} + \beta_4 POP_{it} + \mu_{it} \quad (1)$$

Where: HDI = Human development index, GWT = Economic growth. EXP = Oil exportation, INN = Technological innovation and POP = Population

However, for the purpose of this study, the model was adjusted to suit the objective of this study:

$$HDI_{it} = \alpha_0 + \beta_1 OEXP_{it} + \beta_2 logNBP_{it} + \beta_3 INF_{it} + \beta_4 EXR_{it} + \mu_{it} \quad (2)$$

Where: HDI- Human Development Index is used as a measurement for poverty reduction UNDP (2019) and Fayyaz et al. (2019). This serves as the dependent variable. OEXP- Oil Exports which is proxied with oil rents as % of GDP. Meanwhile, NBP- values of the Number of barrels of crude oil produced annually and INF- Inflation or consumer price index are control variables. And EXR- Exchange rate is a policy variable. Also, α_0 = the intercept, $\beta_1 \_ \beta_4$ = the coefficients of the independent variables. i = cross-section of ten countries, t = time frame of the study, 1991-2020, μ = Error term.

3.3. Estimation Technique

The analysis of this study has two parts, in which the first part requires various pres-estimation techniques such as correlation matrix panel, unit root test and Johansen fisher panel cointegration test for verifying the potential multicollinearity, the stationary status of the data and the long run equilibrium convergence among the data systematically. Meanwhile, the outcomes from the pre-estimation which show that the data comprise of I (0) and I (1) motivated the study to employ the panel ARDL technique as its principal technique of estimation due to the submission of Pesaran et al. (2001), Pesaran and Pesaran (1997) and Pesaran et al. (1999). As such, the panel ARDL is illustrated as follows;

$$\begin{aligned} HDI_{it} = & \sum_{i=1}^{p1} \beta_1 \ HDI_{it-j} + \sum_{j=1}^{p2} \beta_2 \ NBP_{it} \\ & + \sum_{k=1}^{p3} \beta_3 \ INF_{it} + \sum_{i=1}^{p4} \beta_4 \ EXR_{it} + \\ & + \theta ECM_{it-1} + \sum_{i=1}^{p1} \beta_{11} \Delta HDI_{it-j} + \\ & \sum_{j=1}^{p2} \beta_{12} \Delta NBP_{it} + \sum_{k=1}^{p3} \beta_{13} \Delta INF_{it} \\ & + \sum_{i=1}^{p4} \beta_{14} \Delta EXR_{it} + u_{it} \end{aligned} \quad (3)$$

3.4. A-priori Expectation

The prior expectation checks the co-efficient of the model parameters which are being estimated. This study believes that some variables positive, while some are negative. This is explicitly explained further in Table 1.

3.5. Source of Data and Sample Size

Secondary data for this study was obtained from the World Development Indicators (WDI), and the period covered is from 1991 to 2020. In the same vein, the study utilized data from ten (10) highest oil-producing countries in Africa. According to OPEC the countries are Nigeria, Libya, Angola, Algeria, Egypt, the Republic of Congo, Gabon, Ghana, Equatorial Guinea and Chad. It is important to stress that the selection of these countries and the scope of the study were majorly driven by data availability.

4. RESULTS AND DISCUSSION

The section of this study shows the systematic presentation of both empirical results and discussion of the results thereof. The study first presented the trend analysis followed by the presentation of descriptive statistics and then the pre-estimation test, after which the regression analysis followed suit.

4.1. Trend Analyses

Trend analyses were conducted using graphical expression to examine the trends and patterns of the major variables of interest in the study such as human development index (HDI) oil exports (OEXP) and number of barrels of crude oil produced annually of the selected ten (10) African oil producing countries. This is shown as follows:

Figure 1 shows various human development status of the African oil producing countries under investigation over the period of 30 years in this study. As shown in the above figure, Egypt has the highest level of human development index followed by Chad and Angola respectively. This implies that the residents of these countries enjoy relatively good standard of living in terms of economic, social and health over the time. On the other hand, countries such as Nigeria, Libya, Garbon and Algeria possess the least human development in terms of economic, social and health over the time.

Table 1: Explanation of A-priori for model 1

Variable	Expectation	Mean
β_1 and β_{11}	Positive	Revenues from oil exportation would be significantly positive
β_2 and β_{12}	Positive	Number of barrels produced would be significantly positive
β_3 \$ β_{13}	Negative	Inflation would be significantly negative
β_4 and β_{14}	Negative	The exchange rate would be negatively significant
θ	Negative	The speed of adjustment would be significantly negative
β_1 β_2 β_3 and β_4	Long run parameters	
β_{11} β_{12} β_{13} and β_{14}	Short run parameters	

Sources: Authors` computation (2022)

Figure 2 shows the trends of oil rents as percentage of GDP over the periods of 30 years in the selected African oil producing countries. It is evident from the above figure that Libya had the highest level of rents as GDP during the study period followed by Congo and Equatorial Guinea respectively. Meanwhile, Ghana, Egypt and Nigeria had least oil rents as percentage of GDP among the selected countries over the years.

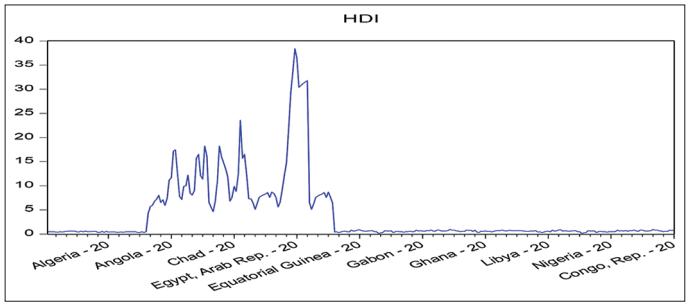
4.2. Pre-estimation

The characteristics of the researched variables are described by descriptive statistics, in which the summary of the results are reported in Table 2.

The mean values of the variables in Table 2 are within their minimum and maximum values indicating that no variables are affected by outliers. The standard deviation, which is a measure of how scattered the data is in regard to the mean shows that all variables in Table 2 have a standard deviation of greater than one, indicating that the data is dispersed around the mean. The skewness values indicate the asymmetry or distortion of a symmetric distribution. Table 2 shows that all variables (HDI, OEXP, LNBP, INF, EXR) are positively skewed. The ratio of the combined sizes of the two tails is known as kurtosis. From Table 2, OEXP, LNBP and EXR have kurtosis values less than 3, indicating that the variables have a smaller tail than the normal distribution. The other variables (HDI and INF) have kurtosis values larger than 3, suggesting a heavier tail than a normal distribution.

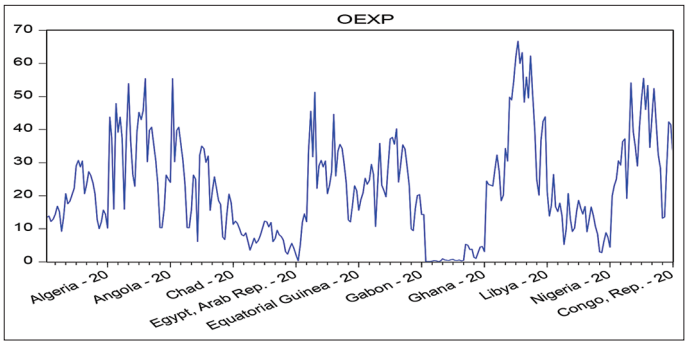
The Jargue-Bera test determines the distribution's normality. The probability values of the Jarque-Bera coefficient are all <5%, showing that the variables are normally distributed at a 5% level of significance.

Figure 1: Trend of Human Development Index (1991-2020)



Source: Authors' Computation (2022)

Figure 2: Trend of oil rents as percentage of GDP (1991-2020)



Source: Authors' Computation (2022)

It is important to ensure that there is an absence of multicollinearity in the model. This is because the presence of multicollinearity would bring about spurious results. A test for multicollinearity was conducted using the correlation matrix method. The result of the correlation matrix is shown in Table 3. As shown in Table 3, all the pairs of correlation are very low to the extent that none of the pairs of the variables is equal to 0.5. This implies that the variables employed in this research are independent of one another and do not suffer from multicollinearity issues.

The Levin, Lin, and Chu (LLC) tests are used to evaluate stationarity of the data for empirical analysis in this work. This stationarity statistic is used to confirm that no variables are integrated at the second differencing level. Consequently, the Levin, Lin and Chu (LLC) unit root test result in Table 4 shows that OEXP and INF are stationary at levels (I[0]) while HDI, LNBP and EXR are stationary at first difference. Since some variables are only stationary at first difference. This implies that there might be a loss in the long-run characteristics of the data series which can be recovered using the method of cointegration.

For the purpose of determining whether or not two or more time series are connected to one another, a co-integration test is used. It is possible for many time series to become co-integrated if they are all susceptible to the same stochastic drift. The Johansen Fisher Panel Cointegration Analysis was used to investigate the likelihood of long-run linkages between the variables. Table 5 demonstrates that there are at least 4 co-integrating equations based on the trace statistics and at least 3 co-integrating equation based on the max-eigen statistics. These results indicates that there is a long-run relationship among the variables.

Table 6 shows the ARDL short-run and long-run estimated results of impact of crude oil exports on poverty reduction in the selected African oil-producing countries. From the short-run result, none

Table 2: Descriptive statistics

	HDI	OEXP	LNBP	INF	EXR
Mean	3.991817	22.23477	14.61702	15.73423	241.6567
Median	0.666667	20.55280	14.40639	14.95153	110.2080
Maximum	38.40000	66.71263	21.36941	55.60000	732.3977
Minimum	0.100000	0.069045	7.943073	0.300000	5.51E-08
SD	6.823998	15.12737	3.747629	11.86725	251.5160
Skewness	2.674278	0.574844	0.234749	1.009961	0.469561
Kurtosis	10.85830	2.709824	1.850874	4.336382	1.526997
Jarque-bera	1129.499	17.57478	19.26148	73.32500	38.14610
Probability	0.000000	0.000153	0.000066	0.000000	0.000000
Observations	300	300	300	300	300

Source: Authors' calculation (2022). HDI: Human development index, OEXP: Oil exports, LNBP: Number of barrels produced, INF: Inflation rate, EXR: Exchange rate

Table 3: Correlation matrix

	HDI	OEXP	LNBP	INF	EXR
HDI	1.000000	−0.213258	0.096038	−0.147829	0.095751
OEXP	−0.213258	1.000000	−0.070447	0.076386	0.236475
LNBP	0.096038	−0.070447	1.000000	0.217855	0.008448
INF	−0.147829	0.076386	0.217855	1.000000	−0.008899
EXR	0.095751	0.236475	0.008448	−0.008899	1.000000

Source: Authors' computation (2022). HDI: Human development index, OEXP: Oil exports, LNBP: Number of barrels produced, INF: Inflation rate, EXR: Exchange rate

Table 4: Unit root tests (stationarity test)

Variables	LLC		LLC		Status
	Level (0)		1ST Diff (1)		
	LLC test stat	Probability	LLC test stat	Probability	
HDI	−0.93747	0.1743	−12.0340	0.0000*	I (1)
OEXP	−5.29554	0.0000*	−11.5249	0.0000*	I (0)
LNBP	−0.41377	0.3395	−13.6124	0.0000	I (1)
INF	−1.96845	0.0245*	−11.3980	0.0000*	I (0)
EXR	4.31056	1.0000	−6.72606	0.0000*	I (1)

(*) (**) indicate significance at 5% and 10% levels, respectively. Source: Authors' Calculation (2022). LLC: Levin, Lin, and Chu, HDI: Human development index, OEXP: Oil exports, LNBP: Number of barrels produced, INF: Inflation rate, EXR: Exchange rate

Table 5: Fisher Co-integrating test results

Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(From trace test)	Prob.	(From max-eigen test)	Prob.
None	116.0	0.0000*	77.91	0.0000*
At most 1	55.43	0.0000*	39.00	0.0067*
At most 2	29.91	0.0713**	19.83	0.4689
At most 3	24.14	0.2363	16.10	0.7103
At most 4	36.50	0.0134*	36.50	0.0134*

(*) (**) indicate significance at 5% and 10% levels, respectively. Source: Authors' Computation (2022)

Table 6: ARDL model estimates of crude oil exports and poverty reduction in African oil producing countries

Dependent variable: D (HDI)				
Method: ARDL				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long run equation				
OEXP	0.070585	0.058523	1.206113	0.2299
LNBP	0.863350*	0.266802	3.235919	0.0015
INF	−1.076805*	0.334212	3.221925	0.0016
EXR	0.026128*	0.013012	2.008010	0.0466
Short run equation				
ECM<	−0.055347*	0.024945	2.218762	0.0323
D (OEXP[−1])	0.020920	0.021252	0.984363	0.3267
D (LNBP[−1])	0.085003	0.143310	0.593138	0.5541
D (INF[−1])	0.007565	0.015018	0.503746	0.6153
D (EXR[−1])	0.160691	0.111880	1.436283	0.1532

(*) (**) indicate significance at 5% and 10% levels, respectively. Source: Authors' Computation (2022). HDI: Human development index, OEXP: Oil exports, LNBP: Number of barrels produced, INF: Inflation rate, EXR: Exchange rate

of the independent variables is statistically significant at a 5% or 10% level of significance. This implies that in the short-run the effect each of the independent variables has on HDI is not significant enough to have an impact. Also, the Error correction term (ECM) in Table 5 is negative and statistically significant at a 5% level of significance implying that there is a long-run equilibrium relationship between the dependent and independent variables. The ECM coefficient of −0.055347 indicates that if there is disequilibrium in the system, it takes an average speed of 5.55% to return from the short-run to the long run.

Firstly, the long-run estimates in Table 6 show that rents from oil exports and human development index had insignificant positive relationship in the selected African oil producing countries. Meanwhile, the number of oil barrels produced per annum had both positive and significant relationship with human development index in the selected countries. As such, a unit change in the number of oil barrels produced brings about 0.86% rise in human development index in the countries. However, inflation rate had a negative and statistically significant relationship with human development index at a 5% level of significance. This implies that a unit change in the consumer prices index would reduce the human development index by 1.1%. Finally, exchange rate has a positive and statistically significant relationship with human development index at a 5% level of significance. This result indicates that a unit change in exchange rate has a 0.026% rise in human development index.

By and large, it could be concluded in this study that oil revenues have insignificant positive impact on human development in the selected African oil exporting countries. This implies that the revenues from oil exports do not contribute to a meaningful poverty reduction in these selected countries. The reason for this result might as a result of the inability of these countries to deploy the proceeds of oil exports into the human development oriented programmes that have trickle down effects on poverty reduction in the countries. This study does not provide empirical evidence to support the existence of resource curse hypothesis in African oil exporting economies. It is important to emphasize that these findings contradict the popular opinions of the resource curse hypothesis by the earlier writers such as Auty and Warhurst (1993), Matsuyama (1992), Sachs and Warner (1995). In the same vein, this study provides empirical evidence that is not in tandem with the argument of recent study of Kakanov et al. (2018) which focused on twenty (24) oil exporting countries.

5. CONCLUSION AND RECOMMENDATION

The objective of this research is to determine the impact of oil exports on poverty reduction in African oil exporting countries. The study spanned over 30 years, from 1991 to 2020, and relied on secondary data extracted from the World Development Indicators. The human development index (HDI) was used as a proxy for poverty reduction, while the independent variables were the exchange rate (OEXR), revenue from oil export (EXP), number of barrels produced (LNBP), and inflation rate (INF). The ARDL method was used to analyse the data. According to the findings of this study, the oil exports using revenues from oil exportation and total annual barrels of oil produced had a beneficial impact on human capital development and thus reduced poverty in the selected oil-exporting African countries. The impact of total revenue from oil exports, on the other hand, was statistically insignificant, although the impact of total annual barrels of oil produced was not.

As a result of these findings, the study finds that oil revenue has had a positive impact on poverty reduction in oil-exporting African countries, although not to a significant extent. This implies that the study does not provide empirical evidence to support the existence of resource curse hypothesis in African oil exporting economies. In view of the above findings, this study recommends that the policymakers in African oil exporting countries should utilize the

proceeds from the oil exports for the human development oriented programmes that have trickle down effects on poverty reduction in the countries.

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