Distributional impact of public expenditure on human development in Nigeria

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Abstract

Purpose – The purpose of this paper is to develop and apply a distributional impact assessment methodology to empirically analyze distributional impact of public expenditure on human development using data from 20 states in Nigeria. For robustness of the analysis, expenditure on education, health, agriculture, rural development, energy, housing, environmental protection and portable water resources are employed as predictors of human development. The result reveals that expenditure on education, health, agriculture, rural development and water resources has positive marginal impact on human development. In contrast, the marginal impact of energy, housing and environmental protection is negative. Among the sectors, education, health, agriculture, rural development and water resources expenditure has positive marginal impact while energy, housing and environmental protection have decreasing marginal impact on human development.
Design/methodology/approach – Panel approach.
Findings – The result reveals that expenditure on education, health, agriculture, rural development and water resources has positive marginal impact on human development.
Originality/value – A panel approach is used to investigate whether expenditure on education, health, agriculture, rural development and water resources has positive marginal impact on human development.

Keywords Environmental protection, Rural development, Human development, Public expenditure, National economy, Fixed effect, Random effect

Paper type Research paper

1. Introduction

Since the discovery of a new development paradigm which links growth with enhanced quality of life, public expenditure on some sectors of the economy has assumed an increasing importance. This is more due to the failure of most developing countries to achieve substantially the millennium development goals which have been rolled into sustainable development goals with a target year of 2030 when African countries should achieve specific targets in health, poverty and inequality reduction, education, water and sustainable environment, housing as well as food security that are imperative for human development, this according to Sen (1999) have exacerbated government carrying out expenditure on the education, health, agriculture, rural development, energy, housing, environmental protection, water resources, transport and communication sectors. In Nigeria, government at the federal and state levels has been playing prominent roles in improving human development to such an extent that one should expect a positive correlation between progress in expenditure in these sectors. This optimism may, however, be suspected because despite growth in public expenditure on education, health, agriculture, rural development, energy, housing, environmental protection, portable water resources, transport and communication, the pace of human development has been slow, and so far, its growth has been unstable and erratic. For instance, the human development index (HDI) grew positively by 0.3 percent in 1987 but declined to 0.1 percent in 1988. In 2005 and 2012, it grew negatively by −0.2 and −2.7 percent, respectively (UNDP, 2014).

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In securing human development progress, it is imperative to put the citizens at the center stage of all aspects of the development planning strategy, and high-level resilience is required on the part of government (UNDP, 2001; Seetha, 2010; Qureshi, 2008; UNDP, 2014). In this regard, it is imperative that the citizens' well-being be improved continuously so as to meet new challenges and expand their choices which can be infinite and change over time and space. However, the three most critical and socially valuable choices from among these are the choice to lead a long and healthy life, the choice to acquire knowledge and be educated and have access to resources needed for a decent level of living as the nation develops. Thus, development should increase the availability and widen the distribution of basic life sustaining needs such as decent living, longer life, personal protection, improved living standard and environmental sustainability which ultimately improve well-being through the provision of more jobs, better education and other humanistic values (Goulet, 1991; UNRISD, 1992). But as noted by Todaro and Smith (2012), many developing countries actually experienced decrease in per capita real income among a greater percentage of the populations, and the situation generally worsened during the 1980s. In this context, the development process is essentially to create an environment in which all the people in the society can expand the capabilities needed to take advantage of the increasing opportunities that are available in the society. It is immediately clear from the above fact that once the concept of development is broadened, growth in per capita income becomes imperfect for measuring or describing human development. Therefore, it could be argued that increase in per capita income is a necessary but not a sufficient measure of human development, but enhanced quality life as manifested in higher educational attainment, and provided easier access to employment and healthier life, food security and portable water, affordable housing, sustainable environment and greater life expectancy. In attaining all these, however, public expenditure on education, health, agriculture, rural development, energy, housing, environmental protection, portable water resources, transport and communication has a great role to play (Edeme and Imide, 2014; Chakraborty, 2003; Anand and Ravallion, 2000, *inter-alia*).

As noted by UNDP (2008), there are different ways through which social, economic and environmental sectors' expenditure by the various states can accentuate regional human developmental differences within a country and in essence perpetuate underdevelopment. If human development efforts of a country are to be encompassing and useful for the purpose of policies aimed at achieving sustainable development, the distributional impact on human development at the sub-national levels should be assessed. Yet, there has not been such study at the state level. Available studies on public expenditure and human development are restricted to federal government capital education and health expenditure and have ignored the impact of both capital and recurrent expenditure on other sectors like agriculture, rural development, energy, housing, environmental protection and water resources on human development.

Since the United Nations Development Programme's (UNDP, 1990) first global Human Development Report (HDR), there is a growing concern by most countries of relying heavily on expenditure on the economic, social and environmental protection sectors as a means of improving human development (Ranis and Stewart, 2002). Moreover, considerable changes have occurred on different sectoral expenditure on human development overtime. Much of the existing research have focused on the impact of public expenditure on human development at the federal level. Such an approach has been criticized as being inadequate in assessing human development efforts of a country (UNDP, 2008). Although the study focuses on Nigeria, the adopted methodology is intended to be applicable to a wide range of states. This approach is particularly important in determining the sectors that have contributed meaningfully to human development over the years. We hope to present a meaningful and straightforward methodology that can be also adopted to analyze distributional impact in changes in expenditure on human development efforts in other developing countries.

2. Review of literature

Bigsten and Levin (2005) posited that the compositions of government expenditure are critical determinants of growth, poverty reduction and human development. They are also of the view that if government is undertaking fiscal reforms, three types of impact should be considered. First, is the relative impact on prices and factor income change, income distribution and poverty. Second, the composition of government expenditures as it affects sectoral productivity and hence labor demand. Third, change in public expenditure on services such as education and health which impacts on household's well-being. In line with this and based on simulations equation model of the Swedish 13 different public expenditures, Dehlberg and Jakobsson (2005) showed that the effects of an increase in public consumption on employment, imports and private consumption differs considerably depending on which sector expenditure is expanded. In similar vein, Dorosh and Lundberg (1996) found that change in government expenditure following reduced current expenditures dampens mainly urban households, due to the bias of government employment. Protecting urban households from a short-term income loss incidentally has a long-term negative impact on the rural poor. At the International Food Policy Research Institute, some studies have been conducted along this theme for different countries. These studies are Fan *et al.* (2000) on India; Hao and Fan (2001) on Vietnam; Fan *et al.* (2002) on China and Jitsachon and Methakunavut (2003) on Thailand. A major profound conclusion of these studies is that public expenditure has influenced human development. However, the extent of influence differs from country to country. In a World Bank's (2005) study of 83 developing countries, it was observed that for countries that had the highest growth rates of real per capita GNP between 1980 and 1997, education played a significant impact. In a comparative analysis, it was also discovered that the literacy level in 1980 averaged 16.0 percent higher than those of other countries at the same income level of development. Krueger and Lindahl's (1991) study of 98 countries between 1980 and 1985 equally confirmed that education impacts growth rate of real per capita GDP positively.

Shantamyanan *et al.* (2005) used data from 15 developing countries for six years to show that an increase in the share of current expenditure has a positive and statistically significant growth effect on per capita income. A study of Cameroon by Emini and Fofack (2004) depicts that the dramatic fall in public expenditure during crises period that persisted in the post-devaluation growth period of the late 1990s has negative effect in improving the welfare of the poor and reduction in high unemployment rates in Cameroon. Under a fixed-price multiplier analysis, a simulation of policy experiments highlights the potential growth and welfare benefits of increased public spending on human development and poverty reduction. Under the assumption of a reduction in external debt servicing with the relief reallocated to public investment on economic and social services, a significantly higher economic growth was found which manifested in the rapid increase in human development. Jung and Thorbecke (2003) appraised the impact of education expenditure on productivity and its distributional consequences on the economy using a multi-sector calibrated general equilibrium model applied to two heavily indebted poor countries, Tanzania and Zambia. The result affirms that education expenditure has a positive impact on productivity. To maximize the benefits inherent in education expenditure, however, a sufficiently high level of physical investment is required as a measure to improve the match between the pattern of educational output and the structure of effective demand for labor. From the simulation results, a conclusion was drawn that a well-targeted pattern of education expenditure can be effective for poverty reduction.

In a study of the Indonesian economy and applying SAM, four classes of government recurrent expenditure on, respectively, education and health wages and salaries on other

goods and services, and household transfer and nine classes of government capital expenditure on agriculture, industry and mining, energy, transport and tourism, education, health, housing and water works, general services and other activities was also identified by (Keuning and Thorbecke, 1999). Their finding shows that for the same reduction in public expenditure, the effect on the average income of each group on poverty differs according to the budget option selected. Government household transfers and expenditure on rural development have the greatest positive impact on per capita income of agricultural employees. In contrast, by far, the most favorable program for the urban group consists of government wages. In a study of the patterns of government expenditure conducted in Canada, Gordon (2008) found that government expenditure on economic and community services have a positive impact on income per capita at various lag periods, while at some other lags, they show a negative impact. Besides, transfer expenditure has a negative impact on income per capita. Nasaruddin and Zulkifly (2000), using data from 1980, analyzed Malaysian Government's expenditure pattern according to functional classification and discovered that aggregate expenditure on the whole shows a high degree of stability and exhibited an increasing trend. This structural change presumably reflects partly the effort of the government to reduce heavy dependency on agricultural sector, while at the same time enlarging the contribution of industrial sector to the growth of the economy. In addition, expenditure on other sectors such as housing, education, social and community services, public utilities and communication increased from 5 to 10 percent. The study however suggested a balanced expenditure between as well as within sectors in order to reduce inequality and poverty, especially if the allocations of the budget always fall short of, and does not effectively trickle down into the target group.

Kuburi (2003) conducted a study on the differential impact of government expenditures by various departments on total employment, total income, the distribution of income between wages and non-wage and import requirement for Ontario's economy by applying the input-output analysis and found that there exist wide variations in the income multiplier generated by a percentage increase in different departments. Similar outcomes hold for employment multiplier. However, the employment multipliers are obviously lower in magnitude and more clustered than the income multipliers. Surprisingly, expenditures on education and health generate lower than average income and employment multipliers. A high-income effect is associated with a departmental expenditure that entails purchase of goods from industries as well as with lower import components and high direct income coefficient.

3. Methodology

The Sen's (1985) capabilities theory has shifted the analysis of development to the vector of not only attributes or even the basic needs view of human welfare, to the vector of possible opportunities available to individuals in a particular country. In essence, the capability approach goes far beyond assessing individual efforts to acquire these benefits to considering the efforts of government in enhancing or influencing an individual's ability to acquire more opportunities which the development process provides. In fact, Anand and Ravallion (1993) posit that the most effective means of human development flow through government budgetary expenditure.

3.1 Model specification

Deaton (1990, 1998) and Tilak (2002) variously developed distributional impact assessment models that was used to analyze the effect of changes in public expenditure on poverty and human welfare. This study follows the works of Deaton, which was used to explore how units change in public expenditure in a sector impact on welfare. Analogously, the same

approach can be employed in analyzing the impact of changes in sectoral expenditure on human development. Human development efforts in relation to public expenditure equation can be stated as:

$$Hd = f(Ed,\ Ht,\ Ag,\ Rd,\ Eg,\ Hu,\ Ev,\ Wr) \tag{1}$$

Equation (1) can be re-specified in terms of budget share of different sectors in relation to the differenced value of human development in line with the change in expenditure with the following expression:

$$\Delta Hd_{it} = \sum_{i=1}^{n} Q_{it}\Delta l\_\sum Ep_{it}i \tag{2}$$

where i = selected sectors of the economy, Δ = first difference operator, Q = budget share.

The budget share is simply a sector's share (i) deflated by total expenditure. Equation (2) shows that the distributional impact of the expenditure on human development must be derived from changes in expenditure. It thus provides a minimum bound on the impact of variations in expenditure but it does not take into consideration the distributional impact. Equation (2), therefore, cannot provide the accurate coefficient needed. Differencing the log values of the variables actually allows for the analysis of the impact of sectoral changes in public expenditure on human development. The first-order difference equation expressing a time lag of one period showing the relationship between our dependent variable and independent lagged variables can be expressed as:

$$\begin{aligned}\Delta Hd_{it} = {} & l\_\Delta Ed_t - \Delta Ed_{t-1}/\Delta Ed_t + l\_\Delta Ht_t - \Delta Ht_{t-1}/\Delta Ht_t + l\_\Delta Ag_t - \Delta Ag_{t-1}/\Delta Ag_t \\ & + l\_\Delta Rd_t - \Delta Rd_{t-1}/\Delta Rd_t + l\_\Delta Ev_t - \Delta Ev_{t-1}/\Delta Ev_t + l\_\Delta Hu_t - \Delta Hu_{t-1}/\Delta Hu_t \\ & + \Delta l\_Ev_t - \Delta Ev_{t-1}/\Delta Ev_t + \Delta l\_Wr_t - \Delta Wr_{t-1}/\Delta Wr_t \end{aligned} \tag{3}$$

As we did in Equation (2), we can reformulate Equation (3) in terms of sectoral share and changes in expenditures such that:

$$\Delta Hd_{it} = \sum_{i=1}^{n} B_i^{hln}\Delta Ep_{it} + 1/2\sum_{l=1}^{n}\sum_{t=1}^{n} Hd_{it-l}l\_\Delta Ep_{it}^{h}\Delta l\_Ep_{it} \tag{4}$$

From Equation (4), it can be further shown that HD_{it} is termed to be equivalent to $Б_i\varepsilon_{it}$ as follows:

$$\Delta Hd_{it} = l\_\Delta Ed_{it}\frac{\Delta Ed_{t-1}}{\Delta Ed_t} \tag{5}$$

where ε_{it} is defined as the differential intercept coefficient of human development with respect to expenditure changes. Thus, Equation (4) can be rewritten as follows:

$$\Delta Hd_{it} = \sum_{i=1}^{n} Б\,\Delta l\_Ed_{it} + 1/2\sum_{l=1}^{n}\sum_{t=1}^{n} E_{it}l\_\Delta Ed_{it}\Delta l\_Ed_t \tag{6}$$

Equations (5) and (6) are derived to make an exploration of the differential impact of public expenditure pattern on human development. Thus, the estimation of distributional impact requires estimation of expenditure elasticity in relation to changes in expenditure. Exactly how these elasticities are estimated depends on the nature of data employed. Deaton, however, presented a formulation to the estimation of marginal impact of

changes in expenditure on the economy using cross-section of expenditure variables. Crucial to this approach is the recognition of the fact that expenditure on a particular sector varies with time.

Drawing heavily from the above insights and considering the nature of our data, we exploit the approach to estimate the marginal elasticity of sectoral changes in public expenditure on human development across states and time. This is the technique employed to estimate the ϵ_{ij} terms. Following the works of Edeme and Imide (2014), the corresponding panel specification for the distributional impact of changes in public expenditure on human development can be expressed as:

$$\Delta Hd_{it} = \emptyset_o + \emptyset_1 \Delta\, ln\, Ed_{it-1} + \emptyset_2 \Delta\, ln\, Ht_{it-1} + \emptyset_3 \Delta\, ln\, Ag_{it-1} + \emptyset_4 \Delta\, ln\, Rd_{it-1} + \emptyset_5 \Delta\, ln\, Ev_{it-1} + \emptyset_6 \Delta\, ln\, Hu_{it-1} + \emptyset_7 \Delta\, ln\, Ev_{it-1} + \emptyset_8 \Delta\, ln\, Wr_{it-1} + U_{it} \quad (7)$$

where $\emptyset_o$ = specific state effect; $lnHd$ = log of human development; $lnEd$ = log of education expenditure; $lnHt$ = log of health expenditure; $lnAg$ = log of agricultural expenditure; $lnRd$ = log of rural development expenditure; $lnEv$ = log of energy expenditure; $lnHu$ = log of housing expenditure; $lnEv$ = log of environmental protection expenditure; and $lnWr$ = log of water resources expenditure. The analysis here is only on the estimation of $\emptyset_1$, $\emptyset_2$, $\emptyset_3$, $\emptyset_4$, $\emptyset_5$, $\emptyset_6$, $\emptyset_7$ and $\emptyset_8$ which are the respective marginal elasticity coefficients for education, health, agriculture, rural development, energy, housing, environmental protection and water resource expenditure. Data used in this study are secondary data obtained from Accountant Generals' Report of the various states, while the HDI was compiled from various UNDP HDRs (Nigeria).

Since our analysis is based on two competing models, fixed effects and random effects, the inevitable question is which model should be employed. To test for the appropriateness of the fixed-or random-effects model, we perform the Hausman Specification Test (HST). For such test, we suppose that there are two estimators $\hat{g}$ and $\check{g}$ with the properties that $\hat{g}$ is both consistent and efficient under the null hypothesis but inconsistent under the alternative hypothesis, whereas $\check{g}$ is consistent under both the null and alternative hypothesis, but inefficient under the null hypothesis. The difference of the two estimators can be considered as follows:

$$d = \hat{g} - \check{g} \quad (8)$$

Assuming the null hypothesis, Hausman test shows that:

$$K(d) = K(\hat{g}) - K(\dot{g}) \quad (9)$$

where K is variance. Taking $K(g)$ to be the consistent estimator of $K(\hat{g})$, Hausman test shows that the test statistic:

$$d^1[k(d)]^{-1} d \quad (10)$$

is asymptotically distributed as X^2 with n def, where n is the number of X variables involved in the regression. Insignificance of the test statistic will support the null hypothesis that the X and E variables are independent in the model given by:

$$Y = Xg + E \quad (11)$$

in which the null hypothesis and alternative hypothesis are specified as follows:

$H_{0.}$ X and E independent.

H1. X and E not independent.

Under the null hypothesis, the test statistic is distributed as $g^2(X)$. In case of a non-rejection of null hypothesis, the test suggests that the individual effects are uncorrelated with the other variables in the model; therefore, the fixed effects model is a better choice. If the models are, however, specified correctly and if ε_i is uncorrelated with the explanatory variables, then the two estimates should not differ significantly. In this study, however, we produce estimates of the two methods as well as the specification test. In the classical regression analysis, R^2 is employed as a popular measure of goodness of fit. Since the fixed-effects model can be estimated by OLS using dummy variables, we can evaluate the goodness of fit by reporting its R^2. However, similar measure cannot be derived for the random-effects model. Rather, we report another measure calculated as the correlation squared of the predicted dependent variable. If it is calculated from the predictions of the dependent variable in Equations (3)-(5), it is referred to as R^2 (Overall). If it is calculated from the predictions of the deviations of the dependent variable as in Equations (5)-(7), it is known as R^2 (within). For the fixed-effects model, R^2 (within) is also referred to as ordinary R^2.

4. Presentation and discussion of results

This result shows that although there was no systematic difference between the two models, in terms of goodness of fit, the R^2 overall is consistently higher for the fixed effects model in comparism with the OLS models. Based on the model specification tests, it is evident that the assumption of no individual effects, whether fixed or random, is not supported in the data. Besides, the outcome of the HST points to the rejection of the random effects assumption. For a comparative purpose, we present the results of the fixed effects and OLS models below (Tables I and II).

State			Year			Variable		
	Fixed	OLS		Fixed	OLS		Fixed	OLS
C							0.111 (2.02)*	0.092 (0.38)
Kaduna			2002			ΔnEd	0.015 (2.48)*	0.002 (0.57)
Kebbi	0.128	0.099	2003	−0.383	−0.387	ΔnHt	0.003 (2.12)*	0.001 (0.94)
Jigawa	0.016	0.037	2004	−2.702	−2.145	ΔnAg	0.009 (1.12)	0.003 (0.02)
Plateau	−0.004	−0.002	2005	0.135	0.176	ΔnRd	0.008 (3.54)**	0.005 (1.03)*
Bauchi	−0.005	−0.016	2006	−1.580	−1.585	ΔnEn	−0.088 (−0.06)	−0.107 (0.25)
Benue	0.025	0.022	2007	2.025	−2.092	ΔnHu	−0.010 (2.09)	−0.058 (0.25)
Niger	−0.024	−0.058	2008	−2.001	−2.018	ΔlnEv	−0.011 (−1.13)*	−0.027 (−0.01)
Kogi	0.023	0.022	2009	−2.410	−2.136	ΔlnWr	0.013 (1.09)	0.000 (0.03)
Plateau	−0.037	−0.055	2010	1.707	1.014			
Anambra	0.044	0.108	2011	2.249	2.260			
Abia	−0.026	−0.020	2012	−1.215	−1.445			
Enugu	0.055	0.092	2014	0.043	0.062			
Delta	−0.021	−0.047	2014	0.166	0.145			
Bayelsa	0.002	0.002						
Rivers	0.063	0.059						
Edo	−0.011	−0.000						
Oyo	0.053	0.055						
Lagos	0.012	0.023						
Ondo	0.001	0.001						
Ekiti	−0.004	−0.004						
R^2 (Ordinary)	0.89							
R^2 (Overall)	0.81	0.60						

Notes: The figures in parenthesis denote *t*-statistic. *,** Significant at 1 and 5 percent levels, respectively
Source: Authors' calculation

Table I.
The impact of sectoral changes in public expenditure on human development

Dependent variable: ΔlnHd
Method: panel least squares
Sample (adjusted): 2002-2014
Included observations: 12, after adjustments
Cross-sections included: 20
Total pool (unbalanced) observations: 230

	Coefficient	SE	*t*-statistic	Prob.
C	0.0575	0.0541	1.0631	0.2903
ΔlnEd	0.0035	0.0837	0.0869	0.9309
ΔlnHt	0.0085	0.1201	−0.6332	0.5280
ΔlnAg	0.0051	0.1172	−1.2773	0.2045
ΔlnRd	0.0087	0.0547	2.2499	0.0267
ΔlnEn	−0.0863	−0.0072	0.0992	0.0811
ΔlnHu	−0.0795	−0.0428	−1.0521	0.5623
ΔlnEv	−0.1095	−0.4023	−1.0452	0.2857
ΔlnWr	0.0032	0.0029	0.5950	0.3249

$R^2 = 0.8450$
R^{-2} 0.8149
SE of regression 0.4885
Sum squared resid. 3.6202
Log likelihood −71.4202
F-statistic 117.0354
Prob. (*F*-statistic) 0.0000

Source: Authors' calculations

Table II.
Period random effect test equation

The estimated coefficient for education 0.015 portrays that, holding expenditure on other sectors constant, a unit increase in education expenditure would increase human development by 0.015 percent. Similarly, a unit increase in health expenditure improves human development by 0.003 percentage point, which is lower than that of education. The coefficient for agriculture, rural development, energy, housing, environmental protection and water resources is 0.022, 0.012,−0.09,−0.08,−0.11 and 0.013, respectively, which is an indication that, holding other expenditure constant, a unit increase in agriculture, rural development, energy, housing, environmental protection and water resources accounts for 0.022 percentage increase, 0.012 percentage increase, 0.09 percentage decrease, 0.08 percentage decrease, 0.11 percentage decrease and 0.013 percentage increase in human development, respectively. The cross and period effects, however, differ from state to state and period to period. This finding is in tandem with the study of Deaton and Edeme and Imide (2014).

5. Conclusion

This study was undertaken to determine the distributional impact of public expenditure on human development using education, health, agriculture, rural development, energy, housing, environmental protection and portable water resources. Based on the distributional impact assessment model, the result reveals that expenditure on education, health, agriculture, rural development and water resources has positive marginal impact on human development while the impact of energy, housing and environmental protection is negative. Among the sectors, education, health, agriculture, rural development and water resources expenditure has positive marginal impact on human development while energy, housing and environmental protection have decreasing marginal impact. The policy implication of the finding is that government have spent on energy, housing and environmental protection toward improving human development, such expenditure seems to have negligible marginal impact on human development.

If human development is to appreciate considerably, then it is portentous to stress expenditure on education, health, agriculture, rural development, energy, housing, environmental protection and portable water resources. Any further increase should concentrate on education, health, agriculture, rural development and portable water resources. Also, states in Nigeria should work together to develop a framework to ensure consistency in human development expenditure among the states in Nigeria.

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