

Mediating Effects of Recurrent Expenditure on Economic Growth

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Abstract: It has been theorised that only capital expenditure targeted at infrastructural development bring about economic growth and this has brought about the doubt as to whether recurrent expenditure translates to economic growth in any form, and if yes, what aspects of the recurrent expenditure mediate upon economic growth using crude oil price as Nigeria's major source of income. This study seeks to determine the variables of recurrent expenditure that act as mediators to economic growth in Nigeria; to compute the indirect effect of recurrent expenditure on economic growth in Nigeria; to test for the significance of indirect effect using the Sobels test. From the results, recurrent expenditure on Administration (M_1), Social and Community Services (M_2) and Transfers (M_4) were found to be the substantive mediators between crude oil prices which is a major source of government earnings and economic growth in Nigeria. It is therefore recommended that government should improve on recurrent expenditure especially those of administration, social and community services and transfers which have been found to translate to economic growth.

Keywords: Recurrent expenditure, crude oil prices, economic growth mediation.

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1. Introduction

Mediation model is one that seeks to identify and explain the mechanism that underlies an observed relationship between two variables through the inclusion of a third variable, known as a mediator. A mediation model hypothesizes that the independent variable influences the mediator variable, which in turn influences the dependent variable. Mediation analyses are employed to understand a known relationship by exploring the underlying mechanism or process by which one variable X influences another variable Y (Fairchild and MacKinnon, 2009).

They defined statistical mediation or simply mediation as a causal chain in which it is assumed that the effect of one or more independent variables is transmitted to a dependent variable through third variables. In the simplest case, the term mediation is used to indicate that the effect of an independent variable X is transmitted to a dependent variable Y through a third mediator variable Z. Therefore, statistical mediation refers to a causal sequence such as $X \rightarrow Z \rightarrow Y$. A mediator variable is very useful in understanding the mechanism through which a cause (independent variable) produces an effect (dependent variable).

Cohen *et al* (2003) noted that mediation analyses are employed to understand a known relationship by exploring the underlying mechanism or process by which one variable influences another variable through a mediator variable. Accordingly, mediation analysis facilitates a better understanding of the relationship between the independent and dependent variables when the variables appear not to have a definite connection.

For decades the relationship between public sector expenditure and economic growth has continued to occupy series of debate among researchers and policy makers. The common consensus among the researchers is that public sector expenditure has been identified as an important instrument which the government uses to influence the performance of the economy (Iheanacho, 2016)

Salawu (2005) observed that public expenditure is the expenses incurred by the government for the maintenance of itself, the economy and the society at large. Public expenditure is an important mechanism which the government uses to pilot significant effects on the general growth of the economy.

It has been theorised that only capital expenditure targeted at infrastructural development bring about economic growth. There has been doubt on whether recurrent expenditure translates to economic growth, and if yes, what aspects of the recurrent expenditure mediate upon economic growth using crude oil price as Nigeria's major source of income.

The opinion that government spending on collective needs and wants of the country in different areas including pension, infrastructure, capital investment, roads etc. are categorically classified under public sector

expenditure. Jhingan (2004) conclusively added that public expenditure is "the beginning and end of the collection of revenues by the government". In line with the aforementioned, there is a direct relationship between the amount of public sector expenditure and economic growth. Therefore, the policy makers place more emphasis on the roles of public sector expenditure as an instrument which the government can apply to restore some economic problems such as reduction in inequality, inflation, fall in exchange rate, unemployment, dwindling oil price and the desire to restore the economy on the part of full employment, price stability, balance of payment equilibrium and above all, increase in economic growth.

Considering the fact that recurrent expenditure on salaries, transferred etc paid to workers can be used to create new businesses and jobs which in turn may translate to economic growth. Consequently, there is need to determine if recurrent expenditure brings about economic growth and the aspects that mediate between crude oil prices as a major source of Nigeria earning and economic growth in Nigeria.

Objectives of the Study

The objectives of this study include:

1. To determine the variables of recurrent expenditure that act as mediators to economic growth in Nigeria.
2. To compute the indirect effect of recurrent expenditure on economic growth in Nigeria
3. To test for the significant of indirect effect using the Sobel test

II. Literature Review

Several studies have been conducted in the areas of mediation and economic growth. Some of such studies are reviewed. Dunn and Bentall (2007) presented methods that use baseline covariates interacted with random assignment as instrumental variables, and do not require sequential ignorability of which Small (2013) made two contributions to this approach. First, in previous work on the instrumental variable approach, it has been assumed that the direct effect of treatment and the effect of the mediator are constant across subjects; the author allowed for variation in effects across subjects and shows what assumptions are needed to obtain consistent estimates for this setting. Second, the author developed a method of sensitivity analysis for violations of the key assumption that the direct effect of the treatment and the effect of the mediator do not depend on the baseline covariates.

Frazier et al., (2004) noted that earlier approaches to mediation analysis largely relied on a form of structural equation modeling. Unfortunately, these earlier methods were not derived from a formal framework for causal inference and did not permit sensitivity analyses with respect to key identification assumptions.

MacKinnon et al. (2002) reviewed and compared 14 methods to test the mediation effects through a Monte Carlo study and found that testing $H_0 : ab = 0$ was the best way to evaluate the mediation effects.

MacKinnon, Lockwood, and Williams (2004) also compared the bootstrap resampling method with the single sample method and found that the bootstrap method obtained more accurate confidence limits. They further suggested that confidence limits of the mediation effects provided much more information than the estimates themselves.

Overall, there are two main ways to test the mediation effects. The first one, and also the most influential and widely used one, is the approach outlined by Baron and Kenny (1986). This single sample method (MacKinnon et al., 2002) is based on a large-sample normal approximation test provided by Sobel (1982, 1986) which has low statistical power in many situations (e.g., MacKinnon et al., 2002). The second one may be called the resampling method which is based on the bootstrap resampling procedure (Bollen and Stine, 1990; Efron, 1979, 1987). This method is shown to perform better than the first one in small sample size studies (MacKinnon, Lockwood, and Williams, 2004).

Oyeka & Nwankwo (2014) proposed and developed the use of the non-cummulative dummy variables of 1's and 0's to represent levels of parent independent variables in dummy variable multiple regression models. They found that the indirect effect of a given parent independent variable on a dependent variable is the difference between its total or absolute effect and its direct effect through its representative dummy variables.

Sherman & Gorkin (1980) randomly assigned subjects to solve either (a) a sex- role related brainteaser, or (b) a brainteaser not related to sex roles. The sexist brainteaser condition was designed to evoke cognitive dissonance in the self-identified feminist subjects, while the non sex-role related condition was not. Participants were then asked to judge the fairness of a legal decision made in an affirmative action trial. The results were consistent with the prediction that participants with strong feminist beliefs were more likely to make extreme feminist judgments in the trial if they failed the sexist brainteaser task, in an attempt to reduce cognitive dissonance.

Iheanacho (2016) examines the long and short run relationship between public expenditure and economic growth in Nigeria over the period of 1986-2014, using Johansen cointegration and error correction approach. Two components of public sector expenditure and gross capital formation ratio are derived from Cobb Douglas production function. The result shows recurrent expenditure is the major driver of economic growth in

Nigeria. Controlling for the influence of non-oil revenue, this study shows a negative and significant long run relationship between economic growth (rgdpc) and recurrent expenditure coexists with a positive short run relationship, highlighting the dual effects of recurrent expenditure on economic growth in Nigeria. For the capital expenditure, this study documents negative and significant long run effect of capital expenditure on economic growth in Nigeria. The variance decomposition confirms the collective contribution of public expenditure on economic growth. This implies that effective utilization of public funds should be directed on rightful projects rather than spending it on enormous projects that will not translate into meaningful growth of the economy.

Nwankwo and Igweze (2016b) determined economic variables mediating between unemployment and government expenditure in Nigeria. The indirect effect was tested using the method of difference of coefficient. the findings showed that only labour force population and inflation showed evidence of partial mediation, although their mediational (indirect) effect are not statistically significant as the P-values of the test of indirect effect are all greater than the level of significance, 0.05. They recommended further studies to ascertain factors mediating upon government expenditure and unemployment in Nigeria other than economic variables already studied.

Nwankwo and Igweze (2016c) compared various methods of mediations analysis. Firstly, their study compared the two methods of calculating indirect effect which are product of coefficient and difference of coefficients respectively. Secondly, the study compared the three methods of testing the significance of indirect effect vis a vis Sobel’s test, Aroian test and Goodman’s test. The differences in these three tests are due to variations in the methods of standard error computation. The results show that both methods of product of coefficients and difference of coefficients give approximately the same result. However the product of coefficient gave a slightly higher result. The comparison of test of indirect effect for mediator shows that the tests gave the same result for Sobel’s, Aroian and Goodman test. The study recommended further studies to seek methods of ascertaining the direction of relationship of indirect effect, other than those of the regression models, further studies may be carried out to determine the effect of multicollinearity on mediation results.

III. Research Methods

There are three major approaches to statistical mediation (a) causal steps (b) difference in coefficients, and (c) product of coefficients (MacKinnon, 2000) listed. The method of difference of coefficient and product of coefficient give the same result. This study employs the difference of coefficient in computing the indirect effect and tests for the significant of the indirect effect using the Sobel’s test. The difference of coefficient use information from the following regression equations:

$$E(Y) = c_0 + cX \tag{1}$$

For any pair of mediators, M_1 and M_2 , the partial effect model is given as:

$$E(Y_{12}) = c_{012} + c_{12}X + b_1M_1 + b_2M_2; \tag{2}$$

Where c_0 and c_{012} are intercepts of equations (1), (2) and (3) respectively.

Y is the dependent variable; X is the independent variable; M_1 and M_2 are the two different mediator variables in the partial effect model.

Mediation is supported if the partial direct effect for path c is non- significantly different from zero and path b is significantly greater than zero. If c is non-significantly different from zero, results are consistent with a *full* mediation. If path b is significant after controlling for the direct effect of X (path c), but path c is still significant, the model is consistent with *partial* mediation (Baron & Kenny, 1986) approach.

The condition for existence of mediation in the two mediator cases is that the coefficient of X in the partial effect model, c_{12} must be less than the coefficient of X in path c.

The various coefficients in the partial effect model for the two mediator case are present in table below:

IV. Result And Discussion of Findings

Analysis of Path C

Table 1: Model Summary for path C				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.953 ^a	.907	.903	9476.045
a. Predictors: (Constant), X				

Table 1 presents the path c model summary statistics. The value of 0.907 shows that 90.7% change in economic growth is attributable to crude oil price change in Nigeria.

Path C is the model of the independent variable predicting the dependent variable. The path c model is given from table 2 as:

$$Y = 826.3X - 11229.77$$

The model is significant at 5% level of significant. This prove that a strong relationship exist between economic growth and crude oil price.

Table 2: Coefficients for path C

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-11229.769	3233.257		-3.473	.002
	X	826.300	55.055	.953	15.009	.000

a. Dependent Variable: Y

Partial Effect Model

The partial effect model is presented in table 3. The partial effect model is the model of the independent variable and mediator variables jointly predicting the dependent variable. The model shows how much of the effect in the independent variable that has been transmitted to the mediator variables. The partial effect model is given as: $Y=167X-22.87M_1+64.96M_2 +18.26M_3+29.74M_4$

Table 3: Coefficients of partial effect model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3659.160	1392.045		-2.629	.017
	M1	-22.870	9.564	-.337	-2.391	.027
	M2	64.960	10.780	.648	6.026	.000
	M3	18.262	10.383	.093	1.759	.095
	M4	29.739	4.747	.439	6.265	.000
	X	167.069	55.607	.193	3.004	.007

a. Dependent Variable: Y

From table 3, M_3 was found not to mediate between Economic growth and crude oil price in Nigeria as it was not significant at 5% level of significance. This suggests that expenses on economic services do not really translate to economic growth. Recurrent expenditure on Administration (M_1), Social and Community Services (M_2) and Transfers (M_4) were found to be possible mediators between crude oil prices and economic growth in Nigeria. This possibility holds until the indirect (mediating effect) is tested and proven to be significant.

Indirect effect

The indirect effect is computed as the difference between the coefficient of X in path C and the coefficient of X in the partial effect model or the sum of the specific indirect effects in which both methods give the same result (Nwankwo and Igweze, 2016a). For ease of computation we employ the difference of coefficient in this study. The indirect effect for factors mediating between crude oil price and economic growth in Nigeria is calculated below.

Table 4: parameter Estimates and the indirect effect sizes for mediators

	$y=c_{01}+c_{12}X+b_1Z_1+b_2Z_2+ b_3Z_3+ b_4Z_4$					$D_{indirect}$
c	b_1	b_2	b_3	b_4	C_{12}	$c-c_{12}$
826.3	-22.87	64.96	18.26	29.74	167.07	659.23

The indirect effect is significant at 5% level of significance. This proves that recurrent expenditure on Administration (M_1) Social and Community Services (M_2) and Transfers (M_4) are substantive mediators between crude oil prices and economic growth in Nigeria

V. Conclusion

The study seeks to determine the variables of recurrent expenditure that act as mediators to economic growth in Nigeria; compute the indirect effect of recurrent expenditure on economic growth in Nigeria; and to test for the significant of indirect effect using the sobel test. Recurrent expenditure on Administration (M_1), Social and Community Services (M_2) and Transfers (M_4) were found to be the substantive mediators between crude oil prices which is a major source of government earnings and economic growth in Nigeria. This study has proven that recurrent expenditures translate to economic growth in Nigeria. It is therefore recommended that government should improve on recurrent expenditure especially those of administration, social and community services and transfers which have been found to translate to economic growth.

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Table 5: Data on recurrent Expenditure and. GDP and Crude Oil Price

Year	Administration (M1)	Social and Community Services (M2)	Economic Services (M3)	Transfers (M4)	GDP (y)	Crude oil Price (x)
1991	6.95	2.68	1.30	27.31	596.04	23.76
1992	8.68	1.34	3.08	39.93	909.80	20.04
1993	30.57	14.66	7.75	83.75	1,259.07	19.32
1994	20.54	10.09	3.91	55.44	1,762.81	17.01
1995	28.76	13.82	5.92	79.13	2,895.20	15.86
1996	46.55	15.99	4.75	57.20	3,779.13	17.02
1997	56.18	22.06	6.20	74.12	4,111.64	20.64
1998	50.68	21.44	11.57	94.40	4,588.99	19.11
1999	183.64	71.37	87.08	107.58	5,307.36	12.76
2000	144.53	84.79	28.59	203.69	6,897.48	17.9
2001	180.80	79.63	53.01	265.86	8,134.14	28.66
2002	266.51	152.19	52.95	225.15	11,332.25	24.46
2003	307.97	102.61	96.07	477.65	13,301.56	24.99
2004	306.77	134.39	58.78	610.70	17,321.30	28.85
2005	434.67	151.65	64.31	670.60	22,269.98	38.26
2006	522.20	194.17	79.69	594.05	28,662.47	54.57
2007	626.36	256.67	179.07	527.17	32,995.38	65.16
2008	731.02	332.93	313.75	739.66	39,157.88	72.44
2009	714.42	354.19	423.61	635.75	44,285.56	96.94
2010	1,117.44	550.90	562.75	878.34	54,612.26	61.74
2011	1,262.40	785.44	310.50	956.18	62,980.40	79.61
2012	1,159.40	790.06	230.10	1,145.60	71,713.94	111.26
2013	1,111.82	844.07	291.23	967.83	80,092.56	111.63
2014	992.84	774.77	266.40	1,392.93	89,043.62	108.56
2015	1,228.99	807.62	275.36	1,520.01	94,144.96	98.97

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