

Effect of the Joint Interaction between Oil Revenue and Governance on Life Expectancy in Nigeria (1990-2021)

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Abstract: *The study investigated the effect of the joint interaction between oil revenue and governance on life expectancy in Nigeria 1990-2021. The study adopted the Autoregressive Distributive Lag (ARDL) modelling techniques for the data analysis. Data for the analysis were sourced from secondary sources such as World Data Index (WDI) and CBN Statistical Bulletin. The results of the analysis indicated as follows; the ARDL ECM regression results showed that in short run, the coefficients; ORV*GOE has a positive (0.000507) relationship with LER, ORV*ROQ has a negative (-0.000158) relationship with LER, ORV*VOA has a negative (-0.000092) relationship with LER, ORV*COC has a positive (0.000026) relationship with LER, ORV*ROL has a positive (0.000675) relationship with RPI. The Breusch-Godfrey Serial Correlation LM Test result showed that there is no serial correlation in the model. The Breusch-Pagan-Godfrey Heteroskedasticity Test result suggests that there is no evidence of heteroskedasticity in the model. The study concluded that oil revenue and governance has not promoted economic development in Nigeria within the period under review and recommended that there should be accountability and transparency on the part of government and officials in the management of oil revenues for the benefit of the citizens and the economy as a whole.*

Keywords: Crude oil, Revenue, Governance, Life Expectancy

INTRODUCTION

The most widely used measure of the comparative status of socioeconomic development is presented by United Nations Development Program (UNDP) in its annual series of Human Development Reports. The centrepiece of these reports, which were initiated in 1990, is the construction and refinement of its informative Human Development Index (HDI). The HDI attempts to rank all countries on a scale of 0 (lowest human development) to 1 (highest human development) based on three goals or end products of development: *longevity* as measured by life expectancy at birth, knowledge as measured by a weighted average of adult literacy (two-thirds) and gross school enrolment ratio (one-third) and standard of *living* as measured by real per capita gross domestic product adjusted for the differing purchasing power parity of each country's currency to reflect cost of living and for the consumption of diminishing marginal utility of income.

Until date, Nigeria remains classified as one of the developing countries of the world with low per capita incomes, high infant and maternal mortality rates and low life expectancy at birth (Weinthal & Luong, 2006).

Ogunbiyi and Abina (2019) investigated the role crude oil and non-oil revenue play in the development process of Nigeria. The Error correction estimates result showed that oil revenue has a negative but significant relationship with human development index, the negative contribution arose as a result of the resource curse ideology, while non-oil revenue has a positive but insignificant relationship with human development index.

Maku et al., (2018) investigated the impact of petroleum pump price on human welfare in Nigeria for the period 1990 to 2015 using the auto regressive distributive lag (ARDL)/Bounds approach. The study concluded that for human welfare to increase there must be a drop in the price of premium motor spirit and dual-purpose kerosene and inflation rate in Nigeria. In addition, the government and relevant agencies should ensure that petroleum pump prices be regulated because they have a long way on the market.

The aim of the study was to determine the effect of the joint interaction between crude oil revenue and governance on the life expectancy in Nigeria. Governance was proxied by control of corruption, voice and accountability, regulatory qualities, rule of law, government effectiveness and exchange rate.

Methodology

Research Design

This study adopted the quasi-experimental research design. The choice of this approach emanated from its suitability in assessing the impact of multivariate explanatory variables on a single dependent variable.

Data Collection

The data for this study was time series data obtained from secondary sources such as Central Bank of Nigeria and Federal bureau of statistics bulletin, the World Bank database, the Nigerian national petroleum corporation statistics bulletin, National Bureau of statistics (NBS) and index Mudi for the period of 1990 to 2021.

Data Analysis

This study employed descriptive statistics, unit root test, bound cointegration, and Autoregressive Distributed Lag (ARDL) to estimate the effect of the explanatory variables on the dependent variable.

Model Specification

The model is expressed explicitly as

$$LER_t = f(ORV_t * COC_t, ORV_t * VOA_t, ORV_t * ROQ_t, ORV_t * ROL_t, ORV_t * GOE_t) \quad 1$$

$$LER_t = \alpha_0 + \beta_1 ORV_t * COC_t + \beta_2 ORV_t * VOA_t + \beta_3 ORV_t * ROQ_t + \beta_4 ORV_t * ROL_t + \beta_5 ORV_t * GOE_t + U_t \quad 2$$

Where;

LER = Life Expectancy Rate

ORV = Oil Revenue

COC = Control of Corruption

VOA = Voice and Accountability

ROQ = Regulatory qualities

ROL = Rule of Law

GOE = Government Effectiveness

EXH = Exchange Rate

α_0, β = Unknown Parameters

a priori; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5 > 0$.

The Autoregressive Distributed Lag (ARDL) Model (Bound Test Approach) for the model is specified as follows:

$$\Delta LER_t = \beta_0 + \Delta LER_{t-1} + \sum \beta_{1i} \Delta ORV_t * GOE_{t-1} + \sum \beta_{2i} \Delta ORV_t * ROQ_{t-1} + \sum \beta_{3i} \Delta ORV_t * VOA_{t-1} + \sum \beta_{4i} \Delta ORV_t * COC_{t-1} + \sum \beta_{5i} \Delta ORV_t * ROL_{t-1} + LER_{t-1} \sum \phi_{2i} ORV_t * GOE_{t-1} + \sum \phi_{3i} ORV_t * ROQ_{t-1} + \sum \phi_{4i} ORV_t * VOA_{t-1} + \sum \phi_{5i} ORV_t * COC_{t-1} + \sum \phi_{6i} ORV_t * ROL_{t-1} + U_t \quad 3$$

β_0 is the constant terms, LER, ORV, COC, VOA, ROQ, ROL, GOE, EXR, are as earlier defined, $\beta_1 - \beta_5$ are the coefficients of independent variables while μ is the error terms, Δ = first difference of the variable, U_t = white noise disturbance error term.

RESULTS AND DISCUSSION

The trends life expectancy rate is presented in Figure 1

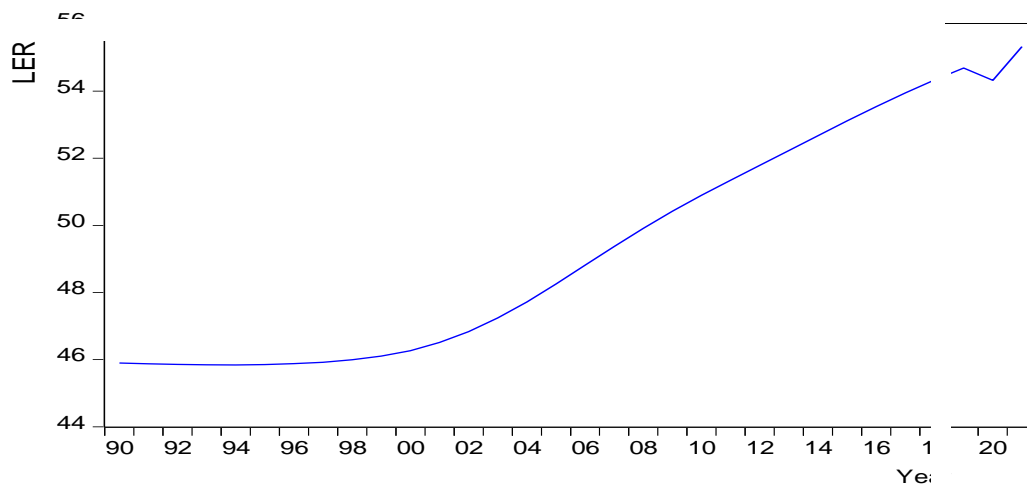


Figure 1: Time Series Plot of Nigeria's LER (1990-2021)

Figure 1 shows that the values of Nigeria's Life Expectancy Rate (LER) have been on the increase within the period of the study. The value increased steadily from 1990 to 1995 and from 2000 to 2002 down to 2010 later increased steadily in 2015 to 2021.

Unit Root Test

Table 1 present the results of the stationarity test for each of the variables used in model one using the Augmented Dickey Fuller (ADF) test. The results were conducted with intercept and no trend.

Table 1: ADF at Constant for Joint Interaction between Oil Revenue and Governance on Life Expectancy

Variable	ADF at Level	ADF at 1 st Difference	Status	Remark
LER	-1.235281	-3.749388	I(1)	Stationary
ORV*COC	-5.003495	-	I(0)	Stationary
ORV*VOA	-1.995041	-7.164196	I(1)	Stationary
ORV*ROQ	-2.990132	-7.128108	I(1)	Stationary

ORV*ROL	-1.610315	-6.010464	I(1)	Stationary
ORV*GOE	-1.600841	-5.949366	I(1)	Stationary
Critical Values				
1% level	-3.670170	-3.679322		
5% level	-2.963972	-2.967767		
10% level	-2.621007	-2.622989		

Source: Author's Computation using E-view 10

The results of the unit root test in Table 1 reveals that ORV*COC was stationary at level while LER, ORV*VOA, ORV*ROL, ORV*ROQ and ORV*GOE were stationary at 1st difference. Hence, the study then concludes that the independent variables used in model one were integrated of both order zero and one, that is I(1) and I(0) and the dependent variable is integrated of order one, that is, I(1). Since the ADF results indicate that the series are of different order of integration, we cannot use the Engle-Granger and Johansen co-integration tests but rather the appropriate test to use in this study is the Bounds co-integration test.

Bound Test Co-integration Result for Joint Interaction between Oil Revenue and Governance on Life Expectancy

The result of the Bound Co-integration test for Joint Interaction between Oil Revenue and Governance on Life Expectancy is presented in Table 2.

Table 2: ARDL Bound Test Co-integration Result for the Model

Test Statistic	Value	K
F-statistic	5.199666	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: Author's Computation using E-view 10

From Table 2, the result of the bound co-integration test shows that the calculated f-statistic value of 5.199666 falls higher than the theoretical critical value for the upper bound I(1) bound at 5 percent. This means that there is co-integration, hence, a long run relationship exists between ORV*COC, ORV*VOA, ORV*ROL, ORV*ROQ, ORV*GOE and RPI in Nigeria within the period under review.

Since there is a long run relationship among the variables in the model, we now proceed to estimate the short run dynamics and long run models based on the ARDL approach.

Long Run Estimation Results for Joint Interaction between Oil Revenue and Governance on Life Expectancy

Table 3 shows the estimated coefficients of the long run relationship between the variables for Joint Interaction between Oil Revenue and Governance on Life Expectancy model.

Table 3: ARDL Long Run Estimation Result for the Joint Interaction Between Oil Revenue and Governance on Life Expectancy model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ORV*GOE	-0.028095	0.013197	-2.128940	0.0442
ORV*ROQ	0.001261	0.002522	0.499960	0.6244
ORV*VOA	0.001021	0.000727	1.403966	0.1807
ORV*COC	0.000684	0.000300	2.284357	0.0315
ORV*ROL	0.010299	0.012851	0.801377	0.4354
C	42.995472	3.449594	12.463923	0.0000

Source: Author's Computation using E-view 10

Table 3 shows that in long run, the interaction between ORV*GOE coefficient has a negative (-0.028095) relationship with LER, meaning that a unit increase in ORV*GOE decreases LER in Nigeria. This implies that an indirect relationship exists between ORV*GOE and LER. The negative sign of the coefficient of ORV*GOE in the long run does not conform to a-priori expectation. The coefficient of ORV*GOE is not statistically significant with LER at 5 percent level of significance.

While the coefficient of ORV*ROQ has a positive (0.001261) relationship with LER, meaning that a unit increase in ORV*ROQ increases LER in Nigeria. This implies that a direct relationship exists between ORV*ROQ and LER in Nigeria. The positive sign of the coefficient of ORV*ROQ in the long run conforms to a-priori expectation. The coefficient of ORV*ROQ is statistically significant with LER at 5 percent level of significance,

The table also shows that in the long run, the coefficient of ORV*VOA has a positive (0.001021) relationship with LER, meaning that a unit increase in ORV*VOA increases LER in Nigeria. This implies that a direct relationship exists between ORV*VOA and LER in Nigeria all things being equal. The positive sign of the coefficient of ORV*VOA in the long run conforms to a-priori expectation. The coefficient of ORV*VOA is statistically significant with LER at 5 percent level of significance.

Again, in the long run, the coefficient of ORV*COC has a positive (0.000684) relationship with LER, meaning that a unit increase in ORV*COC increases LER in Nigeria. This implies that a direct relationship exists between ORV*COC and LER. The positive sign of the coefficient of ORV*COC in the long run conforms to a-priori expectation. The coefficient of ORV*COC is statistically significant with LER at 5 percent level of significance.

The coefficient of ORV*ROL has a positive (0.010299) relationship with LER, meaning that a unit increase in ORV*ROL increases LER in Nigeria. This implies that a direct relationship exists between ORV*ROL and LER in Nigeria. The positive sign of the coefficient of ORV*ROL in the long run conforms to a-priori expectation. The coefficient of ORV*ROL is statistically significant with LER at 5 percent level of significance.

Short Run Estimation Results for Joint Interaction between Oil Revenue and Governance on Life Expectancy

The results of the short run dynamics estimation for the Joint Interaction between Oil Revenue and Governance on Life Expectancy model is presented in equation 4.

Table 4: ARDL Short Run Estimation Result for Joint Interaction Between Oil Revenue and Governance on Life Expectancy Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LER(-1))	-0.688615	0.265428	-2.594355	0.0203
D(ORV*GOE)	0.000507	0.000337	1.501745	0.1539
D(ORV*GOE(-1))	-0.000725	0.000235	-3.089855	0.0075
D(ORV*ROQ)	-0.000158	0.000094	-1.682354	0.1132
D(ORV*VOA)	-0.000092	0.000177	-0.517649	0.6123
D(ORV*COC)	-0.000071	0.000243	-0.292181	0.0053
D(ORV*COC(-1))	0.000026	0.000015	1.806893	0.0909
D(ORV*ROL)	-0.000385	0.000274	-1.407930	0.1795
D(ORV*ROL(-1))	0.000675	0.000221	3.053864	0.0080
ECM (-1)	-0.521132	0.162229	-3.212320	0.0033

Adj-R² = 0.557144; F-stat. = 3.606006 with F-Prob. = 0.009472; and DW = 2.166965

Source: Author's Computation using E-view 10

From Table 4, the result shows that the ECM included in this model has the right sign (i. e. negative) and is statistically significant at 5 percent level. The coefficient indicates an adjustment speed of about 52 percent. This adjustment implies that 52 per cent of errors are corrected within one year since that data were annual series. The ECM also reveals that a long run relationship exists between the regressors (ORV*GOE, ORV*ROQ, ORV*VOA, ORV*COC and ORV*ROL) and the response variable (LER) in this model.

Furthermore, the calculated Adj-R² is 0.557144. This means that about 56 per cent of the total variations in LER are caused by the explanatory variables ORV*GOE, ORV*ROQ, ORV*VOA, ORV*COC and ORV*ROL. Thus, the remaining 44 per cent of variations is caused by exogenous factors to the model but covered by the error term. Also, the F-statistics calculated of 3.606006 with F-Probability value of 0.009472 is less than 0.05 level. This means that the overall model is significant at 5 per cent level. The value of the D.W is 2.166965 suggests that there is minimal serial autocorrelation in the model.

Table 4 shows that in short run, the coefficient of current value of ORV*GOE has a positive (0.000507) relationship with LER, meaning that a unit increase in ORV*GOE increases LER in Nigeria. This implies that a direct relationship exists between ORV*GOE and LER. The positive sign of the coefficient of ORV*GOE in the short run conform to the a-priori expectation. The coefficient of ORV*GOE is statistically significant with LER at 5 percent level of significance while past lag 1 value of ORV*GOE has a negative (-0.000725) relationship with LER, meaning that a unit increase in ORV*GOE decreases LER in Nigeria. This implies that an indirect relationship exists between ORV*GOE and LER. The negative sign of the coefficient of ORV*GOE in the short run does not conform to a-priori expectation. The coefficient of ORV*GOE is not statistically significant with LER at 5 percent level of significance.

The coefficient of ORV*ROQ has a negative (-0.000158) relationship with LER, meaning that a unit increase in ORV*ROQ decreases LER in Nigeria in the short run. This implies that an indirect relationship exists between ORV*ROQ and LER in Nigeria. The negative sign of the coefficient of ORV*ROQ in the short run does not conform to a-priori expectation. The coefficient of ORV*ROQ is not statistically significant with LER at 5 percent level of significance.

The table also shows that in short run, the coefficient of ORV*VOA has a negative (-0.000092) relationship with LER, meaning that a unit increase in ORV*VOA decreases LER in Nigeria. This implies that an indirect relationship exists between ORV*VOA and LER in Nigeria all things being equal. The negative sign of the coefficient of ORV*VOA in the short run does not conform to a-priori expectation. The coefficient of ORV*VOA is not statistically significant with LER at 5 percent level of significance.

Again, in the short run, the coefficient of current value ORV*COC has a negative (-0.000071) relationship with LER, meaning that a unit increase in ORV*COC decreases LER in Nigeria. This implies that an indirect relationship exists between ORV*COC and LER. The negative sign of the coefficient of ORV*COC in the short run does not conform to a-priori expectation. The coefficient of ORV*COC is not statistically significant with LER at 5 percent level of significance while past lag 1 value ORV*COC has a positive (0.000026) relationship with LER, meaning that a unit increase in ORV*COC increases LER in Nigeria. This implies that a direct relationship exists between ORV*COC and LER. The positive sign of the coefficient of past lag 1 value ORV*COC in the short run conforms to a-priori expectation. The coefficient of past lag 1 value ORV*COC is statistically significant with LER at 5 percent level of significance.

The coefficient of current value of ORV*ROL has a negative (-0.000385) relationship with RPI, meaning that a unit increase in ORV*ROL decreases LER in Nigeria. This implies that an indirect relationship exists between ORV*ROL and LER in Nigeria. The negative sign of the coefficient of ROL in the short run does not conform to a-priori expectation. The negative sign of regulatory quality (ROQ) and Oil Revenue ORV*ROL on life expectancy (LER) in the short run is similar to the findings of Azam and Emirullah (2014), Deyshappriy (2015), Awan and Mustafa (2015)

The coefficient of ORV*ROL is not statistically significant with LER at 5 percent level of significance while past lag 1 value of ORV*ROL has a positive (0.000675) relationship with RPI, meaning that a unit increase in past lag 1 value of ORV*ROL increases LER in Nigeria. This implies that a direct relationship exists between past lag 1 value of ORV*ROL and LER in Nigeria. The positive sign of the coefficient of past lag 1 value of ORV*ROL in the short run conforms to a-priori expectation. The coefficient of past lag 1 value of ORV*ROL is statistically significant with LER at 5 percent level of significance. The positive and significant effect of (VOA) ORV*ROL on life expectancy (LER) in Nigeria is different from the findings of Azam and Emirullah (2014), Deyshappriy (2015), Awan and Mustafa (2015).

Inferences drawn from the short and long run results using the autoregressive distributed lag (ARDL) estimation shows that the interaction between oil revenue and government effectiveness (ORV*GOE) has a stable effect on Life Expectancy (LER) in Nigeria; the interaction between oil revenue and Regulatory Quality(ORV*ROQ) has an unstable effect on Life Expectancy (LER) in Nigeria over; the interaction between oil revenue and Voice & Accountability (ORV*VOA) has an unstable effect on Life Expectancy (LER) in Nigeria, the insignificant effect of the interaction between oil revenue and Voice & Accountability (ORV*VOA) and Life Expectancy (LER) in Nigeria in the short run, may be as a result of bad governance that is centralised around the idea of not only corruption within a system but a lack of transparency and accountability, arbitrary policy making and the cheating of those who are governed; the interaction between oil revenue and Control of Corruption(ORV*COC) has an unstable effect on Life Expectancy (LER) in Nigeria The negative effect of the interaction between oil revenue and Control of Corruption(ORV*COC) and Life Expectancy (LER) in Nigeria may be as a result of bad governance that is centralised around the idea of not only corruption within a system but a lack of transparency and accountability, arbitrary policy making and the cheating of those who are governed; the interaction between oil revenue and Rule of Law(ORV*ROL) has a stable effect on Life Expectancy (LER) in Nigeria over the study period.

Post Estimation Test for Joint Interaction between Oil Revenue and Governance on Life Expectancy

The researcher also conducted a diagnostic test to ascertain whether or not the series are free from autocorrelation (Breusch-Godfrey Serial Correlation LM Test) and heteroscedasticity (Breusch-Pagan-Godfrey Test).

The result of the diagnostic test is presented in Table 5.

Table 5: Serial Correlation LM Test and Homoscedasticity Test Results for Joint Interaction between Oil Revenue and Governance on Life Expectancy (Model Five)

	F-Statistic	Prob. Value
Breusch-Godfrey Serial Correlation LM Test	1.678853	0.2246
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.022105	0.4813

Source: Author's Computation using E-view 10

From Table 5, the results of the diagnostic test show that the serial or autocorrelation test using Breusch-Godfrey Serial Correlation LM Test shows that the f-statistic is 1.678853, and a Chi-Square probability value is 0.3438. This indicates that the probability value of about 22 percent (0.2246) is greater than 5 percent (0.05) critical value; hence we confirm no serial correlation in the model.

The result of the heteroscedasticity test using Breusch-Pagan-Godfrey test shows that the f-statistic is 1.022105 with a Chi-Square probability value of 0.4813. The result suggests that there is no evidence of heteroskedasticity in the model since the probability Chi-square value is more than 5 percent ($p > 0.05$). So, residuals do have constant variance which is desirable in regression meaning that residuals are Homoscedastic.

Conclusion

The study concluded that the interaction between oil revenue and Regulatory Quality increases Life Expectancy in Nigeria in the long run but causes a reduction in the short run; The interaction between oil revenue and Voice & Accountability increases Life Expectancy in Nigeria in the long run but causes a reduction in the short run; The interaction between oil revenue and Control of Corruption increases Life Expectancy in Nigeria in the long run but causes a reduction in the short run; The interaction between oil revenue and Rule of Law increases Life Expectancy in Nigeria both in the short run and long run. The study therefore concludes that oil revenue and governance has not promoted economic development in Nigeria within the period under review.

Recommendation

The study recommended that there should be accountability and transparency on the part of government and officials in the management of oil revenues for the benefit of the citizens and the economy as a whole.

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