


Henry Omotayo Olayemi [1)]
Timothy Ayomitunde Aderemi [2)]
Olayinka Afolakemi Adeagbo [3)]
Olufunmilayo Aromoke Olajide [4)]

[2)] *Department of Economics, Olabisi Onabanjo University, (Ago-Iwoye, Nigeria)*
e-mail: aderemi.timothy@gmail.com
ORCID: https://orcid.org/0000-0003-1877-8657

[1)] *Department of Economics, Olabisi Onabanjo University, (Ago-Iwoye, Nigeria)*
e-mail: Henri_ola1006@yahoo.com
ORCID: https://orcid.org/0000-0001-6413-3273

[3)] *PhD, Institute for Entrepreneurship and Development Studies, Obafemi Awolowo University, (Ile-Ife., Nigeria)*
e-mail: *ladoyeolayinka@yahoo.com*
ORCID: https://orcid.org/0000-0002-9265-2182

[4)] *Department of General Studies, Federal Polytechnic, (Ede, Nigeria)*
e-mail: olajideolufunmilayo75@gmail.com
ORCID: https://orcid.org/0000-0003-0216-7376

HEALTH, AGRICULTURAL EXPENDITURE AND ECONOMIC GROWTH IN NIGERIA: ARDL AND ECM APPROACH

ZDROWIE, WYDATKI ROLNE I WZROST GOSPODARCZY W NIGERII: W PODEJŚCIU ARDL I ECM

Abstract

This study examines the short run and long relationship between agricultural expenditure, health expenditure and economic growth in Nigeria. This study was motivated due to the lack of sufficient studies regarding this subject matter in recent times. Consequently, Data were collected from CBN Statistical Bulletin from 1981 to 2016. Relevant pre-estimation tests such as unit root and Bound tests were carried out because all the study variables were integrated of order zero and one. Estimated results from ARDL and ECM models established the existence of a short-run and long-run

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relationship between the variables of interest in Nigeria. While the error correction model reveals that about 19 percent of total disequilibrium due to external shock in the previous year is corrected in the current year. Therefore, it will take about five (5) years for the system to adjust back to its long-run equilibrium path. Results further showed that there is a significant positive relationship between agricultural expenditure and economic growth in Nigeria. However, there is a significant negative relationship between health expenditure and economic growth in the long run. Finally, policymakers in Nigeria should allocate substantial budget towards health and agricultural sectors in Nigeria.
Keywords: *Health; Agriculture; Expenditure; Economic Growth; ARDL and ECM*

Streszczenie

Niniejszy artykuł analizuje krótko- i długoterminowy związek między wydatkami na rolnictwo, wydatkami na zdrowie a wzrostem gospodarczym w Nigerii. Badanie będące przedmiotem artykułu było motywowane brakiem wystarczających badań dotyczących tego tematu w ostatnim czasie. W związku z tym dane zebrano z Biuletynu Statystycznego CBN od 1981 do 2016 r. Przeprowadzono odpowiednie testy wstępnego oszacowania, takie jak testy pierwiastkowe i powiązane, ponieważ wszystkie zmienne badawcze zostały zintegrowane od zera i jednego rzędu. Szacowane wyniki modeli ARDL i ECM wykazały istnienie krótko- i długoterminowej zależności między zmiennymi. Natomiast model korekcji błędów wykazuje, że około 19 procent całkowitej nierównowagi spowodowanej szokiem zewnętrznym w poprzednim roku jest korygowane w bieżącym roku. Dlatego też przywrócenie systemu do długoterminowej ścieżki równowagi powinno zająć około pięciu lat. Wyniki pokazały również, że istnieje znaczący pozytywny związek między wydatkami rolnymi a wzrostem gospodarczym w Nigerii. Jednak długoterminowo istnieje również znaczący negatywny związek między wydatkami na zdrowie a wzrostem gospodarczym. Wyniki badania, pozwalają na wysunięcie wniosku, że Nigeryjscy decydenci powinni przeznaczyć znaczny budżet na ochronę zdrowia i sektory rolnictwa.
Słowa kluczowe: zdrowie; rolnictwo; wydatki; rozwój ekonomiczny; ARDL i ECM

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Statement of the problem in general outlook and its connection with important scientific and practical tasks.

In the last few decades, the size of government expenditure and its aftermath effects on economic growth has been an issue of concern in Nigeria (Okoro 2013). Agricultural and health sectors are indispensable in sustaining economic growth in any country especially developing countries of Sub Saharan Africa in which agriculture constitutes the larger bulk of their national output. In Nigeria, one of the prominent resources the country has is agriculture. Before the oil boom, this sector constituted the live wire of the Nigerian economy. As a matter of fact, not

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only agriculture contributed to about 71% of the nation`s GDP but also over 70% of the country`s working population depended on this sector for their survival, and the sector as well generated about 90% of the country`s foreign earnings in those days. (CBN, 1970). However, the complete neglect of the agricultural sector in Nigeria has been arrogated to the overdependence of the economy on foreign exchange from crude oil exports. (Odularu 2008). This has motivated the continuous declining in agricultural investment by the policymakers in the country.

Meanwhile, modern economists have identified investment in health care as a significant platform for improving human capital (Becker, 1993). It is instructive to note that the health sector plays a paramount role in advancing economic development in any nation because of its multiplier effects on human capital development which is the critical variable that drives the economy. As it is commonly stated that health is wealth. Therefore, healthy human resources are the ultimate basis for the nation`s wealth because these resources are the active agents in the economy who accumulate capital, exploit natural resources, build a social economic and political climate that propel national development.

In recent times, several factors such as diseases and climate change have caused a reduction in agricultural production in the developing economies in which Nigeria is inclusive. The aftermath effect of this has deepened the poverty level in Nigeria because nothing less than 70% of Nigeria`s teeming population depends on agriculture for their means of livelihood. Also, the cases of food insecurity have led to malnutrition which directly and indirectly affects human health in the country. In response to the important role in which food security and sound health play in propelling economic growth, the Nigerian government has over time made some effort to revamp these sectors through the allocation of a certain percentage of its annual expenditure to these sectors. However, despite the fact that the Nigerian government has been a committed defaulter of the Abuja declaration of 2001, yet some amount of money has been appropriated to the health and agricultural sectors over the years, it is disturbing that these expenditures have not metamorphosed into economic growth in Nigeria. An attempt to empirically verify the above assertion has sparked off a debate among the scholars in the recent time. See Fatuase et al (2016), Okoro, (2013), Imoughele and Ismaila (2013), Adelowokan (2012). Nasiru and Usman (2012) Abu and Abdullahi (2010), Ebiringa and Chalse-Anyaogu (2012), Usman et al (2011) and Adesoye et al (2010). Due to the inconclusiveness of the literature regarding this topic, a re-examination of this subject matter cannot be undermined in recent times. In view of the above, this study examines the short-run and long-run relationship between health expenditure, agricultural expenditure and economic growth in Nigeria.

Apart from the introductory aspect, the rest of this work is organized as follows; section two critically reviews the relevant literature and section three presents methodology, discussion of results, conclusion and policy recommendation.

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Analysis of latest research where the solution of the problem was initiated.

Studies on nexus between public expenditures and economic growth have been approached with different methodologies by different scholars at different times. It is important to stress that this paper focuses on the agricultural and health sectors of government expenditure vis-à-vis economic growth in Nigeria. Therefore, an effort has been made to painstakingly review the past studies in order to keep abreast with the positions of other scholars on the subject matter of this study.

Imoughele and Ismaila (2013) examined the factors that influenced public health expenditure in Nigeria between 1986 and 2010 with the application of error correction techniques. It was discovered from the study that the principal determinants of health expenditure in Nigeria is health expenditure share in the gross domestic product, but gross domestic product per capita, unemployment rate, Population per Physician, consumer price index and political instability were identified as insignificant determinants of health expenditure in the country. In a related study, Oyeronke and Bolarinwa (2017) submitted that the promotion of agricultural production and rural development lies in agriculture financing and affordable credit access to the farmers in Nigeria. Adelowokan (2012) investigated the relationship between education, health expenditures and economic growth in Nigeria from 1970 to 2010 with the aid of a static regression model (the Engle-Granger two-step co-integration procedure). The author argued that public investment and public consumption (in education and health) have a direct relationship with economic growth, meanwhile, the reverse is the case of private investment and public capital investment on economic growth in Nigeria. Similarly, Nasiru and Usman (2012) adopted an integrated sequential dynamic computable general equilibrium (CGE) model to analyze the relationship between health expenditure and economic growth in Nigeria between 2004 and 2015. The findings from the paper concluded that government expenditure on the health sector and economic growth have a significant relationship in the country. In the same vein, Dauda (2004) employed the neo-classical growth and OLS model to explore the link between healthcare spending and economic growth in Nigeria. The author submitted that a positive relationship exists between health care expenditure and economic growth in the country. While examining the impact of the sectoral contribution to economic growth in Nigeria between 1977 and 2005, Abdulraheem (2010) used a vector autoregression (VAR) model to discover that the health sector contributed to the increment of economic growth significantly, but the reverse was the case of the agricultural sector. In another perspective, Adeniyi and Abiodun (2011) estimated the nexus between health expenditure and economic growth from1985 to 2009 with the application of ordinary least square (OLS). It was discovered from the study that if expenditure on health is properly and appropriately channeled to both the recurrent and capital projects in health, there a positive relationship between economic growth and health will be more widened. This submission was supported by Bakare and Sanmi (2011) who argued in the same line with the same methodology. Meanwhile, Das and Martin (2010)

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employed a co-integration technique to support their argument that the contribution of per capita income to health care expenditure is significant in Nigeria. In a related study, Philips (2005) submitted that over the past 50 years, there was a drastic improvement in life expectancy and a decline in infant mortality in all parts of the world, except the African continent in the 1990s. Therefore, good health has the capacity to reinforce economic growth by increasing the productivity of people especially in countries that have little or no corruption. Loto (2011) analyzed sectoral government expenditure and economic growth in Nigeria between 1980 and 2008 with the aid of the Johansen cointegration technique and error correction model. The finding from the paper indicated that in the short run expenditures on agriculture were negatively related to economic growth. Meanwhile, expenditure on health was insignificant but positively related to economic growth. In a related study, Ebiringa and Chalse-Anyaogu (2012) employed Error Correction Model to corroborate that expenditure on the health sector has a positive effect on economic growth in Nigeria's economic growth. However, agricultural expenditure has a negative on the economic growth in the country

Aims of paper. Methods

Secondary data from 1990 to 2016 were utilized for the analysis of this work. The effort was made to extract data on expenditures on agriculture and health and real GDP from CBN statistical bulletin. Consequently, the paper employed E-Views software to run the data.

Exposition of main material of research with complete substantiation of obtained scientific results. Discussion.

Model Specification

The model for this study can be specified in the general form as follows:

RGDP = F (HEXP, AEXP)……..…. (I)

Model (I) could be written in an explicit form as follows.

Ln RGDPt= $\beta_1 + \beta_2$LnHEXPt + β_3 LnAEXPt + μ_i ……... (II)

ARDL Model Specification

Various diagnostic tests such as unit root test and Bound Test performed on the variables of interest motivated the choice of ARDL and ECM for this paper. Due to different orders of integration of the variables i.e. I(1) and I(0), the paper utilizes the autoregressive lag model to address its objective (Pesaran, Shin, and Smith, 2001, Pesaran and Pesaran, 1997).

In a general form, ARDL model can be specified as follows:

ARDL (1, 1) model: $Y_t = \lceil + \langle_1 Y_{t-1} + ®_o X_t + ®_1 X_{t-1} + U_t$ ……... (III)

Meanwhile,

Y_t and X_t are stationary variables, and U_t is white noise.

Therefore, in an explicit way the model to capture the analysis of this work could be stated thus:

$$\Delta LnRGDP_t \; LnRGDP_t = \beta_0 + \sum_{i=1}^{p} \beta_1$$

$$\beta_0 + \sum_{i=1}^{p} \beta_1 \; \Delta Ln\,RGDP_{t-1} + \sum_{i=0}^{p} \beta_2$$

$$Ln\,RGDP_{t-1} + \sum_{i=0}^{p} \beta_2 \; \Delta$$

$$LnHEXP_{t-1} + \sum_{i=0}^{p} \beta_3$$

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$LnHEXP_{t-1} + \sum_{i=0}^{p} \beta_3 \Delta$

$AEXP_{t-1} + ECM_{t-1} + \theta_1 LnRGDP_{t-1} + \theta_2 HEXP_{t-1} + \theta_3 LnAEXP_{t-1+} \mu i$

$AEXP_{t-1} + ECM_{t-1} + \theta_1 LnRGDP_{t-1} + \theta_2 HEXP_{t-1} + \theta_3 LnAEXP_{t-1+} \mu i$

---------- (IV)

Where RGDP proxies economic growth.

HEXP denotes both capital and recurrent expenditures on health in Nigeria.

AEXP is used to proxy both capital and recurrent expenditures on agriculture in Nigeria.

μ_i is error term. t =1990-2016.

$ECM_{t-1} ECM_{t-1}$ measures the speed of adjustment between the short run and long run relationship in the model.

The term $\beta_1 \beta_1 - \beta_3$ β_3 is short run parameters/ coefficients, meanwhile, $\theta_1 - \theta_3$ $\theta_1 - \theta_3$ is long run parameters. is long run parameters.

It is expected that $\beta_1, \beta_2,$

It is expected that $\beta_1, \beta_2, \beta_3 \beta_3,$ θ_1, θ_2 and θ_3

θ_1, θ_2 and θ_3 $> 0 > 0$

Result and Discussion

Table 1. Descriptive Statistics of Annual Data Series (1981-2016)

Descriptive Statistics	RGDP	A/EXPENDITURE	H/EXPENDITURE
Mean	39.68286	21.36206	22.49150
Median	30.76924	22.17733	22.86259
Maximum	346.1660	24.90379	26.27514
Minimum	28.16628	16.11810	17.50439
Std. Deviation	52.54444	2.957498	2.901784
Skewness	0.745490	0.548238	-0.271612
Kurtosis	3.001700	1.893092	1.618439
Jargue-Bera	1641.146	3.641254	3.305704
Probability	0.000000	0.161924	0.191503
Sum	1428.583	769.0343	809.6941
Sum. Sq. Deviation	96632.15	306.1377	294.7123
Observation	36	36	36

Source: Author`s Computation (2019)

In carrying out this study, an attempt has been made to examine various descriptive statistics of the data. The descriptive statistics of the data series provide information about the sample series such as the mean, median, minimum and maximum values; and the distribution of the sample measured by the skewness, kurtosis and Jaque-Bera statistics. However, it is observed that the values of the mean and

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median are very close. This is reinforced by the proposition of Karmel and Polasek (1980) that when a distribution is perfectly symmetrical, the mean, mode and median must converge; and in cases of near symmetry, the three measures are necessarily very close.

Table 2. Unit Root Test

Variables	ADF Test			PP Test		
	Level	1st Difference	Remarks	Level	1st Difference	Remarks
H/Expenditure	-2.960411**	-2.951125**	I (1)	-2.948404**	-2.951125**	I (1)
A/Expenditure	-2.954021**	-2.951125**	I (1)	-2.948404**	-2.951125**	I (1)
RGDP	-2.948404**	-	I (0)	-2.948404**	-	I (0)

Source: Authors` Computation (2019) ** %5 level

The test for stationarity or unit root is done using the augmented dickey fuller (ADF) and Phillips-Perron (PP) tests. To verify whether there is a presence of unit root or the series are stationary we explore the time series characteristics of the variables (RGDP, Agriculture expenditure, and Health expenditure). This test is very important due to the problem of spurious regression which could emanate from the analysis of time series data if such data is not stationary. However, the reported results in the table indicate that Agriculture expenditure and Health expenditure are stationary after first differencing. This implies that these variables possess unit-roots. Meanwhile, RGDP is stationary at level. This shows the absence of a unit root in the variable.

Table 3. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-173.4151	NA	3599.745	11.02594	11.16336	11.07149
1	-173.3831	0.055951*	3827.175*	11.08644*	11.26966*	11.14718*
2	-173.2204	0.274518	4037.906	11.13878	11.36780	11.21469
3	-173.1870	0.054270	4297.560	11.19919	11.47402	11.29029
4	-173.1703	0.026207	4582.274	11.26064	11.58127	11.36692

* indicates lag order selected by the criterion

Source: Authors` Computation (2019)

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Unrestricted Vector Autoregression (VAR) by lag selection criteria was modeled to the time series data in order to determine the optimal number of lags for the model. As shown in Table 3, the lowest value for each estimator falls under lags one (1). Based on the result, SBIC criterion was chosen for the determination of the optimum lag length of ARDL model in this study. ARDL (1,1,0) model was selected as a common consequence of the SBIC criterion

Table 4. ARDL Bounds Test

Sample: 1982 2016
Included observations: 35
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	11.23807	2

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Source: Authors` Computation (2019)

The dataset for this study is a combination of stationarity and non-stationarity data. Therefore, it is expedient to examine the existence or otherwise of the long-run equilibrium relationship among these variables using Bound Test. {Pesaran and Pesaran (1997), Pesaran, Shin and Smith (2001)}. The result presented in the above table shows that the Null hypothesis of no long-run relationship could not be accepted because the upper and lower Critical Value Bounds at all level of significance is less than the value of F-Statistic. Hence, there is a presence of a cointegrating relationship among the variables in the model. This outcome necessitates the estimation of both the short-run relationship and long-run relationship among these variables.

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Table 5. Parsimonious Short Run and Long Run Regression Estimates Dependent Variable: LRGDP

Short Run	Coefficient	t-statistics	P-value	Variable	Coefficient	t-statistics	P-value
D(LRGDP(-1)	-0.044413	0.24	0.8067	LRGDP(-1)	0.009469	0.53	0.5935
D(LAEXP(-1)	-0.044413	0.24	0.5635	LAEXP(-1)	2.346772	2.00	0.0539
D(LHEXP(-1)	7.138535	0.58	0.5635	LHEXP(-1)	-2.600102	2.16	0.0384
C	53.57553	0.69	0.4899	C	47.76113	6.45	0.0000
ECM	-0.197780	15.7	0.0100				

Source: Authors` computation (2019)

The ARDL result of the short-run and long-run relationship between the variables is presented above. From the estimated result it could be deduced that when real GDP is the dependent variable, there is a negative relationship between agriculture expenditure and economic growth in Nigeria, though not significant at 5% level of significance. A unit change in agriculture expenditure causes economic growth to reduce by 0.04%. The probable reason for the negative relationship between GDP and expenditure on agriculture might be a result of the oil boom of the 1970s which has shifted the attention of the Nigerians and the Nigerian government away from the agricultural sector. From that period till now little or no serious effort is geared towards revamping this sector by the policymakers in the country. However, health expenditure and economic growth have a non-significant relationship with economic growth in the short run. A unit change in health expenditure leads to a 7.1% increment in economic growth in the country. In addition, The Error Correction Model (ECM) shows the speed of adjustments back to equilibrium in the estimated model. A significant relationship with a negative sign for the ECM implies the speed of adjustment from disequilibrium in the last period to the current period. The speed of adjustment for correcting disequilibrium from the previous year to equilibrium in the current year is 19% as shown by the coefficient of ECM. In other words, this implies that approximately 19% of disequilibria from the previous year's shock converge to the long-run equilibrium in the current year.

Conversely, from the estimated results of the long-run analysis, it could be deduced that there is a significant positive relationship between agriculture expenditure and economic growth in Nigeria. A unit change in agriculture expenditure causes an increment in economic growth by 2.3%. This finding is in agreement with the propositions of Fatuase et al (2016) and Olajide et al. (2013) However, there is a significant negative relationship between health expenditure and economic growth in the long run. A unit change in health expenditure leads to 2.6% reduction in economic growth. The reason for this result might be due to the lack of political will by the government to invest in the health sector, malfunctioning of healthcare facilities and improper investment in the health sector, and which has invariably led to a deplorable health condition in Nigeria.

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Besides, the Nigerian government has been a perpetual defaulter of the recommendation of the Abuja declaration of 2001. This finding is validated by a similar conclusion of Fatuase et al (2016) and Menizibeya (2011). Meanwhile, this result is different from the submission of Nasiru and Usman (2012), Dauda (2011) Bakare and Sanmi (2011).

Diagnostic and Stability Tests

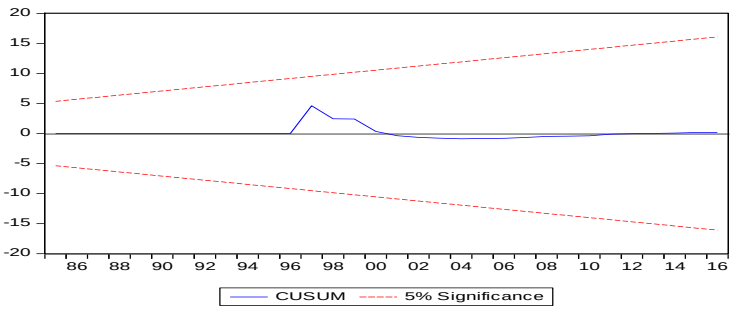
Table 6. Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.229626	Prob. F(2,29)	0.7963
Obs*R-squared	0.545629	Prob. Chi-Square(2)	0.7612

Source: Authors` computation (2019)

Figure 1. Stability Tests

CUSUM Stability Test



Source: Authors` computation (2019)

In order to establish the appropriateness of the short-run (parsimonious) model, in this study further attempt was made to carry out the diagnostic test (the Serial Correlation LM test) and stability tests (Cumulative Sum (CUSUM) on the residual of the short-run model. From the results of table 4.6, the F-statistics of the Serial Correlation LM test of the model was insignificant, this confirmed the absence of serial correlation in the residuals of the ECM regression estimate. Similarly, the results of the cumulative sum (CUSUM) test in the above gap showed that the residuals of the error-correction model are within the critical bounds of a five percent significant level. This connotes that the estimated parameters are stable over the period 1981-2016. Therefore, the model is considered to be reasonably specified as a result of the tests carried out above.

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Conclusions.

This study examined both short run and long relationship between agricultural expenditure, health expenditure and economic growth in Nigeria over the period of 1981 to 2016. The result of the error correction term indicated that about 19% of the total disequilibrium in the previous year would be corrected in the current year. There was an existence of an insignificant negative relationship between agriculture expenditure and economic growth in Nigeria in the short run. However, the relationship became positive and significant in the long run. Furthermore, there was an existence of a positive but insignificant relationship between health expenditure and economic growth in Nigeria, but the relationship became negative and significant in the long run. Based on these findings, this paper recommends the following for both the policymakers and the future researchers that the Nigerian government should allocate substantial budget towards health and agricultural sectors in Nigeria on a sustainable basis. Also, the funds allocated to these sectors of the economy should be fully utilized for the intended purposes without embezzling by the public office holders in the country.

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