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INCREASE IN VALUE ADDED TAX ON HOUSEHOLD WELFARE IN NIGERIA: A COMPUTABLE GENERAL EQUILIBRIUM APPROACH

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Abstract

The fiscal action adopted by the Nigerian government to cut its deficit and increase domestic earnings through VAT reform is a matter of concern. This study analysed the effect of an increase in VAT on household welfare in Nigeria using Computable General Equilibrium Model for the 2018 base year which was calibrated on the reformatted Social Accounting Matrix of Nigeria. Results revealed that increase in VAT will constitute household welfare loss in Nigeria as indicated by the negative value of Equivalent Variation of -3131.30 which will lead to a fall in household consumption and income by 7.14% and 3.54 respectively due to the high price of products. The study concluded that the VAT policy will undesirably affect household welfare and therefore, the study recommends that the government should consider the reversal of the VAT reform and expand the base.

Keywords: Value Added Tax, Welfare, Household, General Equilibrium

Introduction

All economies around the world require some level of government intervention to promote economic growth and development. This is particularly so as to uplift the social and economic well-being of the populace, which remains the primary goal of government. Nonetheless, the magnitude of economic growth in terms of political, economic, social, and infrastructure development has been extraordinary.Found used to provide these goods and services are generated through internal and external sources. This explains why the income generation drive is handled strategically with the goal of generating enough revenue from various sources to meet the government's obligation to finance government activities. Several governments have implemented taxation to improve developed countries' domestic revenue-earning ability(Samba 2019). In many developing countries, VAT has become a major contributor to total government tax revenues and it is levied at varying rates (Aminu, 2019).

Since VAT is a consumer tax placed on the commodity when value is added from production to sale at each stage of production, its policy changes take account of household excess burden. However, Modigliani-Brumberg's life-cycle hypothesis directly states that an upward shift in taxes will not have a pessimistic effect on households unless the policy is unanticipated (Kaya, & Sen, 2015).Moving towards a simpler and sustainability, the desire of the Nigerian government to find alternative sources of revenue due to the sudden global oil price fluctuation and makes it imperious for tax reformin Nigeria such as increase in VAT, which its effect is contestable.Given the recent upward review in minimum wage amidst the increase in VAT, it has posed an empirical question as to whether the increase in VAT rate by 50% may simply deplete the value of income or purchasing power of consumers and further affect households' welfare or otherwise.

Literature Review

Several studies have examined the effect of VAT reform on economic variables, Benjasak, and

Bhattarai (2017) employed a CGE model for Thailand and assessed the effect of VAT reforms and corporate income tax (CIT) on welfare. Findings revealed that increasing VAT was a desirable policy action for welfare maximization while decreasing CIT rate also favoured welfare. Though much was not done using all the basic welfare indices. In a similar study and employing the same methodology, Sajeewani and Meng (2017) researched on the macroeconomic and welfare effects of VAT in Gulf Corporation Council (GCC) countries and found that introducing VAT raises government revenue and the general VAT policy was more welfare efficient than the selected VAT. In another empirical analysis in Nigeria, conducted by Abachi and Iorember, (2017) addressed the impact of increase in the minimum wage on household welfare in Nigeria using a computable general equilibrium model. It discovered that, increase in minimum wage of workers will augment household welfare indicators (income, consumption and savings). This study however focused on the estimated effect of increase in minimum wage on welfare of households in Nigeria. However, increase in income because of improved minimum wage may be affected by the level of value added tax that in turn affects welfare and economic growth. Using dynamic structural model in Japan, Cashin (2017) investigated the effect of increase VAT rate on household expenditures and consumption utilizing CGE model.Simulation result showsthat timing of household expenditure was highly sensitive to salient inter-temporal price variation during increase in VAT rate or upward VAT review. Again, results demonstrated that the household expenditure response was large, but short-lived.

Erero (2015) analyzed the effects of increases in VAT by employing a dynamic computable general equilibrium model in South Africa. The study found that low-income households benefited from the VAT reform more than the middle and high-income households. yet it pays no attention to other welfare indicators in its analysis but only used employment and income, which alone are not real measures household welfare.Bohringer, Boeters, Kraus and Buettner (2010) simulate the effect of VAT reforms in Germany and found that VAT rate differentiation act primarily as a subsidy to specific industries rather than an instrument of redistribution. Nonetheless, household welfare was treated in the study without specifying the relevant indices. In another study, Dietl, Jaag, Lang and Trinkner (2010) examined household welfare effects of VAT exempted items from postal service in Iranian economy using static CGE. The simulation results confirmed that VAT exemption has a positive effect on consumer's welfare. Again, consumption alone is not the only measure of welfare as referred in the study.

Theoretical Framework

The Laffer Curve Theory: Developed by the supply-side economist Arthur Laffer in 1974 (Kazman 2014), describes the relationship between tax rates and total tax revenue, with an optimal tax rate that maximizes total government tax revenue and at the same time drive economic activities. The Laffer curve concept infers that a tax rate above maximizing rate is counterproductive, as it harms the economy's underground drive. Tax rates below the revenue maximizing rate also produce less revenue, but allow the economy to grow faster, thus such low rates may be desirable to consumers. The prime concern of supply-siders is to ensure that, whatever the degree of government intervention in the workings of the markets, it should occur in the most efficient manner possible.

The General Equilibrium Theory. According to Ekanem & Iyoha (1999)**,** the general equilibrium theory was developed by a French economist Leon Walras in 1834 and he argued that all prices and quantities in all markets are determined simultaneously through market forces. Greatly complemented by the works of Wilfredo Pareto and Francis Edgeworth in 1881,the theory contained that the economy is in a state of general equilibrium when the demand for every commodity and services is equal to its supply at a given price which is VAT inclusive. The CGE modeling approach is an empirical counterpart of the general equilibrium analysis. It converts the Walrasian general equilibrium structure from an abstract representation of an economy into realistic models of actual economies. The idea is to use these models to evaluate policy options by specifying production and demand parameters and incorporating data reflective of real economies.

Model Specification

This study grouped equations into four blocks viz: prices, production and trade, institutions, and system constraints.

Price Block

The price system of the model assumed quality differences among commodities of different origins and destinations. The price block consists of equations in which endogenous model prices are linked to other prices (endogenous or exogenous) and non-price model variables.

Demand price of Domestic None Traded Goods

The model comprises different prices for locally made products or domestic output that is used within the country given that locally manufactured commodities are VATable base on the Nigerian tax system. In the presence of transaction costs, it is necessary to distinguish between prices paid by demanders and those received by suppliers as given in equation 1

$$PDL_j = PLS_j + \sum PX_{j'} \cdot ijdj'j + \alpha VAT_j \qquad j' \in JT \qquad j \in JD \text{----------1}$$

$$\begin{bmatrix} price\ for\ domestic\ demand \end{bmatrix} = \begin{bmatrix} price\ for\ domestic\ or\ local\ supply \end{bmatrix} + \begin{bmatrix} cost\ of\ input\ per\ unit\ of\ local\ sales \end{bmatrix} + \begin{bmatrix} VAT\ adjusted\ rate\ for\ domestic\ iterms \end{bmatrix}$$

Where $j \in JD\ (\subset J)$ = a set of commodities with domestic sales of domestic output, PDL_j = demand price for commodity produced and sold domestically,and $ijdj'j$ = quantity of commodity j as trade input per unit of j produced and sold domestically.

Import Price

$$MP_j = pwmj \cdot (1 + vatmj) \cdot EXR + \sum PQj' \cdot ijm_{j',j} \quad j \in JM \text{-----2}$$

$$\begin{bmatrix} price\ of\ import\ for\ commodity\ j\ (NGN) \end{bmatrix} = \begin{bmatrix} import\ price\ (FCU) \end{bmatrix} . \begin{bmatrix} VAT\ adjusted\ rate\ for\ unit\ commodity \end{bmatrix} . \begin{bmatrix} exchange\ rate\ (NGN\ per\ FCU) \end{bmatrix} + \begin{bmatrix} cost\ of\ trade\ inputs\ per\ import\ unit \end{bmatrix}$$

Price of Product on Sectors

Given that value added tax is levied on the product, then the vector of VAT including sectorial prices can be define in equation 3 as:

$$P_{vat} = (1 + \alpha) P' \text{----------3}$$

$$\begin{bmatrix} sectorial\ price\ of\ product\ inclusive\ of\ vat \end{bmatrix} = \begin{bmatrix} adjusted\ VAT\ rate\ multiply\ by\ price\ of\ product \end{bmatrix}$$

Where: P = price of product from sector, vat = VAT collected from sectors, $1+\alpha$ = adjusted VAT rate

Absorption

The aggregate domestic spending on a commodity at domestic demander prices is termed absorption. Equation 4 defines absorption which includes value added tax. Absorption is expressed as the sum of spending on domestic outputs and imports at the demand prices, *DDp* and *Mp*. The prices *DDp* and *Mp* include the cost of trade inputs and value added tax. Equation 3.4 expresses all import products and domestic sales of domestic outputs excluding the entire output volume for exports. The two terms of the equation on the right-hand side applies JD and JM, respectively (domestic and import demand for commodity *j*).

$$PQ_j \cdot (1 - vatq_j) \cdot QQ_j = DDp_j \cdot QD_j + Mp_j \cdot QM_j \quad j \in (JD \cup JM) \text{-- ----4}$$

$$\begin{bmatrix} absorption \\ at\ demand \\ prices \\ net\ of\ VAT \\ for \\ commodity \end{bmatrix} = \begin{bmatrix} price\ of \\ domestic\ demand \\ multiply\ by \\ domestic\ sales\ quantity \end{bmatrix} + \begin{bmatrix} price\ of\ import \\ multiply\ by \\ import\ quantity \end{bmatrix}$$

Marketed Output Value

For each domestically produced commodity, the marketed output value at producer prices is stated as the sum of the values of domestic sales and exports which are valued at the prices received by the suppliers. An upward review of the value added tax (VAT) will affect the volume of domestic sales in the country and may also affect the country's growth.

$$PX_j \cdot QX_j = PDS_j \cdot QD_j + PE_j \cdot QE_j \qquad j \in JX \text{----------5}$$

$$\begin{bmatrix} producer\ price \\ times\ marketed \\ output\ quantity \end{bmatrix} = \begin{bmatrix} domestic\ supply\ price \\ times \\ domestic\ sales\ quantity \end{bmatrix} + \begin{bmatrix} export\ price \\ times \\ export\ quantity \end{bmatrix}$$

Where $j \in JX\ (\subset\ C)$ = a set of commodities containing domestic output.

Activity Price

Equation 6 describes the gross revenue per activity unit or the activity price (PA_a), which is the yields per activity unit multiplied by activity-specific commodity prices, summed over all commodities. This allows for the fact that activities may produce multiple commodities. Correspondingly, activity price (gross revenue per activity unit)) is affected by the increase in yield due to an upward review of the VAT rate. Thus the equation is defined as

$$PAa = \sum_{j \in J} PXAC_{aj} . \theta_{aj} \quad a \in A \text{----------6}$$

$$\begin{bmatrix} ativity \\ price \end{bmatrix} = \begin{bmatrix} producer\ price \\ times \\ yields \end{bmatrix}$$

Where $a \in A$ = a set of activities, PA_a = activity price (gross revenue per activity unit), $PXAC_{aj}$ = producer price of commodity c for activity *a*, and $\theta\ a\ j$ = yield of output c per unit of activity *a*.

Activity Revenue and Costs: Equation 7 defines the value added price (*PA*), given the definitions of *PA* and *PINTA* below. For each activity, the total revenue net of taxes is fully tied by payments for value-added and intermediate inputs.

$$PA_a \cdot (1 - va_a) \cdot QA_a = PVA_a \cdot QVA_a + PINTA_a \cdot QINTA_a \quad a \in A \text{----------7}$$

$$\begin{bmatrix} activity\ price \\ (net\ of\ VAT) \\ times \\ activity\ level \end{bmatrix} = \begin{bmatrix} value\ added\ price \\ times \\ quantity \end{bmatrix} + \begin{bmatrix} aggregate\ input\ price \\ times \\ quantity \end{bmatrix}$$

Where va_a = vat rate for activity, QA_a = quantity (level) of activity, $QINTA_a$ = quantity of aggregate input, PVA_a = price of (aggregate) value-added and QVA_a = quantity of (aggregate) value-added,.

Production and Trade Block

At the top level of the technology nests: the activity level uses a CES function of the quantities of value-added and aggregate intermediate input use. The

activity production function here can be expressed as follows:

$$QA_{\alpha_a^a.} = \left(\delta_a^a.QVA_a^{-p_a^a} + \left(1-\delta_a^a\right).QINTA_a^{-p_a^a}\right)^{\frac{1}{p_a^a}} \quad a \grave{o} ACE \text{ ----------8}$$

$$\begin{bmatrix} activity \\ level \end{bmatrix} = CES \begin{bmatrix} quantity\,of\ aggregate\,value\,added, \\ quantity\,of\ aggregate\,intermidiate\,input \end{bmatrix}$$

Where $a \in ACE(\subset A)$ = a set of activities with a CES function at the top of the technology nest, α_a^a= efficiency parameter in the CES activity function, δ_a^a= CES activity function share parameter, and ρ_a^a= CES activity function exponent.The specification of activities is anchored, if any, that belong to the set ACES.The Value-Added and Factor Demands function take the form:

$$QVA_{a=\alpha_a^{va}.}\left(\sum_{f\in F}\alpha^{va}_{f\,a\,.\,QF_{fa}{}^{-p_a^{va}}}\right)^{\frac{1}{p_a^{va}}} \quad a \in A \qquad \text{……..9}$$

Demand for the Factor Inputs

Given the assumption of perfect competition and profit maximization, the demand for factor inputs is presented in equation 10

$$WF_f.\overline{WFDIST_{fa}} = PVA_a\left(-tva_a\right).\left(\sum_{f\in F'}\beta_{fa}^{va}.QF_{fa}^{-\rho_a^{va}}\right)^{-1}.\beta_{fa}^{va}.QF_{fa}^{-\rho_a^{va}-1} \quad \begin{matrix} a \grave{o} A \\ f \grave{o} F \end{matrix} \text{-----10}$$

$$\begin{bmatrix} marginal\,cost \\ of\ \ factor\ f\ in \\ activity\,a \end{bmatrix} = \begin{bmatrix} marginal\,revenue \\ product\,of\ \ factor\ f \\ in\,activity\,a \end{bmatrix}$$

The right-hand side of equation 10 is defined as the marginal revenue product of factor *f* in activity *a*, which is equal to the marginal cost of factor *f* in activity *a*. The factor market is cleared when the model solves for average factor price (WF_f).

Commodity Production and Allocation

Equation 11 describes the production and allocation of commodities. It shows how commodities are distributed and used domestically using the Armington assumption, which is based on Constant Elasticity of Substitution (CES). Thus, an increase in VAT rate will affect the production of composite goods. On the right-hand side, production quantities, disaggregated by activity, are defined as yields time's activity levels. While on the left-hand side, these quantities are allocated to market sales and home consumption

$$QXAC_{a\,a} + \sum_{h\grave{o}H} QHA_{ajh} = \theta_{aj}.QA_a \qquad \begin{matrix} a \in A \\ j \in JX \end{matrix} \text{ ----------11}$$

$$\begin{bmatrix} marketed\,quantity \\ of\,commodity\,c \\ from\,activity\,a \end{bmatrix} + \begin{bmatrix} household\,home \\ consumption\,of \\ commodity\,c \\ from\,activity\,a \end{bmatrix} = \begin{bmatrix} production\,of \\ commodity\,c \\ from\,activity\,a \end{bmatrix}$$

Output Aggregation Function

Aggregate marketed production of any commodity is defined as a CES aggregate of the marketed output

levels of the different activities producing the commodity (equation 12). The optimal quantity of the commodity from each activity source is inversely related to the activity-specific price. QX appears as the output, sold at the price which can be affected by any increase in the Nigerian VAT rate. The choice between commodities from different sources is cast as an optimization problem.

$$QX_j = \alpha_j^{aj} \cdot \left(\sum_{a\grave{o}\ A} \delta_{aj}^{aj} \cdot QXAJ_{aj}^{-p_j^{aj}} \right)^{-\frac{1}{\rho_j^{aj}}} \qquad j \in JX \qquad ----------12$$

$$\begin{bmatrix} aggregate\,marketed \\ production\ of \\ commodity\ j \end{bmatrix} = CES \begin{bmatrix} activity-specific \\ marketed\ prouction \\ of\ commodity\ j \end{bmatrix}$$

Where α_j^{aj} = shift parameter for domestic commodity aggregation function, δ_{aj}^{aj} = share parameter for domestic commodity aggregation function, and ρ_j^{aj} = domestic commodity aggregation function exponent.

Output Transformation (CET) Function

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. Equations (13) address the allocation of marketed domestic output through the constant elasticity of transformation (CET) which is guided by the assumption of imperfect transformation in the economy.

$$QX_j = \alpha_j^t \cdot \left(\delta_j^t \cdot QE_j^{p_j^t} + (1-\delta_j^t) \cdot QD_j^{p_j^t} \right)^{\frac{1}{p_j^t}} \quad j \in (JE \cap JD) \qquad ----------13$$

$$\begin{bmatrix} aggregate\,marketed \\ domestic\,output \end{bmatrix} = CES \begin{bmatrix} export\ quantity, \\ domestic\ sales\ of \\ domestic\ output \end{bmatrix}$$

Where α_j^t = a CET function shift parameter, δ_j^t = a CET function share parameter, and ρ_j^t = a CET function exponent.

Composite Supply (Armington) Function

$$QQ_j = \alpha_j^q \cdot \left(\delta_j^q \cdot QM_j^{-p_j^q} + (1-\delta_j^q) \cdot QD_j^{-p_j^q} \right)^{-\frac{1}{p_j^q}} \quad c \in (JM \cap JD) \qquad ----------14$$

$$\begin{bmatrix} composite \\ suplly \end{bmatrix} = f \begin{bmatrix} import\ quantity, \\ domestic\ use\ of \\ domestic\ output \end{bmatrix}$$

α_j^q = an Armington function shift parameter, δ_j^q = a Armington function share parameter, and p_j^q = the Armington function exponent.

The ability of a composite commodity to maintain its intrinsic value relative to the output produced domestically is captured by a function known as CES aggregation. When the domain of this function is limited to commodities that are both imported and produced domestically, it is often called the Armington function, named after the originator of the idea of using a CES function for this purpose.

Demand for Transactions Services

Equation 15 defines how fixed quantities of one or more transactions service inputs are required per unit of the traded commodity.

$$QT_j = \sum_{j' \in J'} \left(icm_{j'j} \cdot QM_{j+} \;\; ice_{j'j} \cdot QE_{j'} + icd_{j'j} \cdot QD_{j'} \right) \quad j \in JT \quad \text{----------15}$$

$$\begin{bmatrix} demand\ for \\ transactions \\ service \end{bmatrix} = \begin{bmatrix} sum\ of\ demand \\ for\ imports, exports \\ and\ domestic\ sales \end{bmatrix}$$

Institution Block

This block consists of equations that map the flow of income from value added to institutions and ultimately to households. These equations fill out the inter-institutional entries in the Social Accounting Matrix of Nigeria.

Factor income

Equation (16) defines the total income of each factor.

$$YF_f = \sum_{a \in A} WF_f \cdot \overline{WFDIST_{fa}} \cdot QF_{fa} \qquad f \in F \quad \text{----------16}$$

$$\begin{bmatrix} income\ of \\ factor\ f \end{bmatrix} = \begin{bmatrix} sum\ of\ activity \\ payement \\ (activity\ specific\ wage \\ times\ employment \\ level) \end{bmatrix}$$

Institutional Factor Incomes

The institutional factor incomes from equation (17) is fragmented among domestic institutions in fixed shares after payment of indirect factor taxes and transfers to the rest of the world.

$$YF_f = shif_{if} \cdot \left[\left(1 - tf_f \right) \cdot YF_f - tsnf_{if} \cdot EXR \right] \qquad \begin{matrix} i \in INSD \\ f \in F \end{matrix} \quad \text{----------17}$$

Where $i \in INS$ = a set of institutions (domestic and rest of the world), $i \in INSD (\subset INS)$ = a set of domestic institutions, YF_f = income to domestic institution i from factor f, $shif_{if}$ = share of domestic institution i in income of factor f, tf_f = direct tax rate for factor f, and $tsnf_{if}$ = transfer from factor f to institution i.

Household Consumption Expenditure

Among the domestic non-governmental institutions, only households demand commodities. In equation 18, the total value of consumption spending is defined as the income that remains after direct taxes, savings, and transfers to other domestic nongovernment institutions.

$$EH_h = \left(1 - \sum_{i \in INSN} shi_{ih} \right) \cdot \left(1 - MPS_h \right) \cdot \left(1 - TINS_h \right) \cdot YI_h \quad h \in H \quad \text{----------18}$$

$$\begin{bmatrix} household\ income \\ disposable\ for \\ consumption \end{bmatrix} = \begin{bmatrix} household\ income\ net\ of\ direct \\ taxes, savings\ and\ transfer\ to \\ other\ nongovernmental\ institutions \end{bmatrix}$$

Where $i \in INSN$ = a set of households,

Household Consumption Spending on Marketed Commodities

Equation 19 describes the consumption of market commodities (purchased at market prices) that are VAT inclusive, any VAT reform will therefore affect

the household consumption which is an index of welfare. It is assumed that each household maximizes utility function subject to a consumption expenditure constraint. It is referred to as LES (linear expenditure system) functions since spending on individual commodities is a linear function of total consumption spending, EH.

$$PQ_j \,.\, QH_{jh} = PQ_j .+ \beta^m_{j\,h} . \left(EH_h - \sum_{j' \in j} PQ_{j'} \;.\gamma^m_h - \sum_{a \in A} \sum_{j' \grave{o}\; j} PXAC_{aj'} \,.\, \gamma^h_{a\;j'h} \right) ----------19$$

$$\begin{bmatrix} household\ consumption \\ spending\ on\ market \\ commodity\ j \end{bmatrix} = f \begin{bmatrix} total\ household\ consumption \\ spending, market\ price\ of\ j \\ and\ other\ commodity\ prices \\ (market\ and\ home) \end{bmatrix}$$

Government Consumption Demand

Government consumption demand, in which the main component tends to be the services provided by the government labour force, is also defined as the base-year quantity multiplied by an adjustment factor. This factor is also exogenous and, hence, the quantity of government consumption is fixed.

$$GDQ_j = \overline{AGDQJ} \;.\overline{qg_j} \qquad ----------20$$

Where GDQ_j =government consumption demand for commodity, $\overline{AGDQJ}$ = government consumption adjustment factor (exogenous variable), and $\overline{qg_j}$ =base-year quantity of government demand.

System Constraint Block

The basic model version of the CGE model shows that all demand and supply variables are flexible. This block defines the constraints that the economy must meet as a whole. The standard CGE model imposes equality between the total quantity demanded and the total quantity supplied for each factor

Factor Markets

The equilibrium in the factor market defined from equation 21 is the equality in total quantity demanded and supplied of two factors (capital and labour). In the model, it is assumed that supply of the two factors are exogenous and given as parameters.

$$\sum_{a\,\grave{o}\;A} QF_{f\,a} = \overline{QFS_f} \qquad f \in F ----------21$$

$$\begin{bmatrix} demad\ for \\ factor\ f \end{bmatrix} = \begin{bmatrix} supply\ for \\ factor\ f \end{bmatrix}$$

Similarly, the equilibrium in the commodity market as expressed in equation 22 is the composite commodity market. It imposes equality between quantities supplied and demanded of the composite commodity.

$$QQ_j = \sum_{a\,\grave{o}\;A} QINT_{ja} + \sum_{h \grave{o} H} QH_{jh} + qg_j + QINV_{j,}\;\; qdst_j + QT_j \;\; j\grave{o}\; J --22$$

$$\begin{bmatrix} composite \\ supply \end{bmatrix} = \begin{bmatrix} intermidiate \\ use\ fixed \\ investment \end{bmatrix} + \begin{bmatrix} hpusehold \\ consumption \end{bmatrix} + \begin{bmatrix} government \\ consumption \end{bmatrix} + \begin{bmatrix} fixed \\ investment \end{bmatrix} + \begin{bmatrix} stock \\ change \end{bmatrix} + \begin{bmatrix} trade \\ input\,use \end{bmatrix}$$

Institutional Indirect Tax Rates

Equation 23 defines the indirect tax rates of nongovernment institutions, which is VAT inclusive.

$$TVAS_i = \overline{tvas_i} \cdot \left(1 + \overline{TINSADJ}.tins01_i\right) + \overline{DTINS} \cdot t \quad i \in INSDNG \text{ ----------23}$$

From equation 23, *DTVAS* is the flexible variable that clears the government balance by scaling the base-year tax rates of each tax-paying institution. For the basic model version, all variables on the right-hand side are fixed, in effect fixing the values for the indirect tax rate variable for all institutions as the case in Nigeria. In this setting, the rate is fixed for all institutions on VATable goods and services.

Savings-investment balance is another macro constraint, which is presented in equation 24. It states that total savings and total investment have to be equal. Total savings are the sum of all savings from households, nongovernment institutions, and the government. Total investment is the sum of the values of fixed investment (gross fixed capital formation) and stock changes.

Savings–Investment Balance

$$\sum_{i \grave{o} INSDNG} MPS_i \left(1 - TINS_i\right) \cdot YI_i + GSAV + EXR \cdot \overline{FSAV} = \sum_{j \in J} PQ_j \cdot QINV_j + \sum_{j \in J} PQ_j \cdot qdst_j \text{ -----24}$$

$$\begin{bmatrix} nongovernment \\ savings \end{bmatrix} + \begin{bmatrix} governemnt \\ savings \end{bmatrix} + \begin{bmatrix} foreign \\ savings \end{bmatrix} = \begin{bmatrix} fixed \\ investment \end{bmatrix} + \begin{bmatrix} stock \\ change \end{bmatrix}$$

Simulation Design and Macroeconomic Closures

In order to achieve the stated objective of this study, a single VAT policy scenarios (5%-7.5% increase) was created while the baseline solution of the model assumes no change in the VAT policy. The created scenario represented an exogenous change in economic condition and was compared to the baseline scenario that assumes no specific changes to the policy. It is assumed that the government is pursuing avigorous fiscal policy involving the reinjection of the VAT via increases in government final consumption expenditure. The CGE model's closure rules for the created scenario are that savings are endogenous while investment is exogenously fixed, so individual sectorial investments do not have to vary in the same direction as savings. Furthermore, the current account balance, budget deficit, and savings are all determined endogenously.

Evaluation of Household Welfare and Economic Growth

The assessment of household welfare and effects of economic growth from the increase in VAT will be performed in the following way:

$$EV^i = \left[\frac{\prod_i^f - \prod_o^f}{\prod_o^f}\right] Y_O^f \text{ ----------25}$$

$$\begin{bmatrix} equivalent \\ variation \\ of\ household\ i \end{bmatrix} = \begin{bmatrix} change\ in\ household \\ welfare\ after\ the \\ policy \\ divided\ by\ initial\ welfare \end{bmatrix} \cdot \begin{bmatrix} income\ of\ the \\ household \end{bmatrix}$$

A general rule of thumb is that a positive Hicksian *EV* is a measure of welfare gain.

Result and Discussion of Findings

To ascertain the effect of an increase in VAT on household welfare in Nigeria, the baseline values and the simulated results with respect to the established scenario that VAT has increased from 5% to 7.5% (50% increase) is presented in Table1 considering household welfare indices (consumption, income and savings).

Table 4.1: Effect of 50% Increase in VAT on Household welfare in Nigeria.

Household consumption of:		Baseline Value (Bil. NGN)	Simulated Value (Bil. NGN)	% Change	% price	Hicksian Equivalent Variation(EV)
Agric. Goods		5165.910	4819.676	-6.70		
Manufacturing Goods		10239.600	9368.814	-8.50		
Solid Minerals		347.560	316.159	-9.04		
Services		11769.740	10980.899	-6.70		
Construction goods		3615.690	3373.356	-6.70		
Oil & Gas		12686.060	11835.805	-6.70		
	Total Household Consumption	43824.56	40694.709	-7.14		-3131.30
	Household Income	74,541.78	71,904.715	-3.54		
	Savings	26851.590	27282.361	1.60		
	Domestic Goods Price				23.42	

Source: Author's computation using GAMS

The simulation results presented in Table 4.1 shows that household consumption of agricultural goods, manufacturing, and solid minerals products will fall by 6.70% (from ₦5165.910 to ₦4819.676), 8.50% (from ₦ 10239.600 to ₦9368.814) and 9.04% (from ₦ 347.560 to ₦316.159) respectively from their baseline values to their simulated values. Similarly, household use of services will decrease to ₦10980.899 (6.70%) less than the baseline value of ₦11769.740, household use of construction will depress by 6.70% (from ₦3615.690 to ₦3373.356) while oil and gas products will equally diminish by 6.70% (from ₦12686.060 to ₦11835.805). The simulation results specifies that the naira value of total household consumption and income indicators declines by **7**.14% and 3.54% (from their baseline values of ₦43824.56 and ₦74, 541.78 to their simulated values of ₦40694.709 and ₦71,904.715 respectively. Contrary to the above, household savings will marginally increase by 1.60% from its baseline value of ₦26851.590 to its simulated value of ₦27282.361. The result unveils positive effect of VAT policy on savings but the degree of the effect is not significant. The Hicksian Equivalent Variation (EV) value of -3131.30, shows that an increase in VAT will worsen household welfare in Nigeria due to a hike in domestic goods price by 23.42%. The negative value of Equivalent Variation implies the adverse effect of the VAT policy on household welfare in Nigeria.The reason may be due to the reducing effect of VAT on income that also affects consumption negatively, while a fall in consumption due to high price will boost household savings since the unspent income is saved. This is in line with the law of demand and the Keynesian consumption theory because a decrease in consumption is accompanying by income but disproportionately while savings can increase. The positive but insignificant value of savings may also be due to household saving habit or future expectations. This finding is in line with the study result of Leahy, Lyons and Tol (2011) and Obiakor, Kwarbai and Okwu (2015) who found that increase in VAT will worst household welfare and would disproportionately hit the poorest households.

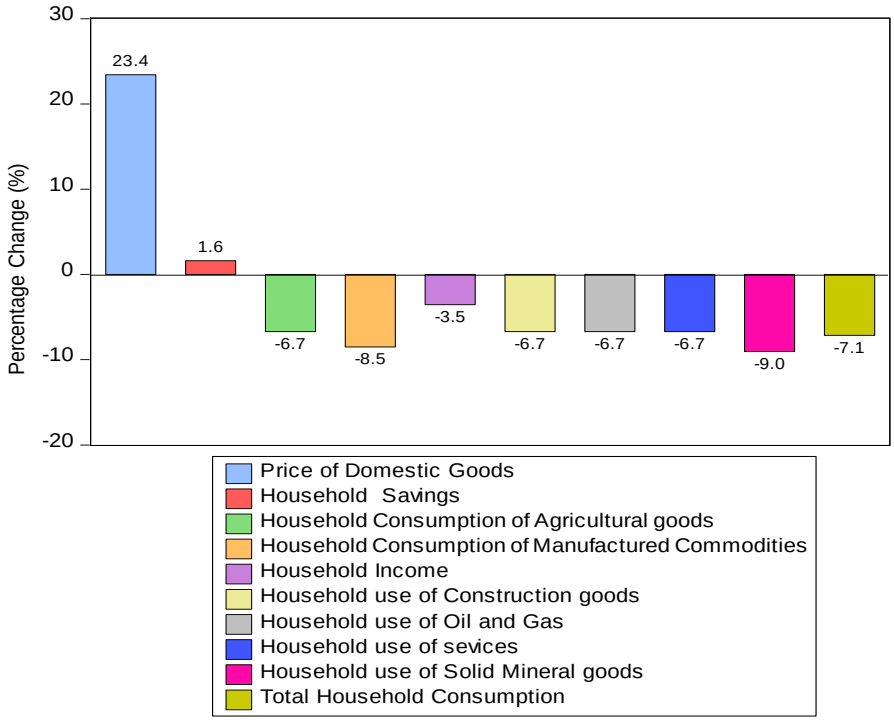

Figure 1: VAT Policy on Household Welfare Indicators from Simulation Results

Conclusion and Recommendations

It can be deduced from the findings of this study that given the negative effect of VAT reform on household consumption and income as welfare indicators.Based on the findings and the conclusion made, this study recommends the following: Government should reverse the approved and implemented 50% increase in VAT policy since household welfare is notmaximized. A reverse of this policy would help to eliminate the excess burden (economic inefficiency) it poses on household welfare since the fiscal action does not favour consumers and producers but distorts the economic agents.

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