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GOVERNMENT EXPENDITURE ON EDUCATION AND POVERTY REDUCTION: IMPLICATIONS FOR ACHIEVING THE MDGS IN NIGERIA A COMPUTABLE GENERAL EQUILIBRIUM MICRO-SIMULATION ANALYSIS

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ABSTRACT

This study examines the likely impact of government expenditure policy on education and poverty reduction in Nigeria. The specific objective of the study is to explore or simulate how government expenditure on education would help to meet the Millennium Development Goals (MDG) of the United Nations in terms of improving education service and reduce poverty in Nigeria. An integrated sequential dynamic computable general equilibrium (CGE) model was used to simulate the potential impact of increase in government expenditure on education in Nigeria. The model is simulated with a 2004 social accounting matrix (SAM) data of the Nigerian economy. The result of experiment indicate that it will be extremely difficult for Nigeria to achieve the MDG target, in terms of education and poverty reduction by the year 2015, because this policy measure in the analysis was unable to meet this goal. The MDG target for Nigeria in terms of poverty reduction is to reduce the percentage of population living in relative poverty from 54.4% in 2004 to 21.4% by 2015. It was found that the re-allocation of government expenditure to education sector is important in determine economic growth and the reduction of poverty in Nigeria. It was recommends that in order to achieve the MDG in both education and poverty reduction poverty, investment in education service should receive the highest priority in the public investment portfolio. The study concludes that if government policy is going to substantially reduce poverty, then future economic growth has to be pro-poor. Investing in education is one of the pro-poor policies for improving human capital and reducing poverty.

Keywords: Government expenditure, Education, Poverty, CGE.

1. INTRODUCTION

Recent years have seen important advances in our understanding of the link between education and poverty reduction in developing countries. The importance of government expenditure in the process of human development is well recognized. Education does not only provide a better quality of life for every citizen of any nation but also have positive effects on the economic growth and

development of a country. The provision of education is a key element of a policy to promote broad-based economic growth and there is no doubt that only investment in human capital can contribute significantly to global competitiveness. Also, a well-educated population has longer life expectancy and lower child mortality rates. Fertility tends to be lower where the levels of education are higher (Cochrane, 1986; Cochrane, 1988; Sackey, 2005).

It has been stressed that, human resources input play an important role in alleviating household poverty. Many developing countries are moving to knowledge based economies with investment in education as the new source of wealth of nations, holding to the fact that education is considered a major remedy for many problems faced by them. And the main asset of the poor lies in their labour and education services improve the productivity and earnings of workers. For example, it is widely accepted that female education helps to lower fertility rates. Moreover, educated parents are in a better position to look after the education needs of their children. Similarly, the linkages of education to poverty eradication and long-term economic growth are strong. Education is important tools to empower poor people and overcome exclusion based on gender, location and other correlates of poverty (Cochrane, 1986; Cochrane, 1988; Sackey, 2005).

In Nigeria, like in most developing countries, arguments about the basic components of human capital development such as education, training and health have stimulated the need for active government participation in the provision of basic education. It has been asserted that for effective development of human resources, the Nigerian government should play a leading role in financing education. As the acceleration of globalization creates a new standard for human capital development, the successive Nigerian governments have reorganized this in line with international standard towards the millennium development goals as related to education. The globalization new standard for human capital development (see the MDGs for education, agreed by the special session of the UN General Assembly in June 2000) as related to education is to achieve universal primary education and ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling. The overall objective is the eradication of extreme poverty, for which the development of human resources through education is key. The public sector is still a major provider of education in developing countries of the SSA region. The Millennium Development Goals (MDGs) which aim towards the provision of basic education can all be influential in causing and sustaining the extraordinary level of poverty in developing countries. Yet, it has been shown that, even after taking note of low levels of these variables, "one would have expected a much higher level of government spending on education and health services in order to attain the MDG in 2015 (UNDP, 2006; MDG, 2008) (Department for International Development (DFID), 2008). The specific objectives of the study is to explore or simulate how government expenditure on education would help to meet the Millennium Development Goals (MDG) of the United Nations in terms of improving education service and reduce poverty in Nigeria.

The structures of the next sections of this paper are as follows. Section two gives the review of relevant literature, while section three provides theoretical frameworks on the subject matter. Section four contains the description of policy experiments and specifications of model. Section

five discusses the database of the model and section six is the model simulation and the interpretation of model results, while section seven explains the policy implications of the findings. Section eight concludes the paper.

2. REVIEW OF LITERATURE

The 1990 World Development Report's two-part strategy has become an almost undisputed paradigm in development discussions: "rapid and politically sustainable progress on poverty has been achieved by pursuing a strategy that has two equally important elements. The first is to provide basic social services to the poor. Primary education family planning, nutrition and primary health care, are especially important while, the second element is to promote the productive use of the poor's most abundant asset labour (World Bank, 1990). The economic argument for investing in education in developed countries may differ in detail from that in developing countries, we have found considerable and convincing evidence that poverty reduction can be achieved by improving education not only in developed, but also in developing countries, exemplified by the report of the East Asian countries, this issue has so far received scant attention in those countries

Barro (1997) notes that the steady state depends on government policies, for example, with regard to public consumption spending, protection of property rights, and distortions of domestic and international markets. Barro (1997) also note that the concept of capital in the standard model can be extended to include human capital in the form of education, experience, and health. The endogenous growth literature, starting with Romer (1986) and Lucas (1988), suggests that growth may go on indefinitely, since returns to investment in human capital, for example, need not to be diminishing. External effect of human capital and spillovers between producers, help economies to avoid diminishing returns to capital.

Dreze and Sen (1990) also explained the relationship between economic growth, human capital (education and health) and incomes. According to them, although there are important interactions, experience with efforts to improve the health and educational attainment of the poor differs from that with efforts to increase their incomes. They argue that economic growth does not always lead to widespread improvement in standards of health and education as measured by such indicators as life expectancy, child mortality, primary enrollment rates and adult literacy. Some argued that the dimensions of well-being of individuals is not based on the economic performance in terms of growth in GDP and increases in the incomes but, on the state and the level of education of an individual or a population is likely to impact not only upon the level of income but also the distribution of this income between savings and consumption. Brazil (World Bank, 1988) and Pakistan (Malik, 1993) are two such cases where indicators of health and educational attainment (especially for girls) are inferior to those of countries with similar GDP per capita. Nevertheless, an important factor in explaining outcome growth is inadequate public provision of basic social services. To be specific, there is a positive relationship between individuals' educational attainment and their savings ratio. The savings ratio of individuals with higher education consequently, is

higher than the one with lower education. If other things being equal, a population whose level of education increases may therefore also be expected to have higher savings

Selected relevant examples focusing on how much education and health has been channeled to the poor, "expenditure incidence analysis" is part of many World Bank poverty assessments. World Bank research has clearly shown that most education and health subsidies are not well targeted to the poor, though they are progressive and reduce inequality. A relatively large number of studies from low-income countries exists for example, Ghana, Guinea, Kenya, Madagascar, Malawi, South Africa, Nigeria, Côte d'Ivoire, Tanzania and Uganda (Van de Walle and Nead, 1995).

Gerschenkron's perspective on the importance of state initiatives to implement industrialization (and sustained economic growth) in the case of backward economies (Gerschenkron, 1965), as well as the more technical approaches where endogenous growth models describe how cross-country differences in governmental economic policy account for differences in economic performance (Rebelo, 1991), seems adequate to approach both Portuguese economic growth in historical perspective in general, as a latecomer to modern economic growth, and, more specifically, the role of the Portuguese state, and of its public finance, in providing human resources of proper quality along the last two centuries.

Moreover, this broad perspective fits quite well into the basic economic functions to be accomplished by the public sector according to the theory of public finance (Musgrave and Musgrave, 1973): the allocation function — public provision of public goods — the distribution function — adjustments in the distribution of income and wealth — the stabilization function — control of the level of economic activity and price stability and its effects on employment and external balances; and, still a very important non-budgetary function, the provision of a proper institutional background, including a legal structure to which economic life must conform to.

Referring to the specific case of education Musgrave and Musgrave (1973) stated that, there are technical reasons for the public sector to be involved in the provision of education, if not through direct provision, at least through some kind of subsidy to private sector purchases. Concerning income and wealth distribution, education policy could reduce inequalities in the distribution of income and wealth, which are grossly correlated to inequalities in educational expenditure. Though, education is not consider as a typical public good, but rated as mixed good, education expenditure generates positive social gains and some kind of market failures may arise, as in the case of credit markets, which may lead to underinvestment in human capital by the private and informal sector. More equal distribution of education may reduce private gains differentials. As for stabilization and growth, public expenditure on education will produce tangible social and economic returns such as the ability to add new knowledge, to produce and diffuse technological change and innovations in general, to foster economic structural changes, inducing productivity gains, as well as more diffuse, intangible gains concerning extra-economical environment aspects.

The importance of these state economic functions may be particularly acute in a comparative backward economy as in these cases relevant market malfunctions on one hand and cultural and

social rigidities on the other may arise: low GDP per capita, adding to very high illiteracy rates, may induce low demand for education consumptions and high unitary supply costs; slow structural changes may develop poor expectations on marginal rates of return of education; financial and credit markets may lack proper institutional background and sufficient diversification and flexibility to support private investment in education. All this may lead, as was the case of Portugal (Reis, 1993; Grácio, 1998), to a very slow initial process of accumulation of the stock of human capital (Domingos, 1999) unless political will breaks through basic vicious circles.

Recent studies suggest that the allocation of public investment for human capital development in many developing countries, however, is often inefficient and inequitable. There is consensus that expansion in the skills knowledge, and capacities of individuals increasing human capital, that it is critical for economic growth and poverty reduction. Education with formal education systems and healthcare plays a key role in creating human capital. Human capital theory predicts that more educated individuals are more productive and good education from childhood enhances cognitive functions and reduces future poverty. Hence, children with better education can be expected to be more productive in the future and receive higher income levels. Also, educated individuals would have more incentives to invest in future education and training, of their children and contribute to the entire society (Suhrcke *et al.*, 2005)

On the roles of total factor productivity (TFP) growth and factor accumulation, in the determinants of GDP growth and the links between growth and poverty, growth accounting is frequently used to disaggregate the sources of GDP growth into factor accumulation and TFP growth. On the view of Chemingui (2005), total factor productivity will increase if government expenditure is directed to the major three priority areas of the economy such as education, education and health and agriculture. The increase in TFP will affect the entire economy through increase in sectors. Empirical evidence shows the importance of investment in social services in improving human capital and mainly for the poor in order to reduce poverty over the long run.

Concerning the more efficient use of inputs, it has been long recognized that an important source of improvements in income and welfare is the gains generating from the total factor productivity (TFP). Reviewing some cross-country studies conducted by Klenow and Rodriguez-Clare (1997) and Easterly and Levine (2001), about the differences in income levels and growth rates, government expenditure on Research and Development (R&D), infrastructure, and human capital is believed to be one of the determinants of high level of income and economic growth, mainly through improving total factor productivity of different countries. Thus, an indirect way for assessing the effect of public spending on economic growth is to use TFP as a dependent variable and to regress other variables on it mainly those related to public spending, assuming that targeted public spending will improve TFP. Through improvement of TFP, the economy will grow faster and then poverty will decline. In order to do so, estimation of trends in TFP is required. However some issues related to the estimation and the interpretations of TFP tend to make such an approach problematic mainly for a country where good data may be scanty.

3. THEORETICAL ISSUES

3.1. Human Capital Stock: Education

Following Judson (2002) cost-based method, we use expenditure on education to capture the quality of education. This allows us to estimate the human capital stock expressed in 1990 international USD, which makes it directly comparable to physical capital and GDP. Judson computed human capital stock based on replacement costs using the following approach:

$$h_{it}=\sum_{j} d_{ijt}a_{ijt}, \quad (1)$$

where d_{ijt} is the public expenditure on education per level of education j in country i in year t, and a_{ijt} denotes the share of the labour force in year t with a certain level of education. h_{it} is defined as the average per worker human capital stock. If one wishes to arrive at the total human capital stock, *hit* must be multiplied with the labour force (L_{it}):

$$H_{it}=h_{it}L_{it} \quad (2)$$

Judson (2002) identifies four problems concerning this method. First, current production costs may not be a good indicator of the value of human capital that has been produced earlier. Second, she does not use private expenditure on education since these data are usually difficult to obtain. Third, foregone income during the time of study is not taken into account. Fourth, while private expenditure is generally neglected, the available figures on students enrolled often include students entering private education. Consequently, if the private expenditures are differently distributed per level of education than public expenditures, the estimates may be biased. We may mention a fifth problem regarding this method. Judson's method uses d_{ijt}, the expenditure per level of education for year t and weighs this with the shares of primary, secondary, and higher educated in the working population. Hence, even after multiplying with the total working population she arrives at the replacement value of *a single year of education* instead of the total accumulated stock of human capital. As such, the human capital stock by the original method of Judson is very likely to underestimate the value of the stock of human capital.

The above-mentioned weaknesses of the Judson method are serious but can be solved. We can address the second and third problem by adding private expenditure and foregone wages to the HC stock. Since foregone wages are likely to increase over time, including it will lead to a faster appreciation of human capital. As for the fourth problem, similarly to Judson, we assume that private expenditures are identically distributed to public expenditures. The fifth problem is corrected for by multiplying equation (2) with *average years of education*. With this multiplication the new stock of human capital is given as *H*:*

$$H^{*}_{it}=H_{it}Educ_{it} \quad (3)$$

3.2. Poverty Measures

Since the publication of Sen (1976) article on the axiomatic approach to the measurement of poverty, several indices of poverty have been developed that make use of three poverty indicators: the percentage of the poor, the aggregate poverty gap and the distribution of income among the poor. According to(Kakwani, 1993);(Ravallion and Datt, 1996)the measurement of poverty involves two distinct problems: (1) the specification of the poverty line - the threshold below which one is considered to be poor; and (2) once the poverty line is determined, construction of an index to measure the intensity of poverty suffered by those below that line. Poverty measures could be additively separable or specific.

(a) Additively Separable Poverty Measures

This measures is given by

$$P=\int_0^z \theta(z,x)\, f(x)\, dx \qquad (4)$$

where x is a random variable with probability density function, $f(x)$ and z denotes the poverty line. While $\theta(z,x)$ can be interpreted as the deprivation suffered by the household with income x. Its value is zero when $x \geq z$ and positive otherwise. Obviously, for a fixed value of z, $\theta(z,x)$ must be a monotonically decreasing function of x variable (s).

if $n(x)$ is the number of individuals in a household with income x, then the average number of individuals in the society will be written as

$$E(n(x))=\int_0^\infty n(x)\, f(x)\, dx \qquad (5)$$

Assuming that every individual in a household enjoys a welfare value equal to the income or consumption per equivalent adult for that household (or every individual within a household suffers the same level of deprivation), and then one gets the probability density function of individual income distribution as

$$g(x)=\frac{n(x)\, f(x)}{E(n(x))} \qquad (6)$$

For the fact that $\int_o^\infty g(x)\, dx = 1$. Thus, we define a class of poverty measures based on the income distribution of individuals as

$$P^*=\int_0^z \theta(z,x)\, g(x)\, dx \qquad (7)$$

(b) Specific Poverty Measure

Foster *et al.* (1984) proposed a class of poverty measures which is obtained if we substitute $\theta(z,x)=\left((z-x)/z\right)^{\alpha}$ in equation (7)

$$P_{\alpha}=\int_0^z\left(\frac{z-x}{z}\right)^{\alpha}g(x)dx, \qquad \alpha\geq 0 \tag{8}$$

where α is defined as the parameter to be specified. If $\alpha=0,\ P_{\alpha}$ equals the head-count ratio, H, is the proportion of individuals living in poverty and when $\alpha=1,\ P_{\alpha}$ is equal to the poverty gap ratio defined as

$$G=\frac{H\left(z-\mu^{*}\right)}{z} \tag{9}$$

where μ^{*} is mean income of the poor. P_{α}, satisfies Sen (1976) monotonicity axiom for $\alpha>0$ and transfer axioms for $\alpha>1$. When $\alpha=2,\ P_{\alpha}$ captures the severity of poverty. When $\alpha>2$, P_{α} also satisfies Kakwani (1993) transfer-sensitivity axiom.

In 1968, Watt proposed a poverty measure which can be obtained by defining

$$\theta(z,x)=\log z-\log x: \tag{10}$$

$$W=\int_0^z(\log z-\log x)g(x)dx \tag{11}$$

which satisfies Sen's monotonicity and transfer-sensitivity axioms as well as Kakwani's transfer-sensitivity axiom.

Finally, in 1981, Clark, Hemming and Ulph proposed a poverty measure which can be obtained by substituting

$$\theta(z,x)=(1/\beta)\left[1-\left((x/z)\right)^{\beta}\right]: \tag{12}$$

$$C_{\beta}=\frac{1}{\beta}\int_0^z\left[1-\left(\frac{x}{z}\right)^{\beta}\right]g(x)dx \tag{13}$$

which satisfies Sen's monotonicity axiom for all $\beta>0$. Both transfer-sensitivity axioms will be satisfied for all $\beta<1$. Chakravarty (1983) derived an index which is the same as βC_{β}

4. POLICY EXPERIMENTS FOR SIMULATIONS AND MODEL SPECIFICATIONS

4.1. Policy Experiments for Simulations

We used the model (CGE) to explore the impact of government policies on education and poverty reduction in Nigeria, using it as a simulation laboratory for investigating the economy wide consequences of alternative investment and growth scenarios. Our starting point is a dynamic base simulation which provides a benchmark against which the other scenarios are compared. We based the base simulations assumptions on annual percentage growth rates of the education sectors. The dynamic model will be validated, by comparing the base run to the country's historical path before any counterfactual experiment is performed. The base run is for the period 2004-2015. Constant growth rates are assumed for all exogenous variables over the simulation period. In this analysis, the information are summarized which are set of indicators, including data on macroeconomic growth, changes in the structure of production and trade, and the evolution of disaggregated household welfare and poverty.

In this study we assume that government demands across all functional areas grow at the same annual rate across all government functions. One policy experiment is carried out: In the experiment, government demand is reallocated to education; we raise the base-year expenditure on education by some percentages, as a share of GDP. This is to see, if intervention will have a positive impact on education in terms of meeting the MDG on education and poverty reduction

4.2. Model Specifications

Household Consumption Demand: Consumer demand is given by the linear expenditure system (LES), derived from a maximization of a Stone-Geary utility function subject to a spending constraint (Lofgren *et al.*, 2002). They take relevant prices (of outputs, factors, and intermediate inputs) as given, and markets are assumed to be competitive. The bulk of household incomes come from factors. They also receive dividends, government transfers and remittances. The main items on the household spending side are direct taxes, savings, and consumption. They pay direct income tax to the government. Household savings are a fixed proportion of total disposable income. Household demand is derived from a C-D utility function. The model includes 13,574 households from the household survey.

Household Consumption Expenditure

$$EH_h = \left(1 - \sum_{i \in INSDNG} shii_{ih}\right).(1 - MPS_h).(1 - TINS_h).YI_h, \quad h \in H \tag{14}$$

where $h \in H (\subset INSDNG)$ is a set of household,

EH_h is the household consumption expenditure

$shii_{ih}$ is the share of net income and

$TINS_h$ is the direct tax rate for institution *i.*

In equation (14) the total value of consumption spending is defined as the income that remains after direct taxes, savings, and transfers to other domestic non-government institution.

LES Consumption Demand by Household for Commodity

$$PQ_c.QH_{ch} = PQ_c.\gamma^m_{c\ h} + \beta^m_{c\ h}.\left(EH_h - \sum_{c'\in C} PQ_{c'}.\gamma^m_{c'\ h} - \sum_{a\in A}\sum_{c'\in C} PXAC_{ac'}.\gamma^h_{a\,c'h} \right) c\in C$$

$h \in H$ (15)

Where;

QH_{ch} is the quantity of consumption of marketed commodity *c* for household h

$\gamma^m_{c\ h}$ is the subsistence consumption of marketed commodity *c* for household

h, $\gamma^h_{a\,ch}$ is the subsistence consumption of home commodity *c* from activity *a* for household *h*, and

$\beta^m_{c\ h}$ is the marginal share of consumption spending on marketed commodity *c* for household *h*.

It is assumed that each household maximizes a "Stone-Geary" utility function subject to a consumption expenditure constraint. Consumption (consumer demand) is split across different commodities. Equation (15) also defines a one-period static. The resulting first-order condition, equation (15) is referred to as LES (linear expenditure system) function since spending on individual commodities is a linear function of total consumption spending, *EH*. Household consumption is modeled using a Les expenditure function

***Government*:** The government earns most of its incomes from direct and indirect taxes and spends it on consumption, transfers, investment, and interest payments (on its foreign and domestic debt). Real government demand (consumption and investment) is exogenously disaggregated by function.

Government Consumption Demand

$$QG_c = \overline{GADJ}.\overline{qg}_c, \quad c\in C \qquad (16)$$

Where;

QG_c is the government consumption demand for commodity,

$\overline{GADJ}$ is the government consumption adjustment factor (exogenous variable) and

$\overline{qg_c}$ is the base-year quantity of government demand

Government revenue: Government revenue is made up of tax revenue and other sources. The latter is exogenous in the model. Tax revenue is made up of import tariffs, direct and other indirect taxes.

$$YG = \sum_{i \in INSDNG} TINS_i.YI_i + \sum_{f \in F} tf_f.YF_f + \sum_{a \in A} tva_a.PVA_a.QVA_a + \sum_{a \in A} ta_a.PA_a.QA_a + \sum_{c \in CM} tm_c.pwm_c.QM_c.EXR$$

$$+ \sum_{c \in CE} te_c.pwe_c.QE_c.EXR + \sum_{c \in C} tq_c.PQ_c.QQ_c + \sum_{f \in F} YIF_{gov.f} + trnsfr_{gov.row}.EXR \quad (17)$$

where *YG* is government revenue. Total government revenue is the sum of revenues from taxes, factors, and transfers from the rest of the world.

Government Expenditure: Government expenditure is made up of expenditure on the goods in the economy and transfers to households. That is, government spends its revenue on consumption demand, investment, and interest payments (on its foreign and domestic debt).

$$EG = \sum_{c \in C} PQ_c.QG_c + \sum_{i \in INSDNG} transfr_{igov}.CPI \quad (18)$$

where *EG* is government expenditure.

Total government spending is the sum of government expenditure on consumption and transfers.

5. THE DATABASE OF THE MODEL

The model database, which captures the structural features of the Nigerian economy, consists of social accounting matrix (SAM), and projected values for labour force, population, poverty level, government demand policies, savings, and various elasticity parameters for functions specifying production, import demand, export supply, consumer expenditures, links between government investment, trade, and sectoral total factors productivity (TFP). The model used 2004 data of the Nigerian economy in simulation.

5.1. Macro and Micro Sam Description

The model database, which captures the structural features of the Nigerian economy, consists of social accounting matrix (SAM), and projected values for labour force, population, poverty level, government demand policies, savings, and various elasticity parameters for functions specifying production, import demand, export supply, consumer expenditures, links between government investment, trade, and sectoral total factors productivity (TFP).

Description of Macro SAM: The SAM is based on the data extracted from the 2004 input-out matrix of the National Accounts of Nigeria data (**CBN**, 2005; NBS, 2005), the Nigerian Statistical Fact Sheets on Economic and Social Development (NBS, 2006), Central Bank of Nigeria (CBN) (2004) and the CBN Statistical Bulletin (2004). The SAM has eight blocks. It is designed to analyze the links between government expenditure (both current and capital) policies on growth and poverty reduction in Nigeria. Recall that a SAM brings disparate data (including input-output tables, household surveys, production surveys trade statistics, national accounts data, balance of

payments statistics, and government budget information) into a unified framework (Lofgren *et al.*, 2003).

Description of Micro SAM: The Micro SAM is fractioned into 39 sectors including the total and the micro SAM was built by disaggregating the information in the macro SAM. The model has 13 activities and 13 commodities sectors. Four of these sectors are agriculture based, 1 mineral and 1 manufacturing sector and 7 services sectors including other service. The model has 6 institutions (3 households, government, saving-investments, and rest of the world), and 1 direct and 1 indirect taxes. The model used 4 factors of production, these are disaggregated into agricultural and non-agricultural labour and agricultural and non-agricultural capital. The model specifies 3 households categories disaggregated into rural, lower urban and higher urban.

5.2. Poverty Data

The experiment on poverty indicators were calculated using the representative-household (RH) approach in a separate poverty module. In this function, the within-group household distribution is specified by a lognormal frequency function. A poverty line of 791.10 Naira was used in this study. The poverty line was based on two-thirds of the average per capita expenditure (PCE) or 23,733 Naira this yielded estimates of 54.41%, 43.19% and 63.27% for national, urban and rural poverty incidence (P0) in the 2005 data set of the National Bureau of Statistic (NBS) Poverty Profile for Nigeria respectively. This poverty line is required to provide the minimum 2,900 calories per person per day. All persons with PCE less than this amount are considered poor. Those equal to or above are non-poor. A core poor (or extreme poverty) are defined as one-third of the average PCE of 11,867 Naira. All persons with PCEs between 11,867 and 23,733 Naira are considered moderately poor NBS (2005). Rural and urban areas are calibrated to exogenous poverty rates using a log standard error of 0.35 for all RHs (household groups in the model). In the calculation of poverty indicators for each experiments, the CGE model feeds the poverty module with simulated data for mean consumption and CPI for each RH Lofgren *et al.* (2003). The poverty measures are pre-programmed in the household module that is linked to the standard model. For poverty, the module covers the three measures of the Foster *et al.* (1984) proposed class of poverty measures, the head-count ratio (P0), Poverty gap ratio (P1) and severity of poverty (P2).

6. SIMULATION OF MODEL AND RESULT INTERPRETATIONS

In the computable general equilibrium (CGE) modeling framework, it is essential to establish a baseline scenario as a counterfactual for comparing the outcome of a policy shock. The indicators chosen to be important in calibrating the model and key assumption used in determining the base growth path (BGP) are presented in Table 1. We use the model to explore the impact of alternative policies on long-run growth and poverty in Nigeria. Our starting point is a dynamic base growth path (2004 data) which provides a benchmark against which the other scenarios are compared. We use this to project a growth path for Nigeria's economy for the period 2004-2015. The dynamic component of the model is calibrated to the annual growth rate of the Nigerian economy in order to

replicate the performance of the key economic indicators. The experiment is increasing government expenditure on education services and one alternative government expenditure scenario is carried out in this study .

Government expenditure comprises of government demand and transfers and investment to domestic institutions. In the base growth path, government demand (consumption and investment) grows at the same annual rate across all government functional areas by 6.92% per year, a rate that is calibrated to maintain the base-year absorption share for this demand category. The base-year (2004) shares are also maintained throughout the simulation period for the other parts of absorption, private investment and household consumption. Most real macro aggregates, including real household consumption, grow at annual rates of between 6.09% and 8.70%. This range of growth rates also holds for all aggregate production sectors except mineral products sectors. The endogenous annual rate of total factor productivity (TFP) growth is greater than zero (0.17). Given a high population growth rate of 2.83%, the economy shows a low per-capita income. However, the head-count poverty rate (P0) decreased from 65.60% in 1996 to 54.41% in 2004; this gave a point deviation of -11.19%, implying a reduction between that period.

Table-1. Assumptions of the Base Simulation

Macroeconomic indicators Base Simulation Assumptions, Base year, 2004			**Welfare indicators Base Simulation Assumptions**		
Items	Billion of Naira	Base Annual growth rates (%)	Household consumption per capita	Billion of Naira	Base Annual growth rates (%)
Total GDP (at factor cost)	8261.44	6.09	Rural income	1106.89	1.88
Absorption	8320.10	4.72	Urban lower income	494.01	2.21
Household consumption	7196.43	6.30	Urban higher income	1152.66	3.00
Government demand	1123.67	6.92	Average, all households	292.97	0.72
Investment	631.15	6.36	Rural	103.92	4.74
Gross fixed capital formation	1381.53	4.36	Urban	562.58	4.41
Exports	4358.23	7.51		Percentage point deviations from base year (2004) values	
Imports	4150.17	8.69	Poverty headcount (P0)		
Agriculture	2578.96	6.50	National	54.41	-11.19
Mineral products	2842.84	3.43	Rural	63.27	-5.93
Manufacturing industry	372.06	10.07	Urban	43.19	-15.01
Government services	471.66	10.85	Elasticity		-1.08

Other services	1999.43	8.20	Poverty gap (P1)		
Real exchange rate	100.00	-0.42	National	21.80	-14.00
Agric/non-agric terms of trade	100.00	-0.33	Rural	25.82	-10.08
Population	129.18	2.83	Urban	16.70	-18.90
Capital depreciation	47.40	10.05	Elasticity		-2.48
TFP index	100.00	0.17	Poverty severity (P2)		
Total factor income	8262.08	6.15	National	11.91	-8.79
Agric-Labour	56.23	4.20	Rural	14.06	-6.64
Non-Agric Labour	122.14	3.81	Urban	9.18	-11.42
Agric Capital	2619.79	2.63	Elasticity		-5.07
Non-Agric Capital	5439.91	1.77			

			Base year % share of Government Expenditure in Total GDP		
Ratios to GDP (%) base year 2004		Percentage point deviations from base year (2004) values	Priority Sectors	Billion of Naira	Base Annual Share of Govt. Expenditure in Total GDP (%)
Investment	7.64	2.43	Agriculture	49.95	0.60
Government expenditure	16.66	-0.99	Transport	15.05	0.18
Saving	15.87	1.80	Education	85.58.	1.04
Government saving	8.24	-0.63	Health	52.42	0.63
National poverty headcount (P0)	54.41	-11.19	Defence	85.05	1.10

Source: Author's Computations based on 2004 SAM data of the Nigerian economy; NSB-PPN, 2005, CBN Statistical bulletin, 2004 and Aigbokhan, 2000. Notes: All quantity annual growth rate variables are in real terms. Income variables are deflated by the consumer price index (CPI). The real exchange rate is price level deflated; the price index used is the CPI and households' consumption estimates are based on samples population and mean per capita expenditure (PCE). Poverty percentage point deviations are based on the base year (2004) and 1996 poverty figures.

The assumptions for the non-base simulations and the empirical total factors productivity (TFP) are presented in Tables 2 and 3. TFP linkage elasticities on which the elasticity parameters for our productivity functions are based, the elasticities in the model productivity functions have been scaled on the basis of the share of base-year economy represented by the activities or factors to which the productivity effect is directed. For example, if the empirical, economy-wide TFP elasticity for the public capital stock in agriculture is 0.2 and the agricultural activities represent one third of GDP at factor cost, then the elasticity used in the model function linking agricultural TFP to the public agricultural capital stock is 0.6.

The results of this study depend on the values of the different elasticities of government expenditure on economic growth, which were taken from literature as a result of many econometric

and data scanty problems in Nigeria, related to TFP linkage elasticities. For these reasons, it can be justified to use results on growth elasticities of government expenditure obtained from other studies, mainly through cross-country analysis. Thus, the elasticities used in the empirical assessment of government expenditure on poverty in Nigeria came from the empirical literature devoted to the determinants of economic growth at aggregate level and human capital development (Barro, 1997; Mundlak *et al*., 1997). Elasticities data are not specific to Nigeria only. Using these elasticities is appropriate if one believes that Nigeria's economy will adjust and respond to the same basic economic forces on education and health services, which will make her human capital more productive as we see in a cross-section of many other countries.

Table-2. Assumptions for Non-Base Simulation

Series Simulation name	Description of experiment
SIMEDU	shift in government expenditure from "other" to education services
Notes: In all government expenditure simulations, expansion or reallocation refers to a change in 2005 corresponding to 10% of 2004 government demands (or 1.36% of GDP). Starting from 2005, all government demand areas grow at a uniform annual real rate of 6.92%. Unless otherwise noted, we use elasticities . "other" are areas of government spending except for educaton.	

Table-3. Total Factors Productivity (TFP) Linkage Elasticity Parameters

Government expenditure category	TFP link elasticity value	Standard error of estimated elasticity	Linkage channel
Agriculture	0.052	0.024	TFP in agriculture
Education	0.211	0.044	Labour productivity in all sectors
Health	0.115	0.034	Labour productivity in all sectors
Defence	-0.182	0.034	TFP in all sectors
Transportation	0.021	0.021	TFP in trade services (strong effect); TFP in other non-mining sectors (weak effect)

Notes: Elasticity estimates and t statistics are based on Fan and Rao (2004). Their independent variables also include labour and private capital. Linkage channels are incorporated in the dynamic CGE model.

Tables 4 and 5 below, provide a summary of the simulation results. These simulations all involve reallocating government demand into alternative priority areas while keeping the real growth of total government demand constant. Unless otherwise noted, in year 2 (2005), 10% of total government expenditure is moved from what is classified as "other" (which has no productivity effects) into one priority area, that is, a reallocation that in the base year corresponds to 1.36% of GDP or 10% of government demand. After this, government demands in all functional areas grow at the same annual rate across all government functions (6.92%). All the non-base simulation

assumptions consider the impact of reallocating government demand into target areas on growth and poverty

Table-4. Government Expenditure, Education and Poverty Reduction Scenario: Macroeconomic and Sectoral Summary Results

	(Billion of Naira)	**Annual percentage growth rates (2004-2015)**	
Items	Initial Value (2004)	Base Growth Path (BGP)	SIMEDU
Total GDP (at factor cost)	8261.44	6.09	7.58
Absorption	8320.10	4.72	5.78
Household consumption	7196.43	6.30	7.94
Government demand	1123.67	6.92	6.92
Investment	631.15	6.36	7.68
Exports	4358.23	7.51	9.25
Imports	4150.17	8.69	10.01
Agriculture	2578.96	6.50	7.87
Mineral products	2842.84	3.37	5.15
Manufacturing industry	372.06	10.00	11.51
Government services	471.66	8.84	9.70
Other services	1999.43	8.20	9.95
Real exchange rate	100.00	-0.42	-0.20
Agric/non-agric terms of trade	100.00	-0.33	0.56
TFP index	100.00	0.17	0.83
Total factor income	8262.08	6.15	7.26
Agric-Labour	56.23	4.20	5.88
Non-Agric Labour	122.14	3.81	5.66
Agric Capital	2619.79	2.63	4.22
Non-Agric Capital	5439.91	1.77	3.02
Ratios to GDP (%)		Percentage point deviations from base year (2004) values	
Investment	7.64	2.43	1.05
Government expenditure	16.66	-0.99	-1.90
Saving	15.87	1.80	-0.09
Government saving	8.24	-0.63	1.38
National poverty headcount (P0)	54.41	-11.19	-22.32

Source: Computations from model simulations
Notes: All quantity variables are in real terms. Income variables are deflated by the consumer price index (CPI). The real exchange rate is price level deflated; the price index used is the CPI.

Macroeconomic effects: In 2004, government expenditure on education was higher than other priority sectors in the economy. In this experiment, government demand is reallocated to education, the GDP share of government expenditure on education expands from 1.04 to 2.40 (see Table 4). The empirical estimate of the linkage elasticity between TFP and expenditures on education is quite high (0.211). The results are impressive, annual growth in most macro aggregates increases approximately by above 1.20%. The annual growth rate of GDP goes from

6.09% in the base run 2004, to 7.58% in 2015; this represents an increase of 24.47% in the annual GDP growth, this result is impressive. The increase in government expenditure on education raised the TFP level by 66% for all productive sectors by 2015. The overall national poverty head-count (P0), poverty gap (P1) and poverty severity (P2) rate fall by 22.32, 24.83 and 10.34 percentage points respectively, much more than any of the other government expenditure scenarios. This represents 41.02%, decrease in poverty head-count level. This is not too far from achieving the millennium development goal (MDG) of reducing poverty by 50% in 2015. This implies that, the sector is highly significant for promoting economic growth and poverty reduction. The MDG target for Nigeria is to reduce the percentage of population living in relative poverty from 54.41% in 2004 to 21.40% in 2015.

Sectoral effects: At the sectoral level, the reallocation of government demand to education has much more positive impacts on all the sectors than any of the other government expenditure scenario. Agriculture, mineral products, manufacturing industry, government services, and other services annual growth rates increased by 1.37%, 1.78%, 1.51%, 0.86% and 1.75% in 2015 respectively (see Table 4).

Table-5. Government Expenditure, Education and poverty Reduction Scenario: Welfare and Poverty Indicators Summary Results

Household consumption per capita	**(Billion of Naira)**	**Annual percentage growth rates (2004-2015)**	
	Initial Value (2004)	Base Growth Path	SIMEDU
Rural income	1106.89	1.88	2.44
Urban lower income	494.01	2.21	2.96
Urban higher income	1152.66	3.00	4.56
Average, all households	292.97	0.72	2.32
Rural	103.92	4.74	4.89
Urban	562.58	4.41	5.97
Poverty headcount (P0)	Level (%)	Percentage point deviations from base year (2004) values	
National	54.41	-11.19	-22.32
Rural	63.27	-5.93	-10.31
Urban	43.19	-15.01	-18.04
Elasticity		-1.08	-1.25
Poverty gap (P1)	Level (%)		
National	21.80	-14.00	-24.83
Rural	25.82	-10.08	-14.71
Urban	16.70	-18.90	-19.30
Elasticity		-2.48	-2.28
Poverty severity (P2)	Level (%)		
National	11.91	-8.79	-10.34
Rural	14.06	-6.64	-8.98
Urban	9.18	-11.42	-11.48
Elasticity		-5.07	-4.25

Source: Computations from Model Simulations

Notes: Household consumption is real per capita consumption. Elasticities for P0, P1, and P2 are the ratios between the percent change in the poverty indicator (National poverty indicators) and the percent change in aggregate per capita consumption. Base growth path poverty percentage point deviations are based on the base year (2004) and 1996 poverty figures

Welfare and Poverty effects: Concerning the impacts on household welfare, we observed an overall increase in the rural, urban lower and the urban higher, per capita incomes annual growth rate of 0.55%, 0.75% and 1.56%; these represent an increase of 29.79%, 33.94% and 52% household welfare respectively. On poverty impact, the three measures of poverty decrease more for urban households than for rural households. The rural and urban poverty headcount rate (P0) declined by 10.30% and 18.04% percentage points respectively, these represent 16.28% and 41.77% decreases in rural and urban poverty respectively (see Table 5). The result shows that, government expenditure on education could be significant for poverty reduction. The growth elasticity for poverty reduction for Nigeria shows that, an increase of 1% in education services will reduce the national, rural and urban head-count poverty (P0) levels by 1.25%. It implies that, increasing government expenditure on education services has great impact on poverty reduction**.** The results show that the reduction in poverty level in the urban sector is not far from achieving the millennium development goal (MDG) of reducing poverty by 50%

7. THE POLICY IMPLICATIONS OF THE FINDINGS

The main finding of this study is that reallocating government expenditure particularly to education sectors will in the long-run lead to substantial growth of the economy (which have the largest measured returns to growth and poverty reduction) increase in welfare and decreases in poverty. The results show that, income distribution worsens, with greater gains among urban dwellers and the non-poor. The results of the paper have shown that additional investments in education can have very favourable impacts on poverty. It was found to have the largest impact on poverty reduction as well as a significant impact on productivity and on per capita income. In other words, investments in education could be regarded as a dominant strategy. In line with various studies on Nigeria, investment in Education will lead to sizeable increases in per capita income per Naira spent. These impacts will well determine the factor productivity in all the sectors of the economy. Therefore, increased expenditure in education should be a priority in all regions in Nigeria.

In the experiment carried out in the study, the results also show that greater impacts in terms of economic growth and poverty reduction could be expected from targeting government expenditure to both rural and urban economy. As in indicated in results, economic performance can be improved significantly when government resources are reallocated from unproductive areas to the different target areas, with the most positive over-all effects when education is targeted. For example, the reallocation of 10% of government expenditure (1.36% of GDP) from unproductive areas at the beginning of the period reduces the final-year overall poverty head-count, gap and severity rate by 22.32, 24.83,and 10.34 percentage points respectively, and raises the annual GDP

growth rate by 1.49%. looking at the result, although head-count poverty rate declines by 41.02%, the results for the base scenario show that Nigeria is unlikely to achieve the MDG target of halving poverty by 2015. The MDG target for Nigeria is to reduce the percentage of population living in relative poverty from 54.41% in 2004 to 21.40% by 2015 (FGN-MDG, 2005)

The results of this study have important policy implications. In order to achieve maximize economic growth and higher poverty reduction, in both rural and urban areas, government expenditure needs to be better prioritized. The Nigerian government should give priority to increasing its expenditure on education services. These types of expenditure not only have a large impact on poverty per Naira spent, but they also produce greatest growth in human productivity. Investing in human capital, particularly in urban Nigeria offers the highest return in terms of both growth and poverty reduction.

The public provision of education may be considered using rights-based and needs-based approaches. Owing to the limited resources of Governments in developing countries, the universal provision of education is almost impossible. However, basic education commands general support under a rights-based approach. The public provision (free or subsidized) of other education services should respond to the needs of marginalized and disadvantaged groups. Huge financial resources are needed in most countries of the region to expand education services and improve the quality. Shifting resources from low-productivity sectors, such as defence and general administration, to education can go some way towards meeting the need. In this respect, increasing government expenditure on education could generate more benefit for the country than focusing on transportation, agriculture, and defence sectors. Multiple channels of financing will also be required to raise sufficient resources, including both public and private sources, communities, non-governmental organizations, bilateral donors and multilateral organizations. All these channels are essential in the growth of the education sector.

Further more, given the current concerns about reducing poverty and meeting the Millennium Development Goal through the NEEDS (1&2) policy agenda in Nigeria, it can be argued that providing the people with the necessary education would be a useful investment and a good mechanism for the realization of their empowerment to meet this proposed goal. With an enhancement in their human capital, they will be better equipped to participate in a more productive way in the labour market and increase their productivity in their respective sectors. The implication of this is that as more people get quality education and acquire more skills, they will increase their employability in the formal labour market, with favourable impacts on their perceptions on poverty.

8. CONCLUSIONS

The main objective of this paper was to evaluate the impact of government expenditure on education and poverty reduction in Nigeria. When designing strategies aimed at accelerating education and poverty reduction in Nigeria, it is particularly important to understand the links between government expenditures, education and poverty reduction. We developed a model, a

dynamic recursive CGE-MS model that incorporates these links and includes the minimum household detail needed to analyze distributional impacts and applied it to the Nigerian economy over the period 2004-2015.

From this research perspective, our results show that the analysis of government expenditure, growth, poverty and income distribution are best analyzed in a computable general equilibrium microsimulation framework, given the economy-wide nature and strong equilibrium effects they imply. CGE-MS models are best suited to capture the welfare effects of policy changes within the economy since they take into account interactions and interdependencies within the economy. This study has provided both theoretical and empirical knowledge about the extent and structure of using a computable general equilibrium microsimulation model to examine the impact of government expenditure policy on growth and poverty reduction.

To ascertain the impact of government expenditure, we rely on econometric estimates of linkages between TFP growth and government expenditure in different functional areas, while the results depend on the values of the different elasticities of government expenditure on education which are taken from literature. The path generated by a recursive expansion of the economy shows that accumulation effects captured by our model contribute to a substantial growth of the education, increase in welfare and decrease in poverty. Our base growth path projects a continuation of past trends in factor accumulation and TFP growth, with only modest aggregate GDP growth and some increase in per-capita household consumption and decrease in the headcount poverty rate over the period 2004-2015.

In sum, the results of the simulation experiments indicate that it will be difficult for Nigeria to achieve the Millennium Development Goal (MDG) target in terms of poverty reduction by 2015, because the policy measure in our analysis is unable to meet the goal. However, the decomposition of the results shows that the re-allocation of government expenditure to the education sector contribute significantly to growth and to be the best option to poverty reduction. In this case, the results of experiments show that more targeting government expenditure towards improving education services will foster economic growth and then reduce the poverty level. although poverty declines, the results for the base scenario show that Nigeria is unlikely to achieve its MDG of halving poverty by 2015. The findings suggest that if Nigeria is going to substantially reduce poverty, then future economic growth has to be pro-poor and in the absence of very rapid growth, which requires a gross domestic product (GDP) over ten percent of an annual rate. The current pro-poor policies outlined in the NEEDS will not enable Nigeria to reach its Millennium Development Goal (MDG) of halving poverty by 2015.

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