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Government Expenditure on Health, Economic Growth and Long Waves in A CGE Micro-Simulation Analysis: The Case of Nigeria

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Abstract

This paper analyses the dynamic direct and indirect effects of government policy on health and its relation to the cyclical economic growth in the long run. The main objective is to simulate if government expenditure on health would help to improve economic performance in Nigeria in long run. The paper provided a brief structure of government expenditure on health in Nigeria, growth profile for Nigeria and a brief review of theoretical literature, as well as new empirical evidence on the relationship between government expenditure on health and growth. The paper used an integrated sequential dynamic computable general equilibrium (CGE) model to examine the potential impact of increase in government expenditure on health in Nigeria. The model is calibrated with a 2004 social accounting matrix (SAM) data of the Nigerian economy. The result shows that the re-allocation of government expenditure to health sector is significant in explaining economic growth in Nigeria. This paper therefore recommends that in order to achieve a steady economic growth, investment in health services should also receive great attention in the public investment portfolio. The policy implication of the paper is that, the Nigerian government should be able to move resources from other sectors to provide quality health for her citizens.

Keywords: Public Expenditure, Health, Economic Growth**,** CGE

1. Introduction

The size of Government and its impact on economic growth has emerged as a major public choice issue facing economies in transition. Previous research focused predominantly on size of Government in industrialised countries. However, given the openness of most LDC's, trade dependency and the vulnerability to external shocks, the role and size of Government become germane to adjustment and stabilisation programmes. The challenge to economists is to find remedies that will close the gap by raising the growth rates of poor countries and useful prescription depends on accurate diagnosis. The question is why has the growth performance of poor countries been so disappointing? Among the many causal factors that economists have proposed, poor health stands out as a likely candidate (Howitt, 2005). Improving the health of people is not only a goal in itself for a better quality of life but also its positive impact on the economic development of a country is far-reaching. The provision of health is a

key element of a policy to promote broad-based economic growth. The main asset of the poor is clearly their labour and health services improve the productivity and earnings of workers (Rebelo, 1991).

The importance of government expenditure in the process of human development is not only improving education also improving the health of people. Health status is conventionally measured by life expectancy at birth, and by child and infant mortality. Neither of these measures reflects the extent of morbidity. Health indicators (nutrition, mobility, morbidity and height) are positively correlated with education (Sackey, 2005; Cochrane 1986, 1988). The provision of health is a key element of a policy to promote broad-based economic growth. The main asset of the poor is clearly their labour health services improve the productivity and earnings of workers. The burden of diseases such as HIV/AIDS can slow the economic growth of developing countries. Health is important tools to empower poor people and overcome exclusion based on gender, location and other correlates of poverty.

It is increasingly being recognized that simply allocating greater public resources to basic health services is not enough to ensure that quality services are made available to the vast majority of poor citizens in the developing world. The impact of public spending on actual services in health service delivery depends critically on existing institutions and incentives in the public sector. In recent years, public revenues in Nigeria have increased substantially due to the boom in world oil prices, and some of this windfall is being channeled into increased spending on primary health care. There remains a concern whether the institutions of public accountability in the country will effectively allow these large spending programs to translate into improved services. 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 human development achievement in Nigeria where oil export boosted the GDP, human development has continued to decrease since 1981(Gupta et al, 2003). The main objective is to simulate if government expenditure on health would help to improve economic growth in Nigeria by 2015.

The structure of the paper is as follows. After, the introductory part, a brief literature (theoretical and empirical literature) is reviewed in section 2. Section 3 is theoretical framework, while analytical framework and model specification is presented in section 4. The model database and model simulation and analysis of results are discussed in section 5 and 6 respectively. Section 7 is the findings and policy implication, while 8 concludes with a brief.

2. Literature Review

The role of human capital in fostering economic development is well recognized in the growth literature. Following Romer (1986) and Lucas (1988), human capital has been identified not only as a key determinant of growth, but as critical for human development more generally. Different theories of economic growth produce different answers to the question of how health conditions affect a country's per-capita GDP over time (Barro, 1996). For example, the neoclassical growth theory of Solow (1956) and Swan (1956) imply that in the long run only the level of per-capita GDP will be affected, not the growth rate, which is determined by the global rate of technological progress. The first generation of endogenous growth models, in which the rate of technological progress varies from country to country depending on local economic conditions, predicts a permanent effect on the growth rate. The growing focus on the Millennium Development Goals (MDGs) has further highlighted the importance of making tangible progress in indicators of human capital measured on the basis of key education and health indicators (MDG, 2008; Howitt, 2005)

Despite the interlinkages between human capital and growth, most empirical studies have employed reduced-form equations that do not capture feedback effects. The literature often focuses on only one segment of the social spending-social indicators-growth nexus. That is, it either analyzes the growth effects of improving education or health indicators, or the impact of public spending on these indicators. The empirical literature on the effects of health capital on growth is relatively thin. Conceptually, a healthy person can not only work more effectively and efficiently but also devote more

time to productive activities. Based on microeconomic evidences, Strauss and Thomas (1998) argue that health explains the variations in wages at least as much as education. Research at the macro level can better capture the potential externalities of health sector interventions and the existing studies are supportive of the positive contribution of health capital to growth. Bloom and Canning (2003, 2004) and Gyimah-Brempong and Wilson (2004) find that health capital indicators positively influence aggregate output. They find that about 22 to 30 percent of the growth rate is attributed to health capital, and improvements in health conditions equivalent to one more year of life expectancy are associated with higher GDP growth of up to 4 percentage points per year.

Similarly, a number of studies find that the contribution of health spending to health status—as measured by infant mortality or child mortality—is either small or statistically insignificant (Musgrove, 1996; Pritchett,1996; Filmer and Pritchett, 1997 and Filmer et al, 1998). In contrast, Gupta and others (2003) find a positive relationship between public spending on health care and the health status of the poor. As key pillars in forming human capital, education and health are interlinked in their contribution to growth. Higher levels of education increase public awareness and the capacity of families to address their own health needs. At the same time, better health enhances the effective and sustained use of the knowledge and skills that individuals acquire through education (Schultz, 1999).

Barro (1996b) further argues that better health can reduce the depreciation of education capital, and thus increases the favorable effect of education on growth. Few studies, however, have examined social spending, social indicators, and growth in an intergrated system. Some cross-country evidence suggests that total public spending on health has had a surprisingly low impact on average health services, relative to other socio-economic characteristics such as income per-capita and female education (Musgrove, 1996). New empirical evidence that the impact of public spending on basic health services depends upon the overall governance environment provides an important explanation for the observed weak relationship between public spending and services. Rajkumar and Swaroop (2002) find that greater public spending on health significantly lowers child and infant mortality rates only in countries with good governance, as measured by lower corruption and quality of the bureaucracy.

Considerable attention has been paid to how much health and education has been targeted to the poor. "Expenditure incidence analysis" is part of many World Bank poverty assessments (e.g., for Nigeria), and World Bank research has clearly shown that most health and education subsidies, although they are progressive and reduce inequality, are not well targeted to the poor (World Bank, 1990). Evidence now exists at least for Côte d'Ivoire, Ghana, Guinea, Kenya, Madagascar, Malawi, South Africa, Nigeria, Tanzania and Uganda (van der 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.

Further, 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. However, despite increase in government health and education spending in recent decades as shares of both GDP and total government spending, human capital investments, particularly in Sub-Saharan Africa, are performing poorly with low school enrollments and growth child labour often performed at the expense of education and inadequate health

3. Theoretical Framework

Health Outcome Determination

Production of Health Services

Health services (*Hs)* – such as infant and child mortality, longevity and the prevalence of disease– for individuals are a function of personal and environmental circumstances (*PC* and *EC*) and of individuals' use of health care (*HC)* (Roberts, 2003).

$$HO_i = f\,(PC_i,\ EC_I,\ HC_I) \quad (1)$$

Personal (and household) circumstances include income (y), asset holdings and other forms of insurance (*A*), knowledge of good nutrition and health maintenance practice (k), and genetic predisposition to illness. Girls' education (*e*) contributed powerfully to the application of relevant knowledge in the household. Genetic factors are mostly unobservable, leaving income, assets/insurance and knowledge as the main measurable factors.

$$PC_i = f(\ y_i,\ A_i,\ k_I(e)) \quad (2)$$

Environmental circumstances include climate (*CLIM*), access to clean water and sanitation (*WAT*) and the prevalence of and exposure to communicable diseases (*DIS*), many of which are susceptible to public and community policy interventions (PE_{env}) (eg pollution control, provision of water, drainage and solid waste removal, and control of communicable diseases and their vectors).

$$EC_I = f(CLIM,\ WAT(PE_{env}),\ DIS(..)) \quad (3)$$

The prevalence of communicable disease is controlled by public expenditure to eliminate the vectors of disease (PE_{vec}) and to vaccinate the population (PE_{vac}). Vector control and immunization both have strong public goods characteristics. They are neither 'rival' (consumption by one person does not prevent consumption by another) nor can potential beneficiaries be excluded from their benefits. Action to prevent or cure communicable disease also has significant positive external benefits in reducing the prevalence of disease, and thus in improving health services.

$$DIS = f(PE_{vec},\ PE_{vac},\ PE_{env},\ HO) \quad (4)$$

Supply and Demand for Health Care

The use made of health care facilities and supplies depends on supply and demand. The quantity and quality of supply of health care by the private sector depends on average local household income (Y) (given that private practitioners offer services tailored to the purchasing power of their potential patients), on prices paid for medical attention (p_{pvt}) and on providers' qualifications (q_{pvt}).

$$HC^s_{pvt} = f(Y,\ p,\ q_{pvt}) \quad (5)$$

Supply by the public sector depends on the amount of public expenditure devoted to providing health care, its geographical distribution and distribution between different income groups and different kinds of medical intervention, and on the cost-effectiveness and quality of provision.

$$HC^s_{pub} = f(PE_{hc},\ d,\ e,\ q_{pub}) \quad (6)$$

Where *d* is a geographic distribution vector, *e* an index of cost-effectiveness, and q_{pub} an index of quality.

In many circumstances private and public supplies of health care services are close substitutes for each other. Traditional healers and local pharmacists are used by poor people in places where public primary health care centres are under-supplied or under-staffed, just as private hospitals offer sophisticated treatments which are not available in public hospitals.

Individual or household demand for health care is a function of personal/household incomes and assets/insurance, of the prices of and other costs associated with receiving medical attention and supplies from the private and public sectors, of knowledge about health maintenance, and of household characteristics (e.g. age structure) (*z*).

$$HC^d_i = f(y_i,\ A_i,\ p_{pvt},\ p_{pub},\ k_i,\ z_i) \quad (7)$$

If public and private health care are close substitutes movements in the relative price of the two sources of supply (or more accurately, their cost to users, including the opportunity cost of time, transport costs etc) will cause customers to shift significantly between the two. Increases in public

supply will not necessarily give rise to higher consumption of health care. If on the other hand there are no close private sector substitutes for publicly provided health care facilities, increases in provision by the public sector are likely to give rise to additional use, provided that the services are accessible and appropriate to patients' felt needs. For non-urgent, routine, low-cost, interventions the private sector is more likely to offer a service, giving rise to high elasticity of substitution with public supply. The public-private elasticity of substitution is likely to be low in the case of emergency, unusual and higher-cost forms of care and treatment (Roberts, 2003.

Public Expenditure Budget

Public expenditure on health and other relevant services is subject to a budget limit or constraint:

$$PE = PE_{hc} + PE_{vec} + PE_{vac} + PE_{env} \quad (8)$$

Public Policy Objective

The public sector's policy objective in the health sector can be schematically represented as maximizing positive health services subject to this budget constraint, and to behavioural and uncontrollable variables:

$$Max: HO_i = f(PC_i, EC_I, HC_I) \quad (9)$$

Subject to:

$PE = PE$ (budget constraint)

$Y, y, CLIM, A, k$ (predetermined and uncontrollable)

$HC_i^d = f(y_i, A_i, p_{pvt}, p_{pub}, k_i, z_i)$ (behavioural)

$HC^s_{pvt} = f(Y, p, q_{pvt})$

$HC^s_{pub} = f(PE_{hc}, d, e, q_{pub})$

The first order conditions for welfare maximisation are:

In other words, the effect of public expenditure on health services is always indirect. It may act positively through its effect on:

$$\frac{dHO}{dPE} = \frac{\partial HO}{\partial PC}.\frac{\partial PC}{\partial PE} + \frac{\partial HO}{\partial EC}.\frac{\partial EC}{\partial PE} + \frac{\partial HO}{\partial HC^s_{pub}}.\frac{\partial HC^s_{pub}}{\partial PE} + \frac{\partial HO}{\partial HC^s_{pvt}}.\frac{\partial HC^s_{pvt}}{\partial HC^s_{pub}}.\frac{\partial HC^s_{pub}}{\partial PE} \quad (10)$$

- households' personal characteristics, e.g. education, knowledge about health and hygiene,
- households' environmental circumstances – water, drainage, infestation
- the supply of health services by the public sector.

It may also act negatively if the provision of health services in the public sector causes a contraction in the supply of health services by the private sector (Roberts, 2003)

4. Description of Policy Experiments and Model Specifications

4.1. Description of Policy Experiments (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 paper we assume that government demands across all functional areas grow at the same annual rate across all government functions. Two policy experiments are carried out:

i. In the first experiment, government demand is reallocated to health; we raise the base-year expenditure on health by some percentages, as a share of GDP. This is to see, if intervention will have a positive impact on macroeconomic and sectoral variables.
ii. In the second experiment, government demand is reallocated to health; we raise the base-year expenditure on health by some percentages, as a share of GDP, *with the aggregate TFP elasticity of education.* This is to see, if intervention will have a higher positive impact on macroeconomic and sectoral variables (see Table 3)

4.2. Model Specifications

Production Activities: The production activities within-period module defines a one-period, static CGE model (Lofgren et al, 2002). At the top of the nest, output is a Leontief or constant elasticity of substitution (CES) function of aggregates of valve-added and intermediate inputs. At the bottom, aggregate value-added is a CES function of primary factors whereas the aggregate intermediate inputs are Leontief functions of disaggregated intermediate inputs. This permits us to utilize data from the Nigerian input-output matrix without unduly restricting the range of substitution possibilities.

CES Technology: Activity Production Function is defined by equation 11. Output is a Leontief or constant elasticity of substitution (CES) function of aggregates of value-added and intermediate inputs

CES Technology: Activity Production Function

$$QA_a = \alpha_a^a . \ell_a^a . QVA^{-\rho_a^a} + (1-\delta_a^a) . QINTA^{-\rho_a^a})^{-\frac{1}{\rho_a^a}}, \quad a \in ACES \tag{11}$$

Where;

$a \in ACES (\subset A)$ is a set of activities with a CES function at the top of the technology nest

α_a^a is the efficiency parameter in the CES activity function

δ_a^a is CES activity function share parameter and

ρ_a^a is CES activity function exponent.

Commodity Activities: Output Transformation (CET) Function: - Equation 13 is the CET function, applies to commodities that are both exported and sold domestically

Disaggregated Intermediate Input Demand

$$QINT_{ca} = ica_{ca} . QINTA_a, \quad a \in A \quad c \in C \tag{12}$$

where $QINT_{ca}$ = quantity of commodity *c* as intermediate input to activity *a*

Output Aggregation Function

Where;

α_c^{ac} is the shift parameter for domestic commodity aggregation function

$\delta_{a\ c}^{ac}$ is the share parameter for domestic commodity aggregation function and

ρ_c^{ac} is the domestic commodity aggregation function exponent.

Output Transformation (CET) Function

$$QX_c = \alpha_c^t . \ell_c^t . QE_c^{\rho_c^t} + (1-\delta_c^t) . QD_c^{\rho_c^t})^{\frac{1}{\rho_c^t}}, \quad c \in (CE \cap CD) \tag{13}$$

Where;

α_c^t is a CET function shift parameter

δ_c^t is a CET function share parameter

ρ_c^t is a CET function exponent

The CET function which applies to commodities that are both exported and sold domestically, is identical to a CES function except for negative elasticities of substitution. The elasticity of transformation between the two destinations is a transformation of ρ_c^t, for which the lower is one

Factors Demand: For primary factors demanded by production activities, aggregate supplies are fixed. For each factor, an economy-wide wage variable adjusts endogenously to clear the market, equating the quantity demanded with the quantity supplied. Each activity pays an activity-specific wage that is the product of the economy-wide wage and a fixed, activity-specific wage (distortion) term

CES Factor Demand for Factor from Activity

$$WF_f.\overline{WFDIST}_{fa} = PVA_a(1-tva_a).QVA_a.\left(\sum_{f\in F}\delta_{fa}^{va}.QF_{fa}^{-\rho_a^{va}}\right)^{-1}.\delta_{fa}^{va}.QF_{fa}^{-\rho_a^{va}-1} \quad ,a\in A\,,f\in F \qquad (14)$$

Where; $f \in F$ is a set of factors

tva_a is the rate of value-added tax for activity a

a_a^{va} is the efficiency parameter in the CES value-added function

$\delta_{f\ a}^{va}$ is the CES value-added function share parameter for factor f in activity a

$QF_{f\,a}$ is the quantity demanded of factor f from activity a

ρ_a^{va} is the CES value-added function exponent

WF_f is the average price of factor and

$\overline{WFDIST}_{fa}$ is the wage distortion factor for factor f in activity a (exogenous variable)

Investment Demand for Commodity

$$QINV_c = \overline{IADJ}.\overline{qinv}_c \qquad (15)$$

where

$QINV_c$ is the quantity of fixed investment demand for commodity

$\overline{IADJ}$ is investment adjustment factor (exogenous variable) and

$\overline{qinv}_c$ is the base-year quantity of fixed investment demand

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

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

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 spending on consumption and transfers.

5. The Model Database

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 is calibrated with 2004 data of the Nigerian economy.

Macro SAM Description: The SAM is based on the data extracted from the 2004 input-out matrix of the National Accounts of Nigeria data (NBS, 2005; CBN, 2005).), the Nigerian Statistical Fact Sheets on Economic and Social Development (NBS, 2006), CBN Annual Report and Statement of Accounts (2004) and the CBN Statistical Bulletin (2004). It 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).

Micro SAM Description: The Micro SAM is disaggregated to 39 sectors including the total. 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 categories disaggregated to agricultural and non-agricultural labour, and agricultural and non-agricultural capital. The model identifies 3 households categories disaggregated to rural, lower urban and higher urban. The micro SAM was built by disaggregating the information in the macro SAM.

6. Model Simulation and Analysis of Results

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 or 'between-period' 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. Two alternative government expenditure scenarios are carried out in this paper. The experiments (including a sensitivity experiment) are increasing government expenditure on health services.

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.

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 paper 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). They are not specific to Nigeria. 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 1: Macroeconomic Base Simulation Assumptions, Base year, 2004

Items	Billion of Naira	Base Annual growth rates (%)	Ratios to GDP (%) base year 2004		Percentage point deviations from base year (2004) values
Total GDP (at factor cost)	8261.44	6.09	Investment	7.64	2.43
Absorption	8320.10	4.72	Government expenditure	16.66	-0.99
Household consumption	7196.43	6.30	Saving	15.87	1.80
Government demand	1123.67	6.92	Government saving	8.24	-0.63
Investment	631.15	6.36			
Gross fixed capital formation	1381.53	4.36			

Table 1: Macroeconomic Base Simulation Assumptions, Base year, 2004 - continued

Exports	4358.23	7.51	**Base year % share of Government Expenditure in Total GDP**		
Imports	4150.17	8.69	**Priority Sectors**	**Billion of Naira**	**Base Annual Share of Govt. Expenditure in Total GDP (%)**
Agriculture	2578.96	6.50	Agriculture	49.95	0.60
Mineral products	2842.84	3.43	Transport	15.05	0.18
Manufacturing industry	372.06	10.07	Education	85.58.	1.04
Government services	471.66	10.85	Health	52.42	0.63
Other services	1999.43	8.20	Defence	85.05	1.10
Real exchange rate	100.00	-0.42			
Agric/non-agric terms of trade	100.00	-0.33			
Population	129.18	2.83			
Capital depreciation	47.40	10.05			
TFP index	100.00	0.17			
Total factor income	8262.08	6.15			
Agric-Labour	56.23	4.20			
Non-Agric Labour	122.14	3.81			
Agric Capital	2619.79	2.63			
Non-Agric Capital	5439.91	1.77			

Source: Author's Computations based on 2004 SAM data of the Nigerian economy; NSB-PPN, 2005, CBN Statistical bulletin, 2004. 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

Table 2: Assumptions for Non-Base Simulation

Simulation Name	Description
SIMHEAL1	shift in government expenditure from "other" to health services
SIMHEAL2	shift in government expenditure from "other" to health with the aggregate TFP elasticity of education

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 health.

Table 4 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 health, 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.

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 the 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.

Analysis of Simulation Results

In 2004, the allocation of government expenditure on health was similar in size to agricultural expenditure. In this experiment, government demand is reallocated to health, in 2005 raising base-year expenditure on health as a share of GDP from 0.63% to 1.99% (see Table 1). Given a higher elasticity, this intervention also has a significant (moderate) impact on overall economic growth and sectoral performance. The expected increase in government expenditure on the health sector will raise the long-run TFP level by 0.40 on annual percentage growth rates for all sectors by 2015 (Table 4 SIMHEAL1).

Macroeconomic Effects: On the macroeconomic effects of the health scenario, the results show that the government expenditure on health is significant for economic growth. The annual percentage growth rate in most macroeconomic aggregates increases by 0.40% approximately. As expected, due to the presence of accumulation effects in the long-run, the real annual real GDP growth goes from 6.09% in the base run 2004, to 6.92% in 2015. This represents an increase of 13.64% over the base growth path (BGP) in the annual GDP growth, this is not too impressive. Total absorption (the sum of private consumption, government consumption, and investment) witnessed an increase of 11.02%. Other macro aggregate components also showed positive increases, the terms of trade for agriculture relative to non-agriculture witnessed 0.86 annual percentage growth rate, while investment recorded 10.34% over BGP and household consumption was 8.41% over BGP. The results show that, in the long run, the import sector declined and the export sectors expand (see Table 4 SIMHEAL1).

Sectoral Effects*:* At the sectoral level, the reallocation of government demand to health has positive impacts on all the activity sectors; namely, government services (which include education, health and public administration), agriculture, mineral products and manufacturing sectors. The reallocation effects among these sectors are determined by the change in value-added price. The results indicate that resources will move towards the mineral products sector in the long- run. Variations in value added prices influence the capital rental rate and labour wage rates. With the health simulation scenario, government services sectors registers positive growth in the long runs due to changed government health investment. The results show that government services sectors will increase by 0.40 annual percentage growth rate or 3.69% over the BGP in 2015 compared to the base growth path. The result shows that the mineral products sectors benefits most (22.7% over the base growth path) followed by agriculture production sectors (14.0% over the base growth path). Manufacturing sectors have the least benefit (8.64% over the base growth path) (see Table 4 SIMHEAL1).

We look at the sectoral impact on factors of production, total factor income increase for all type of factors with agricultural labour and non-agricultural labour benefiting less (21.4% and 28.8%, respectively, over the base growth path). Non-agricultural capital benefiting the most (55.9% for non-agricultural capital compared to 47.9% for agricultural capital over the base growth path), all these will increase the demand for Non-agricultural capital and this will raises capital rental rate (see Table 4 SIMHEAL1)

Table 4: Government Expenditure on Health, Economic Growth and Long Waves Scenario: Macroeconomic and Sectoral Summary Results

Household consumption per capita	**(Billion of Naira)**	**Annual percentage growth rates (2004-2015)**		
Items	**Initial Value (2004)**	**Base Growth Path**	**SIMHEAL1**	**Sensitivity Analysis SIMHEAL2**
Total GDP (at factor cost)	8261.44	6.09	6.92	7.35
Absorption	8320.10	4.72	5.24	5.74
Household consumption	7196.43	6.30	6.83	7.56
Government demand	1123.67	6.92	6.92	6.92
Investment	631.15	6.36	7.02	7.38
Exports	4358.23	7.51	8.06	8.84
Imports	4150.17	8.69	8.45	8.64
Agriculture	2578.96	6.50	7.41	7.89

Table 4: Government Expenditure on Health, Economic Growth and Long Waves Scenario: Macroeconomic and Sectoral Summary Results - continued

Mineral products	2842.84	3.43	4.21	4.84
Manufacturing industry	372.06	10.07	10.94	11.18
Government services	471.66	10.85	11.25	11.31
Other services	1999.43	8.20	8.98	9.78
Real exchange rate	100.00	-0.42	-0.41	-0.15
Agric/non-agric terms of trade	100.00	-0.33	0.53	0.32
TFP index	100.00	0.17	0.57	0.91
Total Factor Incomes	8262.08	6.15	6.85	7.25
Agric-Labour	56.23	4.20	5.10	5.25
Non-Agric Labour	122.14	3.81	4.91	5.23
Agric Capital	2619.79	2.63	3.89	4.96
Non-Agric Capital	5439.91	1.77	2.76	3.10
Ratios to GDP (%)	**Percentage point deviations from base year (2004) values**			
				Sensitivity Analysis Values
Investment	7.64	2.43	1.83	1.29
Govt. Expenditure	16.66	-0.99	-0.91	-2.40
Saving	15.87	1.80	-0.20	-0.23
Government saving	8.24	-0.63	1.31	1.34

Source: Computations from Model Simulations

Sensitivity Analysis of Simulation Results: Macroeconomic and Sectoral Effects

This simulation explores the sensitivity of the results to alternative values for models parameters that are particularly uncertain and may be important in the context of the current set of simulations; productivity elasticities and linkages. We did one additional simulation to analyze the sensitivity of the results to changes in government expenditure elasticities. The result is summarized in Table 4 column SIMHEAL2 scenario. We set the productivity elasticities for government investment in health at the level of the education elasticity, that from 0.115 to 0.211 (see Table 3). The estimated TFP linkage elasticities for government expenditure on SIMHEAL2 scenario, which is the reallocation of expenditure in favour of health with an adjustment in the productivity elasticities to reflect the assumption that the aggregate productivity gain is solely channeled through a productivity.

The result shows in Table 4 shows that SIMHEAL2 scenario yields dramatically improved economic performance than SIMHEAL1. For example, the annual GDP growth rate rises from 6.09% in the base growth path to 7.35% in 2015, this represents an increase of 20.69% over the base growth path (BGP) in the annual GDP growth, and this is very impressive. The long-run TFP level raised by 0.74 by annual percentage growth rate for all sectors by 2015, with these values for the TFP linkage elasticities, a health-led development strategy would be very interesting

7. Findings and Policy Implication

The main findings of this paper is that reallocating government expenditure to health sectors will in the long-run lead to substantial growth of the economy. The results also show that greater benefits in terms of economic growth can be expected from targeting public expenditure to health services. As in indicated in results, economic performance can be improved significantly when government resources are reallocated from unproductive areas to the health, with a positive over-all effects. From the results, the reallocation of 10% of public expenditure (1.36% of GDP) from unproductive areas at the beginning of the period increase the annual growth rate of GDP goes from 6.09% in the base run 2004, to 6.92% in 2015, an increase of 0.83%. It implies that, increasing public expenditure on health services also has positive effect on macroeconomic and sectoral performances.

In another simulation, we reallocated public expenditure to health, utilizing empirical estimates of the TFP linkage elasticity of health expenditure. On a cautionary note, these results are very sensitive to the values of the various elasticities linking total factor productivity (TFP) growth to public expenditure.

The results of this study have important policy implications. In order to achieve maximize economic growth public expenditure needs to be better prioritized; investing in health offers high return in terms of growth. The Nigerian government should give priority to increasing its expenditure on health 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. The implication of this is that as more people get good health, they will increase their productivity at work. It is important, however, to ensure that the investment in health is sustained, this will drastically increase growth.

The public provision of health may be considered using rights-based and needs-based approaches. Owing to the limited resources of government in developing countries, the universal provision of health is almost impossible. However, basic health commands general support under a rights-based approach. The public provision (free or subsidized) of other health services should respond to the needs of marginalized and disadvantaged groups. Huge financial resources are needed in most countries of the region to expand health services and improve the quality. Shifting resources from low-productivity sectors, such as defence and general administration, to health can go some way towards meeting the need. In this respect, increasing public expenditure in health could generate more benefit for the country than focusing only 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-government organizations, bilateral donors and multilateral organizations. An integrative approach using multiple sources is recommended for the provision of health services and future increases should be geared to improving the efficiency of existing public health-care systems.

8. Conclusion

The main objective of this paper was to evaluate the impact of government expenditure on health, in order to better target the available resources to achieve higher economic growth. This paper has provided both theoretical and empirical knowledge about the extent and structure of government expenditure on health and growth, using a computable general equilibrium microsimulation model to examine the impact of government expenditure policy on health and growth in Nigeria. We used a dynamic recursive CGE-MS model that incorporates these links to simulate the impact on growth and targeting health and applied it to the Nigerian economy over the period 2004-2015. 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 economy. Our base growth path projects a continuation of past trends in factor accumulation and TFP growth, with only modest aggregate GDP growth over the period 2004-2015. The government investment on health scenarios considered showed improved economic performance compared to the base growth path.

From this research perspective, our results show that the analysis of government expenditure on health and growth, 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 policy changes within the economy since they take into account interactions and interdependencies within the economy.

To ascertain the impact of public 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 health 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 health. Our base growth path

projects a continuation of past trends in factor accumulation and TFP growth, with only modest aggregate GDP growth over the period 2004-2015. The decomposition of the results shows that the re-allocation of government expenditure to the health sector appears to contribute significantly to growth. In this case, the results of experiments show that more targeting government expenditure towards improving health services will foster economic growth.

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