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Implications of Import Tariff Changes on Household Welfare in Nigeria: A CGE Model Approach

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ABSTRACT: *This study investigated the effects of import tariff changes on the household welfare in Nigeria. Methodologically, the study used a static CGE model to run simulations that indicate the nature of the static effects. In the simulations, the study identifies four different scenarios to investigate the impacts of the changes in the import tariff rates. Scenario 1 & 2 focus on tariff rates reductions, whiles scenarios 3 & 4 test the effects of the increase in import tariff rates on household welfare and compared to the base case scenario 2019 in which the benchmark equilibrium parameters are calibrated. The results show that household income and consumption volume have inverse relationships with import tariff changes. The findings obtained from the model suggest that import tariff increase will provide rise in general price level. But household welfare should be a priority of government complementary policy help, therefore social protection policy should put in place for any upward rise of tariff rate.*

KEYWORDS: tariff changes, household welfare, Nigeria, CGE model
JEL classification: F13, I30, C68

INTRODUCTION

Trade policies often have a different impact on economic agents due to the transmission mechanism through which they operate. Tariffs influence trade, production, consumption patterns and welfare of not only the countries that impose them, but also the welfare of their trading partners (Amiti, et al. 2019). A number of authors posit that factor specific to each country will determine the welfare impact of import trade policy on household's welfare. In other words, welfare shocks

confronted by households on account of trade liberalization could be either negative or positive and of course, country specific.

Announcements of protectionist measures by the Nigerian Government have renewed the academic and policy interest in the macroeconomic and welfare effects of import tariffs policy. Like most developing countries, Nigeria has been passing through an extensive trade liberalization from the beginning of the 1980s. It operates many liberalized economic reforms aiming to integrate into the world economy. Trade policy pursuit by the Nigerian government has been using tariff and non-tariff measures. The economic integration of developing countries such as Nigeria into global markets offers the opportunity for rapid growth and poverty reduction (Martinez and Poole, 2004), but it also entails risks. However, these adjustment attempts have not solved many economic problems and create new challenges in terms of foreign dependency on domestic production, persistent trade deficits even in the economic growth environment after the 2000s.

A superficial glance at the database might convey the idea that tariffs are relatively high. For example, Nigeria maintains several supplemental levies and duties on selected imports that significantly raise effective tariff rates. For example, Nigeria has an effective duty (Tariff, Levy, Excise and Value Added Tax (VAT) where applicable) of 50% or more on over 80 tariff lines. These include about 35 tariff lines whose effective duties exceed the 70% limit set by ECOWAS. Most of these items are luxury goods such as yachts, motorboats and other vehicles for pleasure (75%) as well as on alcohol (75% to 95%) and tobacco products (95%). In addition, Nigeria places high effective duty rates on imports into strategic sectors to boost the competitiveness of the local industries. Such sectors are agriculture where wheat, sugar, rice and tomato paste have effective rates of 85%, 75%, 70% and 50% respectively, and mining with an effective duty of 70% on salt and 55% on cement (NCS, 2020).

There are many factors that may be affected as a result of import tariffs changes. Curiously, several questions arising from the foregoing will bother on various "what if" scenarios for the Nigerian economy. For example, what if import tariff is further reduced or increased in Nigeria? What if import restrictions on some imported goods is further relaxed in Nigeria? Are there substantial welfare gains to be derived by Nigerians from such policy shifts? What does the household welfare look like in the aftermath of tariff changes? Will national welfare level rise because of the policy changes? In view of the stated problems, the goal of this study is to address the following relevant policy questions through the household disposable income and household consumption expenditure.

The overall objective of this study is to empirically ascertain if there is a relationship between the import tariff changes and household disposable income and household consumption expenditure in Nigeria. In other words, this study examines the immediate implication of import tariffs changes on household welfare. Because it is hypothesised that is no significant relationship between import

tariff changes, household disposable income and household consumption expenditure in Nigeria. The direction of change of the import tariff rate determines how welfare will adjust in the counterfactual experiments. In this context, this study uses macro-economic data to investigate these effects. These effects are examined from the perspective of households as producers, consumers, and factor owners, trade openness, government and the rest of the world.

This study provides a more comprehensive picture of on household disposable income and household consumption expenditure effect of tariff change. Generally, most of the studies carried out on these studies have focused on single quantitative method of analysis using econometric models particularly in the developing economy like Nigeria. Not many studies yet exist on the counterfactual quantitative analysis, using a more robust method like the computable general equilibrium model. This study intends to fill this gap and take cognizance of these limitations and use a computable general equilibrium model in estimating and subsequent analysis of the effects import tariff change in Nigeria. Filling this gap of using a better methodology to analysis the impact of import tariffs changes on general price level and import commodity volume is the chief objective of this study. CGE models provide a framework that enables to reveal the direct and indirect impacts of a specific economic policy in a multi-sectoral manner. Thus, the CGE model will enable us to tackle our basic question: does an increase or decrease in import tariffs have any significant impacts on the household disposable income and household consumption expenditure and if so by how much?

Conceptual Framework

Import Tariffs Effects on Welfare

Tariffs affect trade, production, consumption patterns and welfare of not only the countries that impose them, but also the welfare of their trading partners. There is near unanimous consensus among economists that tariffs have a negative effect on economic growth and economic welfare, while free trade and the reduction of trade barriers has a positive effect on economic growth. However, liberalization of trade can cause significant and unequally distributed losses, and the economic dislocation of workers in import-competing sectors (IGM, 2016, Krugman, 1994).

They do so through both the absolute levels of protection they impart and through distortions associated with their structure. In particular, tariffs create a wedge between domestic and world prices pushing demand towards domestically produced substitutes. Additionally, an uneven structure of tariffs distorts production and consumption incentives further preventing trading partners from capturing gains associated with their comparative advantages. Therefore, a non-discriminatory tariff liberalisation if accompanied by appropriate complementary policies (*e.g.*, macroeconomic, social and labour market policies; (see OECD, 2003) is generally expected to result in improved allocation of resources and to bring benefits to countries implementing the reform as well as to their commercial partners.

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But when countries erect barriers to trade, such as tariffs, they raise prices and divert resources away from relatively efficient economic activities towards less efficient economic activities. It is worth noting that in addition to tariffs, many other policy measures can create barriers to trade that have effects like tariffs. As a result of such measures, consumers pay more for goods than they otherwise would have, businesses face higher costs than they otherwise would have, and on net, output and employment fall. Tariffs in particular can have this effect through a few channels. One possibility is that a tariff may be passed on to producers and consumers in the form of higher prices. Tariffs can raise the cost of intermediate goods such as parts and materials, which then raises the price of goods that use those inputs and reduces private sector output. This would result in lower incomes for both the after-tax (Robertson, 1972).

Import Tariffs and Small Country Welfare Effects

Consider a market in a small importing country that faces an international or world price of P_{FT} in free trade. The free trade equilibrium is depicted in Figure 1 "Welfare Effects of a Tariff: Small Country Case", where P_{FT} is the free trade equilibrium price. At that price, domestic demand is given by D_{FT}, domestic supply by S_{FT}, and imports by the difference $D_{FT} - S_{FT}$ (the blue line in the figure) (Suranovic, 2010)

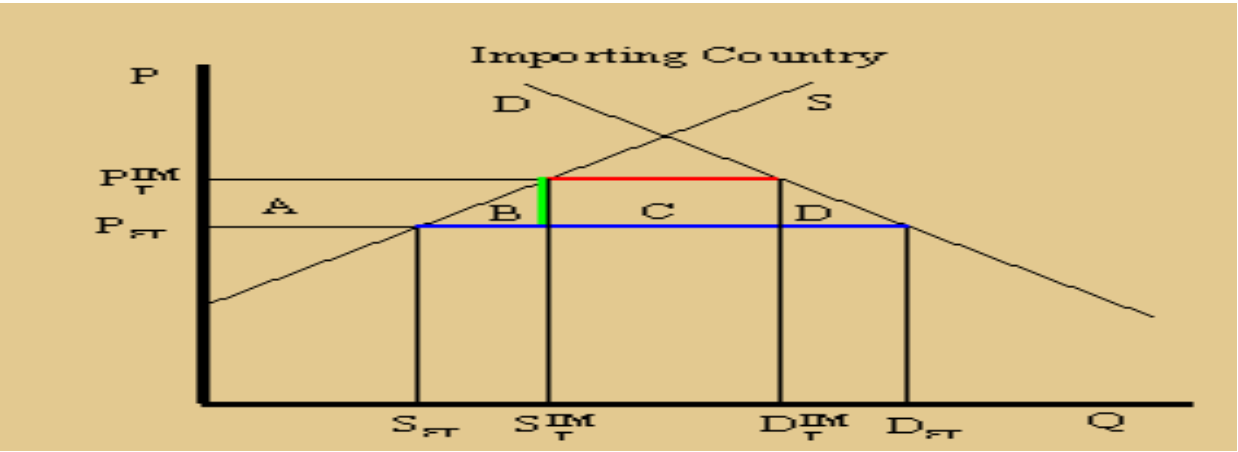

Figure 1. **Welfare Effects of a Tariff: Small Country Case**

When a specific tariff is implemented by a small country, it will raise the domestic price by the full value of the tariff. Suppose the price in the importing country rises to P_T^{IM} because of the tariff. In this case, the tariff rate would be $t = P_T^{IM} - P_{FT}$, equal to the length of the green line segment in the Figure 1.

Table 1"Welfare Effects of an Import Tariff" provides a summary of the direction and magnitude of the welfare effects to producers, consumers, and the governments in the importing country. The aggregate national welfare effect is also shown.

Table 1: Welfare Effects of an Import Tariff

	Importing Country
Consumer Surplus	$-(A + B + C + D)$
Producer Surplus	$+ A$
Govt. Revenue	$+ C$
National Welfare	$- B - D$

See Figure 1 to how the magnitudes of the changes are represented.

Tariff effects on the importing country's consumers. Consumers of the product in the importing country are worse off as a result of the tariff. The increase in the domestic price of both imported goods and the domestic substitutes reduces consumer surplus in the market.
Tariff effects on the importing country's producers. Producers in the importing country are better off because of the tariff. The increase in the price of their product increases producer surplus in the industry. The price increases also induce an increase in the output of existing firms (and perhaps the addition of new firms), an increase in employment, and an increase in profit, payments, or both to fixed costs.

Tariff effects on the importing country. The aggregate welfare effect for the country is found by summing the gains and losses to consumers, producers, and the government. The net effect consists of two components: a negative production efficiency loss (B) and a negative consumption efficiency loss (D). The two losses together are typically referred to as "deadweight losses."
Because there are only negative elements in the national welfare change, the net national welfare effect of a tariff must be negative. This means that **a** tariff implemented by a small importing country must reduce national welfare**.**

1. Whenever a small country implements a tariff, national welfare falls.
2. The higher the tariff is set; the larger will be the loss in national welfare.
3. The tariff causes a redistribution of income. Producers and the recipients of government spending gain, while consumers lose.
4. Because the country is assumed to be small, the tariff has no effect on the price in the rest of the world; therefore, there are no welfare changes for producers or consumers there. Even though imports are reduced, the related reduction in exports by the rest of the world is assumed to be too small to have a noticeable impact (see Suranovic, 2010)

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Effects on Tariff Revenue, Consumer Surplus, and Welfare

Tariff revenue change on a given import flow is computed simply as the final ad-valorem tariff multiplied by the final import value minus the initial ad-valorem tariff multiplied by the initial import value. The graphics below illustrates the link between tariff revenue, consumer surplus and welfare changes. It depicts the market for a given imported good with D and S the demand and supply curves (export supply elasticity is infinite).

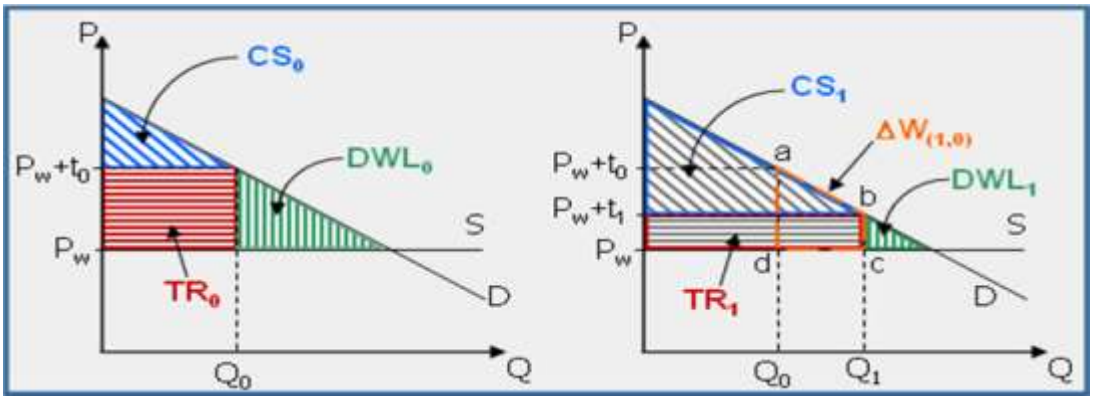

Figure 2: Impact of reducing a tariff from t_0 to t_1

The left-hand diagram depicts the current (precut) situation where the considered good faces a tariff (t_0) which entails a domestic price of Pw +T_0 (Pw is world price) and, given the structure of the demand, an imported quantity of Q_0. The following variables are captured by the graphics:

i. **Initial Tariff Revenue (TR_0):** is represented by the horizontal red stripe rectangle and is equal to Q_0*T_0.
ii. **Initial Consumer Surplus (CS_0):** is represented by the diagonal blue stripe triangle and is broadly defined as the difference between the consumer's willingness to pay (marginal value) and the amount she pays.
iii. **Initial Dead-Weight Loss (DWL_0):** is represented by the vertical green stripe triangle and represents what the economy loses in terms of welfare by imposing tariff t_0 on the imported good.

The right-hand graphics depicts the impact of reducing the tariff from t0 to t1. Since the domestic price (Pw+t1) is lowered compared with the initial state, import demand increases from Q0 to Q1 with consequences on the variables seen above:

i. **Final Tariff Revenue** (TR_1): is represented by the horizontal stripe rectangle and is equal to Q1*T1. The result is not straightforward and depends on the magnitude of the import demand elasticity.
ii. **Final Consumer Surplus** (CS_1): is represented by the diagonal stripe triangle.

iii. **Final Dead-Weight Loss** (DWL_1): is represented by the vertical green stripe triangle and represents what the economy still loses in terms of welfare because of the remaining tariff protection.
iv. **Welfare Change** (DW): is represented by the a-b-c-d area and is what the economy as a whole gain by reducing the tariff from t0 to t1 (the reduction in dead-weight loss). This gain is made of:
    a. The additional tariff revenue entailed by the increase in imports $(Q1-Q_0)*t1$
    b. The additional consumer surplus entailed by the increase in imports $Â½*(Q1-Q_0)*(t_0-t_1)$.

It should be noted that tariff revenue change is made of two opposite effects:

i. A tariff revenue loss at constant import value, which corresponds to a transfer from the State to consumers and is equal to $Q_0*(t0-t1)$.
ii. A tariff revenue gain through the increase in imports which enlarges the tax base and is equal to $(Q_1-Q_0)*t1$ (see The World Bank, 2010)

REVIEW OF LITERATURE

OECD (2003) provides an overview of existing estimates of welfare gains associated with tariff reduction. While these estimates vary depending on the assumed liberalisation scenario as well as the adopted methodological framework, a consensus has emerged that these gains are significant and that developing countries capture the largest gains relative to their GDPs. In this context, it is important for developing countries to actively engage in multilateral tariff liberalisation not least because they would obtain large gains from their own tariff liberalisation but also because by taking such steps, they are more likely to gain better access to industrial countries' markets.

Naron (2003) provides a description of Cambodia's economy and trade structure (Cambodia's main exports and imports), and the potential of trade liberalization. The paper, however, does not provide any analyses of the impact of trade liberalization on household welfare and the labour market.

Khan (2005) reaches contradicting results. Accordingly, he finds that tariff reduction has a nonlinear impact on poverty in South Asia, especially in India, Pakistan, and Bangladesh. However, it is observed that the tariff reduction will ultimately benefit the poor. Raihan (2010) confirms the finding of Khan (2005) for Bangladesh. He examines the welfare and poverty effects of trade liberalization with a scenario of trade liberalization simulated where zero tariffs on all imports. As a conclusion, he finds that resources are reallocated towards the more efficient and expanding sectors and create poverty reduction in the long run.

Chitiga & Mabugu (2005) contribute to literature by directly connecting trade and external policies to poverty within the same framework and applying this approach to Zimbabwe. After the simulation of the removal of import tariffs, they observe that poverty is falling for all income groups, but poor households get the least benefits

Pradhan & Amarendra (2006) found that a general cut in tariffs in India will lead to a decrease in overall welfare and reduction in poverty for urban households. Also, Sapkota & Cockburn (2008) found that trade liberalization in Nepal reduces the nominal returns to urban factors of production in comparison with rural factors of production, resulting in a reduction in the relative income of urban households.

The book by Cockburn, Decaluwé & Robichaud (2008) in collaboration with various researchers in Asia and Africa provides a useful and guiding study with which our research on Cambodia's trade liberalization can be patterned to. In their book, seven Asian and African case study countries (Bangladesh, Benin, India, Nepal, Pakistan, the Philippines, and Senegal) were chosen to examine the poverty and welfare impacts that arise from trade liberalization. For each country, households have been disaggregated according to socioeconomic characteristics. The book also compares welfare, poverty and inequality impacts resulting from trade liberalization, explaining where there are similarities and why there are differences across the sample countries. An important feature of Cockburn, Decaluwé & Robichaud (2008) is that particular attention is paid to identifying how the specific characteristics of each country (such as initial tariff structure, trade patterns, relative factor endowments, production patterns, income sources and consumption patterns of the poor, and so on) influence the poverty and inequality impact of trade liberalization

On the other hand, Chan & Oum (2011) assess the impact of the US tariff exemption on garment and textiles imports on the Cambodian economy and livelihoods, using the 2008 input-output table. They find that the reduction in the poverty headcount rate is approximately 1.5% in urban areas compared to 1.1% in rural areas.

Aredo, Fekadu & Kebede (2012) found that a complete tariff cut in Ethiopia would result in an increase in poverty by 2.8 percent, while a uniform tariff scheme raises poverty by 2.3 percent. Similarly, Diallo, Koné & Kamagaté (2010) found in their simulation results for a study on Côte d'Ivoire that a partial or complete unilateral liberalization would induce a decrease in GDP, household income and household welfare when compared to the baseline. However, multilateral trade liberalization would positively affect economic growth, income, consumption and wellbeing for almost all the household categories.

Araujo and Flaig (2016) analyze the effects of different policy reforms in order to strengthen Brazil's integration into global trade, one of which is characterized as a reduction in import

tariffs. They find that all simulation scenarios towards liberalizing trade would raise aggregate production, employment, investment as well as households' income and consumption.

Quite several studies have used CGE models for different policy analyses in Nigeria. Nkang, et al. (2013) assess the impact of higher imported food prices on agriculture and household poverty in Nigeria using a computable general equilibrium (CGE). The paper shows that an increase in imported food price leads to an increase in domestic food price as well as other agricultural composites. Also, an increase in imported food price led to an increase in poverty. However, this study did not consider the macroeconomic effect of this policy shocks which, are expected to be affected through the exchange rate pass-through channel.

Theoretical Framework

An Optimizing Model

One approach to the analysis of the open economy has recently been developed. In this work, "agents" spending and saving decisions are viewed as solutions to the problem of maximizing an intertemporal utility function subject to lifetime solvency constraints. Razin and Svensson (1983) consider a model of a small open economy which produces and consumes two goods in each period, and faces fixed world prices and interest rates. Firms maximize profits subject to the economy's endowment of productive factors and given technology.

Consumers maximize lifetime utility subject to the constraint that the present value of their spending not exceed the present value of their income. From the point of view of the economy, this constraint is equivalent to the condition that the present value of the sum of the economy's current and future trade surpluses equal the economy's historically given external debt commitment.

Razin and Svensson emphasize that the effects of tariffs on saving, and therefore (ceteris paribus) the trade balance, depend crucially on the timing and expected duration of changes in the tariff rate. A temporary tariff will have very different effects on the trade balance from those of a tariff which is expected to be permanent. A temporary tariff raises the price of current consumption relative to future consumption.

Agents will substitute consumption intertemporally (consuming less today and more in the future) by lending in the international capital market, i.e., by running a trade balance surplus. Thus, tariffs which are viewed as temporary lead to a trade surplus. In contrast, a tariff which is expected to be in place permanently will not induce such an intertemporal substitution effect. In fact, if the initial equilibrium is stationary (in the sense that expenditure shares are constant through time), a permanent tariff will leave intertemporal consumption decisions, and hence the trade balance, completely unaffected.

The Razin-Svensson model has since been extended in a number of directions. Edwards (1989) and Ostry (1988) consider the issue of how tariffs affect the real exchange rate and, in turn, the trade balance. The dynamic behavior of the real exchange rate after a change in the tariff depends upon the ease with which agents substitute consumption within a period (i.e., the elasticity of substitution between tradables and nontradables in a given period) versus the degree of substitution in aggregate consumption across time periods (the intertemporal elasticity of substitution in consumption or the reciprocal of the coefficient of relative risk aversion). Depending on the parameter values, a temporary tariff may improve, worsen, or leave the trade balance unchanged.

Van Wijnbergen (1987) has extended the Razin-Svensson framework to include contract-based real wage rigidities. If nominal wages are indexed to consumer prices (which depend on the prices of both domestic and foreign goods), then a small country which raises a tariff temporarily will experience an increase in the internal price of the foreign good, although the domestic price of the domestic good will not be changed. The tariff therefore leads to a higher real product wage; if employment is demand determined, unemployment will consequently rise. This (transient) unemployment reduces real income temporarily; agents smooth their consumption by borrowing in the international capital market, i.e., by running a trade deficit. Thus, with real wage rigidities, a temporary tariff may worsen the trade balance, in contrast to the Razin-Svensson result. A similar finding is obtained by Ostry (1988) without the assumption of real wage rigidities by considering the case in which the government raises an initially positive tariff.

To summarize, a careful reading of the theoretical literature does not lead to a clear conclusion about the effect of a tariff on, e.g., the trade balance or the level of output. The effect depends on the timing and expected duration of the tariff shock, on the behavior of real wages and exchange rates, and on the values of a variety of elasticities, as well as on institutional factors such as the degree of capital mobility and the exchange rate regime. Any presumption that tariffs tend, e.g., to improve the trade balance and raise output, must therefore be based on empirical rather than theoretical knowledge. With this in mind, we turn to the data.

METHODOLOGY

Model Specification

The overall objective of this study is to analyse the immediate implication (investigate the percentage of impacts) of import tariffs changes on general price level and volume of commodity import. Specification of a complete model requires that the market, behavioural, and system relationships embodied in each account in the SAM be described in the model. Activity, commodity, and factor accounts all require the specification of market behaviour: supply; demand; and clearing conditions (Odior, 2018). Specification of Equations of the Model A non-linear programming (NLP) model of 5 blocks and of forty-one (41) simultaneous complete equations

model were used in this work, but only the behaviour of the price and import equations are specified as follows

Relationship between Household Welfare and General Price Level: The consumption of goods and services is a primary component of economic wellbeing and, as such, a primary indicator of living standards. The literature reveals that the relations among consumption, income, wealth and economic growth are the major issues in economics. This indicates that the amount of aggregate consumption mainly depends on the amount of aggregate income. Wealth and Income are available to support consumption, today and in the future (through the saving that income generates). Income, consumption and wealth are three dimensions of the broader concept of economic well-being, and it is important to understand the relationships between them.

To compare income or consumption expenditure over time, it is necessary to be able to account for relative changes in the prices of the goods and services that households purchase to meet their needs. The consumer price index (CPI) is a measure of inflation: it measures changes in the price of a basket of goods and services, selected as representative the CPI is assumed to approximate the cost of living (Odior, 2019). This suggests that the structure of consumer spending and its changes over time may better reflect the economic well-being of households, social groups and whole societies

The price system of the model is rich, primarily because of the assumed quality differences among commodities of different origins and destinations (exports, imports, and domestic outputs used domestically). The price block consists of equations in which endogenous model prices are linked to other prices (endogenous or exogenous) and to nonprice model variables. It is assumed for simplicity that all prices net of taxes, subsidies and tariffs are normalized to 1 in the base year. The linearized price system is shown below

Import Price

$$PM_c = pwm_c.(1+tm_c).EXR + \sum_{c' \in CT} PQ_{c'}.icm_{c'c} \qquad c \in CM \quad (1)$$

(1)

where, PM_c = is import price in LCU (local-currency units) including transaction costs, pwm_c = is c.i.f. import price in FCU (foreign-currency units), tm_c = is import tariff rate, EXR = is exchange rate (LCU per FCU), $icm_{c'c}$ = is quantity of commodity *c'* as trade input per imported unit of *c.*, PQ_c = Price of composite commodity *c.* $c \in CM (\subset C)$, is a set of imported commodities,

The import price in LCU (local-currency units) is the price paid by domestic users for imported commodities (exclusive of the sales tax). Equation (3.6) states that it is a transformation of the

world price of these imports, considering the exchange rate and import tariffs plus transaction costs (the cost of trade inputs needed to move the commodity from the border to the demander) per unit of the import. For all commodities, the market price paid by domestic commodity demanders is the composite price, *PQ*; in this equation, *PQ* applies only to payments for trade inputs.

Producer price for domestic output by activity

$$PDS_c = PDD_c - \sum_{c' \in CT} PQ_{c'}.icd_{c'c} \qquad (2)$$

where, PDS_c = Supply price for commodity *c* produced and sold domestically, PDD_c = Demand price for commodity *c* produced and sold domestically, $icd_{c'c}$ = Quantity of commodity c' as trade input per unit of c produced and sold domestically. The model includes distinct prices for domestic output that is used domestically. In the presence of transaction costs, it is necessary to distinguish between prices paid by demanders and those received by suppliers. Equation (2) defines the demand prices as the supply price plus the cost of trade inputs per unit of domestic sales of the commodity in question

Absorption/ Consumer price of composite commodity

$$PQ_c.(1-ts_c).QQ_c = PDD_c.GDP_c + PM_c.QM_c \qquad c \in CD \cup CM) \qquad (3)$$

where, QQ_c = Quantity of goods supplied to domestic market (composite supply)

QM_c = Quantity of import of commodity *c*, GDP_c = Gross domestic product, ts_c = *Sales tax rate*

Absorption is total domestic spending on a commodity at domestic demander prices. Equation (3) defines it exclusive of the sales tax. Absorption is expressed as the sum of spending on domestic output and imports at the demand prices, PDD and PM include the cost of trade inputs but exclude the commodity sales tax

Consumer Price Index:

$$CPI = \sum_{c \in C} PQ_c.cwts_c = 1 \qquad (4)$$

CPI = Consumer Price index (exogenous variable).

$cwts_c$ = Weight of commodity *c* in the consumer price index,

Equations (4) define the consumer price index and the producer price index for domestically marketed output. The CPI is fixed and functions as the numéraire in the basic model version

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Armington function between imports and domestic production

$$QQ_c = \alpha_c^q.\delta_c^q.QM_c^{-\rho_c^q} + (1-\delta_c^q).GDP_c^{-\rho_c^q})^{\frac{-1}{\rho_c^q}} \quad (5)$$

Where, QQ_c = Quantity of goods supplied to domestic market (composite supply)

QM_c = Quantity of import of commodity *c*,

α_c^q = An Armington function shift parameter, δ_c^q = An Armington function share parameter,

ρ_c^q = An Armington function exponent, substitution elasticity and δ = delta and ρ = rho

Impact substitutability between imports and domestic output sold domestically is captured by a CES aggregation function in which the composite commodity that is supplied domestically is 'produced' by domestic and imported commodities entering this function as 'input.' The small country assumption is made for all sectors; hence world import and export prices are given, and the terms of trade are fixed.

Import-Domestic Demand Ratio:

$$\frac{QM_c}{GDP_c} = \left[\frac{PDD_c}{PM_c}.\frac{\delta_c^q}{1-\delta_c^q}\right]^{\frac{1}{1+\rho_c^q}} \qquad c \in CM \cup CD) \quad (6)$$

Where, PDD_c = Demand price for commodity *c* produced and sold domestically,

PM_c = is import price in LCU (local-currency units) including transaction costs,

This Equation (5) defines the optimal mix between imports and domestic output. Its domain is thus limited to imports with domestic production. Note that the equation assures that an increase in the domestic-import price ratio generates an increase in the import-domestic demand ratio (that is, a shift away from the source that becomes more expensive). Equations (5 & 6) constitute the first-order conditions for cost minimization given the two prices and subject to the Armington function and a fixed quantity of the composite commodity. where

Household Income

$$YH_h = PX_c.QX_c + hogov_{igov'} + howor_{trnsF_{row}}.EXR \qquad h \in H,\ c \in C \quad (7)$$

where, YH_h = Income to household,

$hogov$ = Transfers from Government to Households

$howor$ = Transfers from RoW to households

$trnsF_{row}$ = transfer from the rest of the world

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Household commodity consumption

$$CD_h \cdot PQ_{ch} = (YH_h \cdot (1 - ty_h)) \cdot (1 - caphosh_h) \qquad h \in H,\ c \in C \qquad (8)$$

Where, CD_h = **Household consumption volume**

Household savings are assumed to be given as an exogenous saving rate times the monetary disposable income

Investment expenditure

$$INVEST_c = PQ \cdot INVD_c \qquad (9)$$

Where, $INVD_c$ = Investment consumption volume, $INVEST_c$ = Investment expenditure or quantity of investment demand for commodity

Household Direct Tax Revenue

$$HTAX = ty_h \cdot YH \qquad (10)$$

$$\begin{bmatrix}\text{household}\\ \text{direct tax}\\ \text{revenue}\end{bmatrix} = \begin{bmatrix}\text{household income}\\ \text{tax rate} \times \text{ inome to}\\ \text{household}\end{bmatrix}$$

$HTAX$ = Household direct tax revenue

Market Clearing Block

Equilibrium (market clearing and macroeconomic closures): This study considered five (5) macroeconomic closures, only the closure for composite commodity market equilibrium and domestic supply and demand equilibrium are required for this study.

Composite Commodity Market Equilibrium

$$QQ_c = \sum_{a \in A} QINT_{ca} + \sum_{h \in H} CD_{ch} + GD_c + QINV_c + qdst_c + QT_c \qquad (11)$$

$$\begin{bmatrix}\text{composite}\\ \text{suppy}\end{bmatrix} = \begin{bmatrix}\text{intermediate}\\ \text{use}\end{bmatrix} + \begin{bmatrix}\text{household}\\ \text{consumption}\end{bmatrix} + \begin{bmatrix}\text{government}\\ \text{consumption}\end{bmatrix} + \begin{bmatrix}\text{fixed}\\ \text{investment}\end{bmatrix} + \begin{bmatrix}\text{stock}\\ \text{change}\end{bmatrix} + \begin{bmatrix}\text{trade}\\ \text{input}\end{bmatrix} \qquad c \in C$$

Where, $qdst_c$: Quantity of stock change and QT_c: Trade Input

Domestic Supply and Demand Equilibrium

$$DD_d = XDS_s / GDP_s \qquad (12)$$

$$\begin{bmatrix}\text{domestic}\\ \text{demand for}\\ \text{commodity}\end{bmatrix} = \begin{bmatrix}\text{domestic output}\\ \text{supplied to}\\ \text{domestic market}\end{bmatrix}$$

Calibration of Parameters of the Model

Calibration is the process where numerical values are assigned to the share parameters of the model. Calibration of the model involves determining a set of parameters and exogenous variables so that the CGE model solution exactly replicates the economy represented in the SAM. In other words, calibration method is a deterministic approach to calculating parameter values from a bench-mark equilibrium data set (Shoven & Whalley, 1992; Odior, 2022).). In static CGE models, a classical baseline calibration corresponds to calculating model exogenous variables, such that model output in the equilibrium replicates the economic structure defined by a given social accounting matrix (SAM) empirically observed in a specific base year. The static models are calibrated subject to the assumption that the base year is a stationary state or a steady state. The share parameters are calibrated from synthetic benchmark equilibrium data sets which portray the Nigeria economy in a notional typical year, 2019. The parameter and elasticity values that feed the equations of the CGE model are crucial to assess the effects of import tariffs changes on the macroeconomic variables.

Parameters Used in Calibration

Price Parameters (Export and import prices)

World Price of Exports: $pwe_c = \frac{PE_c}{((1+te_c).EXR_c)}$ (13)

World Price of Imports: $pwm_c = \frac{PM_c}{((1+tm_c).EXR_c)}$

(14)

Production Coefficient Parameters (Elasticity Related Parameters)

Elasticity Parameter for Armington CES Function: $\rho_a^a = (1/\sigma) - 1$

(15)

Elasticity Parameter for Output Armington CET Function: $\rho_c^t = (1/\Omega) + 1$

(16)

Shift and Share Parameters for Trade (Growth Rates)
Imports-Domestic Composite

Dummy Used to Estimate Delta : $predelta = \left(\frac{PM_c}{PDD_c} \cdot \frac{QM_c}{GDP_c} \right)^{1+\rho_c^q}$ (17)

Share Parameter for Armington CES Function: $\delta_c^q = \frac{(PM_c / PDD_c \times QM_c / GDP_c)^{1+\rho_c^q}}{(1.0 + predelta)}$

(18)

Shift Parameter for Armington CES Function: $\alpha_c^q = \frac{QQ_c}{(\delta_c^q . QM_c^{-\rho_c^q} + ((1-\delta_c^q) . GDP_c^{-\rho_c^q}))^{-1/\rho_c^q}}$

(19)

Exports-Domestic Composite

Share Parameter for Armington CET Function: $\gamma_c^t = \frac{1}{(1 + PDS_c / PE_c \cdot (QE_c / GDP)^{\rho_c^t - 1}}$

(20)

Shift Parameter for Armington CET Function: $\alpha_c^t = \frac{QX_c}{(\gamma_c^t . QE_c^{\rho_c^t} + (1-\gamma_c^t) . GDP_c^{\rho_c^t})^{1/\rho_c^t}}$

(21)

Import Tariff Rate

Annual Growth Rate of Tariff Rate = $\left[\left(\frac{\text{Present tm}_c \times \text{exr}_a}{\text{Past tm}_c \times \text{exr}_a} \right)^{\frac{1}{n}} - 1 \right] \times 100$ (21)

Where tm_c is Import Tariff Rate
exr and Exchange Rate
$tm_c \times exr_a$ is Import tariff rate × Exchange rate (LCU per FCU), Total imported from Country *a* to Institution *i* in LCU per FCU
$c \in CM (\subset C)$ is set of imported commodities

The abovementioned SAM is use to calibrate many CGE blocks, notably, the efficiency and the share parameters of the CES and CET functions and the calculation of selected exogenous variables (remittances, transfers such capital outflow and inflow etc.). Elasticities of substitution for the Armington CES and the CET for domestic-export transformation have been kept in the range 1 to 3, as discussed in Taylor (2006, notably most simulations have been run with: 1)

Armington elasticity of substitution between GDP and QM = 1.75; & 2) Elasticity of transformation between GDP and QE = -1.75. However, one scenario provides a sensitivity analysis of the results to changes of the Armington elasticity, which is set at 0.75. The elasticity of substitution between capital and labour is set at 1.5. And in this model the taxes are declared as variables. The constant elasticity of substitution (CES) and the constant elasticity of transformation (CET) values used in the calibration of the model were derived from literature (Taylor & Arnim, 2006).

Definition of Policy Simulation Experiments

The main research hypothesised issues is that, import tariff changes is a negative function of the household real income and household consumption volume in Nigeria. This hypothesis will be tested using the parameters as specified in the model. The growth rate of any economy by destination is defined by arbitrary constants, the parameters and the elasticities, so our model will be calibrated with respect to the parameters and the elasticities. The parameter to carry the change in tariff rate is its percentage changes in its growth rate. This research identifies four (4) different counterfactual scenarios to investigate the effects. The "base" in the set serves as comparator. Hence, normalised prices and exchange rate will remain constant. Our scenarios are measure by the percentage changes in import tariff rate annual growth rate and elasticities. Table outlines the summary of the percentage changes in import tariff rate annual growth rate.

Table 2: Import Tariff Rates Changes

Scenario	Base Year 2019/2020 tariff rate (%)	Import Tariff rate (%) change	Index	Tariff rate (%) simulation after adjustment	Remark
Baseline Scenario	12.37	Benchmark equilibrium	Base Year Normalized Index Price = 1.00	12.37%	12.37%
Scenario 1	12.37	50% reduction by Government	50% below the base year tariff rate = 0.50	6.19%	12.37% Reduce to 6.19%
Scenario 2	12.37	20% reduction by Government	20% below the base year tariff rate = 0.80	9.90%	12.37% Reduce to 9.90%
Scenario 3	12.37	50% increase by Government	50% above the base year tariff rate = 1.50	18.56%	12.37% increase to 18.56%
Scenario 4	12.37	100% increase by Government	100% above the base year tariff rate = 2.00	24.74%	12.37% increase to 24.74%

Source: Author's Computation, 2022

Baseline Scenario, the focus is on the real values of the annual import tariff rate in Nigeria, that is, allowing 0% decrease or increase in the 2020 import tariff rate. This is the base case scenario. This "base" in the set serves as comparator in which the benchmark equilibrium parameters are calibrated and then ascertain the short run effects household real income and household consumption volume. For that purpose; we apply 12.37% Nigeria tariff rate of 2020 of Applied, weighted mean, all products (%).

i. In Scenario 1, we test the effects of 50% decrease in the 2020 import tariff rate (i.e.,12.37 – 6.185 = 6.185 approximately 6.19%) in Nigeria using a different elasticity (elasticity of demand for imported commodities in Nigeria). Then compared to the base year values and ascertain the short run effects. For that purpose; we apply 6.19% tariff rate

ii. In Scenario 2, we test the effects of 20% decrease in the 2020 import tariff rate (i.e.,12.37 – 2.474 = 9.896 approximately 9.90%) in Nigeria using a different elasticity. Then compared to the base year values and ascertain the short run effects. For that purpose; we apply 9.90% tariff rate.

iii. In Scenario 3, we test the effects of 50% increase in the 2020 import tariff rate (i.e., 12.37 + 6.35 = 18.555 approximately 18.56%) in Nigeria using a different. Then compared to the base year values and ascertain the short run effects. For that purpose; we apply 18.56% tariff rate.

iv. In Scenario 4, we test the effects of 100% increase in the 2020 import tariff rate (12.37 + 12.37 = 24.74%) in Nigeria using a different. Then compared to the base year values and ascertain the short run distributional effects. For that purpose; we apply 24.74% tariff rate.

Bench-Mark Equilibrium Solution

The bench-mark year of the Nigeria CGE model is 2019 for various reasons. First. from a practical point of view, the amount of data required for the compilation of the SAM was entirely available for 2019. Second, using 2019 as the bench-mark year allowed us compare the tariff policy shock of 2020. The bench-mark equilibrium solution will provide the static model solution, while the bench-mark parameters and elasticities are kept constant

Thus, the first, second and third simulation scenarios experiments decreased and increased the actual growth of import tariff rate (deviates from the base-run, 2020). These deviations are structuralist effects. The base value has an index of 1.00 for the prices. The normalized prices are $PDD = 1$, $PDS = 1$, $PE = 1$, $PM0 = 1$. While, PX is a weighted average of prices that are initially normalized, since the model is homogeneous of degree zero in prices, one good must be chosen as the numéraire. The default numéraire is the exchange rate or, equivalently, a price index representing the bundle of imports. Hence $PX = 1$, $ER = 1$ (see model equations).

Thus, whether household real income and household consumption volume decrease or increase in response to the import tariff rate depends on the CES. We analyzed the impact -50, -20, 50 and 100 percent changes in import tariff changes and its effects household real income and household consumption volume in Nigeria base on the trade elasticities, which fall within the range $0 < \sigma < 1$ for the world price of imports (PWM*)* and $0 < \Omega < 2$ for the world price of exports (PWE*)*. The growth rate of any economy by destination is defined by arbitrary constants (α_{0s}), the accelerators (α_{1s}), and the elasticities (β_{1s}). So, our model is calibrated with respect to import tariff rate (tm_c), and World Price of Imports (PWM), is the elasticity with respect to the level of commodity imports and World Price of Exports (PWE). With the results from these experiments or scenarios, we will be able to ascertain the effects of import tariff changes on domestic price of competitive imports of commodity (inflation) and commodity import volume.

Data Requirement and Sources

This study relies mainly on published data from a number of agencies and sources. The study use an existing Social Accounting-Matrix (SAM**)** constructed by Odior & Iwegbu (2022). The data used to construct the Nigerian SAM were extracted from various sources such as macroeconomic data reported in National Accounts (NA) of the Nigerian Gross Domestic Product Report (Expenditure and Income Approach) of the National Bureau of Statistics (NBS) 2019, the Nigerian Statistical Fact Sheets on Economic (NBS, 2019), CBN Statistical Bulletin (2019), IMF-IFS, IMF-GFS and IMF-DOT (2019). Balance of Payments (BoP), supply and use tables (SUT), World Bank's Economic and Social Database, and other relevant sources. All monetary flows are recorded or converted to Nigeria's national currency, the Naira (abbreviated by ₦.). The average annual ₦-US-Dollar exchange rate for the base year 2019 is 360.40 (Nig-₦/US-$).

ANALYSIS AND DISCUSSIONS OF SIMULATION RESULTS

The Import Tariff Rate Policy Scenario Results

This study identifies four different scenarios to investigate the impacts of the tariff rates changes welfare in Nigeria. Scenario 1 and 2 focus only on the tariff rate reductions. 50% and 20% tariff rate reductions are applied to the model. Scenarios 3 and 4 aims to test the effects of the increase in import tariff rates and for that purpose we apply 50 % and 100% tariff increase. The base year (2019) period parameters share is maintained throughout for the four simulations for the variables given the four different rates of changes. In each simulation, we focus on the variation of the endogenous variables in relation to the base year period values. The policy simulations experiments are performed under a flexible exchange rate regime with constant depreciation of the Naira. These scenarios are the constant annua**l** growth rate import tariff rates from the base run 2019 (see definition of policy simulation experiments). That is, these experiments capture the essence of the events that occurred from the static analysis. The parameters result of the effects of import tariff rates on the variables of interest are summarized in Tables 2 to 8.

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Simulation Results: Scenarios 1 to 4 Marginal Effects

Table 3 presents the summary of parameters results of the values of the marginal effects on base year values, 2019, and of scenarios 1 to 4 of the import tariff changes. The simulated marginal values of the four scenarios on the impacts of import tariff changes on household real income and household consumption volume in Nigeria are shown for 50 and 20 percent reductions and for 50 and 100 percent increases. With the tariff rates of 6.19%, 9.90%, 18.56% and 24.74%, respectively. The immediate-short run effects are capture by the simulation models and then compared to the base year (2019) values in which the benchmark equilibrium parameters are calibrated.

Table 3: Simulation Results: Scenarios 1 to 4

Result of Import Tariff Changes						
Summary of the Static Parameters Results **Values of the Marginal Effects on Base Year Values**						
Item		**Base Case Scenario**	**-50% Scenario1**	**-20% Scenario 2**	**+50% Scenario 3**	**+100% Scenario 4**
	Scenario Variables	**12.37%**	**6.19%**	**9.90%**	**18.0%**	**24.74%**
	Household Welfare		**Marginal Effect**	**Marginal Effect**	**Marginal Effect**	**Marginal Effect**
1	Household Real Income	29.668	30.019	29.958	29.904	29.847
2	Household Consumption Vol	21.519	21.788	21.718	21.697	21.651

Source: Authors' Computation.

6.3 Analysis of Simulation Results of Scenario 1: 50% Import Tariff Reduction

Scenario 1 focus on the import tariff rate for the simulation of the model and then compared to the base year (2019) values in which the benchmark equilibrium parameters are calibrated. With an import tariff rate of 6.19%, we ascertained the effects on the household real income and household consumption volume. Table 4 from Scenario 1, shows summary of parameters results of the values of the marginal deviation from base year and the % marginal deviation from base year.

Table 4: Simulation Results of Scenario 1: Import Tariff Reduction by 50%

Simulation with 6.19% Tariff Rate					
Summary of the Static Parameters Results **Values of the Marginal Effect Deviation from Base Year Values**					
Scenario Variables		**Base Case Scenario**	**Effects on Base Year**	**Marginal Deviation from base Year**	**% Marginal Deviation from base Year**
	Household Welfare		**Effect**	**Effect**	**Effect**
1	Household Real Income	29.668	30.019	0.351	35.1
2	Household Consumption Volume	21.519	21.788	0.269	26.9

Source: Authors' Computation.

Household Welfare Effects of 50% tariff Reduction

Income, consumption and wealth are three dimensions of the broader concept of economic well-being and to define the level of welfare. Therefore, it is important to understand the relationships between them. Everything else being equal, a person with a higher level of consumption is regarded as having a higher level of economic well-being than someone with a lower level of consumption. Consumption needs can be met through the spending of income, through the running down of wealth, and through borrowing. On welfare assessment in this study, the household real income and household consumption volume channel are used to capture the effects of import tariff rates on welfare in Nigeria. The consumption of goods and services is a primary component of economic well-being and, as such, a primary indicator of living standards. Import tariff changes can create not only macroeconomic instability, but also worsen conditions in terms of household income distribution and affect the welfare level.

From the result in Table 4, it is observed that the simulation results of import tariff rates scenarios of 50% reduction from the actual 12.37% will have positive effects on household real income and household consumption volume in the immediate-short run. On the immediate and short run effect, household real income will have percentage marginal deviation from its base year value of 35.1%. This implies that household real income witnessed a positive annual growth.

The effect of import tariff rate on household consumption volume in Nigeria is similar to the changes in the household real income. The simulated result for household consumption volume shows an increase 26.9%, a positive annual growth rate. This implies that 50% reduction in import tariff rate will positively affect household real income and household consumption volume in the immediate run in Nigeria.

Analysis of Simulation Results of Scenario 1: 20% Import Tariff Reduction

Scenario 2 aims to test the welfare effects of 20% decrease on the actual import tariff rate of 12.37**%**. The same bench-mark values of 2019 in scenario 1 is simulated with 9.90%. We ascertained the effects of import tariff rate on welfare, and then compared to the base year values. Table 5 present the scenario 2 result of the percentage (%) of marginal deviation from base year values.

Table 5: Simulation Results of Scenario 2: Import Tariff Reduction by 20%

Simulation with 9.90% Tariff Rate					
Summary of the Static Parameters Results Values of the Marginal Effect Deviation from Base Year Values					
Scenario Variables		**Base Case Scenario**	**Effects on Base year**	**Marginal Deviation from base year**	**% Deviation from base year**
	Household Welfare		**Effect**	**Effect**	**Effect**
9	Household Real Income	29.668	29.958	0.29	29.0
10	Household Consumption Volume	21.519	21.718	0.199	19.9

Source: Authors' Computation.

Household Welfare Effects of 20% tariff Reduction

The results in Table 4, show that the simulation results of import tariff rates scenarios of 20% reduction from the actual 12.37% will have positive effects on household real income and household consumption volume in the immediate-short run. On the immediate and short run effect, household real income and household consumption expenditure volume will have percentage marginal deviation from its base year values of 29.0% and 19.9% respectively. That is both variables are indirectly related to import tariff rate reduction. Household real income and consumption will witness positive annual increase if tariff rate is reduced.

Comparative Analysis of Scenario 2 and 1

Table 6 illustrates the difference between percentage (%) marginal deviation from base year values in Table 4, scenario 1 and Table 5. scenario 2. In other words, Scenario

Table 6: Import Tariff Reduction: Scenario 1 and Scenario 2 Difference

Summary of the Static Parameters Results % Deviation from Base Year Values Difference				
		-20% Scenario 2	**-50% Scenario 1**	**(2) – (1)**
Scenario Variables		**% Marginal Deviation from base Year**	**% Marginal Deviation from base Year**	**Difference (%)**
	Household Welfare	**Effect**	**Effect**	**Effect**
1	Household Real Income	29	35.1	-6.1
2	Household Consumption Volume	19.9	26.9	-7.0

Source: Authors' Computation

Household Real Income: and Household Consumption Volume: The result in Table 6 shows that if import tariff policy is change from -50% to -20% that is rise by 30% in the actual import tariff rate scenario will cause the growth rate of household real income and household consumption

volume to have negative percentage difference of -6.1% and 7.0.% respectively in the immediate and short run. This implies that household loss when there is upward shift of tariff rate.

Analysis of Simulation Results of Scenario 3 and 4: 50% & 100% Import Tariff Increase

Scenarios 3 and 4 aim to test the welfare effects of 50% and 100% increase on the actual import tariff rate of 12.37**%**. The same bench-mark values of 2019 in scenario 1 is simulated with 18.56%. With an import tariff rate of 18.56% for 50% and 24.74 for 100%, we ascertained the effects on household real income and household consumption volume and then compared to the base year values. Tables 7 and 8 present the scenarios 3 and 4 results of the percentage (%) of marginal deviation from base year values.

Table 7: Simulation Results of Scenario 3: Import Tariff Increase by 50%

Simulation with 18.56% Tariff Rate					
Summary of the Static Parameters Results **Values of the Marginal Effect Deviation from Base Year Values**					
Scenario Variables		**Base Case Scenario**	**Effects on Base year**	**Marginal Deviation from base year**	**% Marginal Deviation from base Year**
	Household Welfare		**Effect**	**Effect**	**Effect**
1	Household Real Income	29.668	29.904	0.236	23.6
2	Household Consumption Vol	21.519	21.697	0.178	17.8

Source: Authors' Computation

Household Welfare Effects of 50% tariff Increase

The results in Tables 7 and 8 reported that 50% and 100% rise in import tariff rates will have greater declining effects on the growth rates of household real income and household consumption volume in the short run than the import tariff rates reductions in scenarios 1 and 2. It show that the simulation results of import tariff rates scenarios of 50% (18.56%) and a 100% (24.74%) rise from the actual 12.37% will have the similar effects on household real income and household consumption volume because both variables are measures of welfare.

Table 8: Simulation Results: Scenario 4: Import Tariff Increase by 100%

Simulation with 24.74% Tariff Rate					
Summary of the Static Parameters Results Values of the Marginal Effect Deviation from Base Year Values					
Scenario Variables		**Base Case Scenario**	**Effects on Base year**	**Marginal Deviation from base year**	**% Marginal Deviation from base year**
	Household Welfare		**Effect**	**Effect**	**Effect**
1	Household real income	29.668	29.847	0.179	17.9
2	Household consumption volume	21.519	21.651	0.132	13.2

Source: Authors' Computation

The results in Tables 7 and 8 reported that 50% and 100% rise in import tariff rates will cause household real income and household consumption volume to witness growth rates of 23.6% and 17.8% respectively in the 50% scenario and 17.9% and 13.2%, respectively in the 100% scenario. The simulation reveals that a rise in import tariff rate will surely affect household welfare in the short run. This implies that of household real income and household consumption volume will maintain negative annual growths in the immediate if the import tariff rate policy is increased.

Comparative Analysis of Scenario 4 and 3

Table 9 illustrates the difference between percentage (%) marginal deviation from base year values in Table 4, scenario 1 and Table 5, scenario 2. In other words, Scenario 1 minus Scenario1.

Table 9: Import Tariff Increase: Scenario 4 and Scenario 3 Difference

Summary of the Static Parameters Results % Deviation from Base Year Values Difference				
		100% Scenario 1	**50% Scenario 2**	**(4) – (3)**
Scenario Variables		**% Deviation from base year**	**% Deviation from base year**	**Difference**
	Household Welfare			
1	Household Real Income	17.9	23.6	-5.7
2	Household Consumption Volume	13.2	17.8	-4.6

Source: Authors' Computation

Household Real Income: and Household Consumption Volume: The result in Table 9 shows that if import tariff policy is change from 50% to 100% that is rise by 50% in the actual import

tariff rate scenario will cause the growth rate of household real income and household consumption volume to have negative percentage difference of -5.7% and -4.6% respectively, in the immediate and short run. This implies that household loss when there is upward shift of tariff rate.

Graphical Representation of Scenarios

The Figure.3 shows the percentage relationships of import tariff rate change from -50 to 100% for household welfare (reduction (-) and increase (+)). The graph shows that the growth rate of household real income and household consumption volume have inverse relationships with import tariff changes.

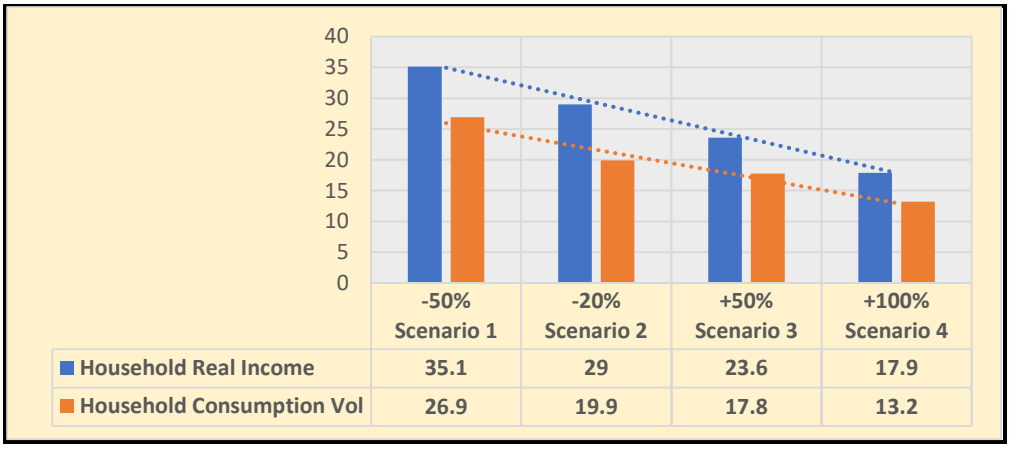

Figure 3: Import Tariff Rates Changes from -50 to 100%

These research findings confirm with previous findings in the literature on the effects of import tariff changes on household welfare. In comparing these research results with previous findings, these results did not contradict the finding of many scholars or with the postulated theories.

CONCLUSION

The objective of this study is to analyse the effects of import tariff changes on household welfare. The study used a Static Computable General Equilibrium model to run simulations that indicate the nature of the static effects. The bench-mark year of the Nigeria CGE model is 2019 for various reasons. The study is limited to the applied, simple and weighed tariff quotas that are only applicable to products imported from a specified country included Nigeria. This study carried out basic four scenarios to investigate the impacts of the changes in the import tariff rates on household welfare in Nigeria. Scenario 1 and 2 focus only on the tariff rates reductions, while scenario 3 and 4 focus on the tariff rates increase and simulations were based on the annual growth rate of import tariff rates from Nigeria.

On welfare assessment in this study, the household real income and household consumption volume channel are used to capture the effects of import tariff rates on welfare in Nigeria. The consumption of goods and services is a primary component of economic well-being and, as such, a primary indicator of living standards. The nature of the link between import tariff rates, macroeconomic variables and government will thus influence household income, household consumption and welfare. But the interrelations among these variables are complex and nonlinear. We show that while not helping boost economic growth, import tariff changes can create not only macroeconomic instability, but also worsen conditions in terms of household income distribution and affect the welfare level.

Based on the four scenarios results, it was obvious that reductions in actual tariff rate will have positive effects on household welfare (increase household real income and consumption volume), while a rise in tariff rate will have negative effects (reduce household real income and consumption volume). Our findings show that the immediate-short run effects of tariff changes in Nigeria shows inverse relationships with household income and consumption volume. The results show that the effect of import tariff rate on household consumption volume in Nigeria is similar to the changes in the household real income. That is, 50% and 20% reductions in import tariff rate will positively affect household real income and household consumption volume in the immediate run in Nigeria while 50% and 100% rise in import tariff rates will negatively effects household real income and household consumption volume in the short run.

The analysis of households' welfare ultimately needs to take into account both the effects of nominal income and consumer prices changes. In this research study, the price index is proxied as general price level. The implication of this is that, the rising inflation will push down the level of household consumption for all individuals. The rising consumer prices will have a devastating effect on the health of households and negatively impact the real consumption of each household, especially the poor households by making it more difficult for them to afford basic needs, but the upper-class household is less affected by any increase. The level of welfare which is already one of the major problems of Nigeria, does decreases further with increase in general price levels. Another implication for the Nigerians, is that, increases in consumer prices reduce the purchasing power of money and the real income of the people and hence worsen the incidence of welfare. This study provides a basis for recommendations on the adjustment path that the country need to take in order to mitigate the adverse impact of import tariff changes on household welfare in Nigeria.

Policy Recommendations and Implication

Policy measures are also needed to mitigate the domestic effects of government trade policies. The CGE indicate that import tariff change is transmitted to the economy through the price of imported commodities and variables such as household income and consumption volume have inverse relationships with import tariff changes. The following policy recommendations are suggested to address the side effect of import tariff changes on the above variables:

i. It is evident that a policy of full (100%) or partial (50%) import tariff policy of the Nigerian economy will on overall, have a mixed welfare implication for Nigerian households in the short run. A partial import tariff policy for instance, will particularly increase rural and urban households' consumption of goods and services produced in all sectors. A partial import tariff policy will also improve real income of all households. This possibility will of course cast doubts on the sustainability of any short-run welfare gains for households in terms of increased real income and consumption.

ii. Our findings obtained from the model suggest that import tariff increase will provide increases in domestic industrial production. Therefore, economic policies aiming to establish a level of import substitution seems to be more favourable in Nigeria.

iii. Following the discussion of import tariff changes presented above, the study recommends a simulation of the welfare effects of reducing tariffs and simultaneously replacing lost tariff revenues with revenues from consumption tax.

iv. Since the revenue impact of tariff changes depends on the initial structure of tariffs, the design of the change scenario and the overall impact of change on macroeconomic performance and welfare in the concerned economy, it is not evident whether, to what extent and which Nigeria may be affected by a tariff revenue loss. But household welfare should be a priority of government complementary policy help, therefore social protection policy should put in place for any upward rise of tariff rate.

v. Social safety nets and security measures should also be put in place at the rural level, especially for vulnerable populations, in order to mitigate the negative income effects of the CET on rural households.

vi. Finally, efforts could also be made to reduce the number of banned products, as such import bans may have the tendency to encourage smuggling because some of the banned goods are in demand given their limited domestic production. This leads to a situation whereby government bans, while trying to protect domestic producers, result in a proliferation of illegal/informal importation.

Future Research

The findings in this study may be viewed with caution as the model did not capture the dynamic adjustments that would have been able to show the long-term path of these variables whose impact are likely to change with time. The limitations in our approach should be borne in mind when interpreting our estimates. But the work covered has been useful in providing insights into the relationship between import tariff changes and household welfare. In future work, it would be of

interest to use a medium-scale model with a broader array of frictions and more sectoral differentiation to revisit some of the questions we have considered here. It will therefore be helpful to pursue an import tariff policy on a sectorial basis with emphasis on those sectors that will not severely undermine the welfare needs of Nigerian households.

Reference

Amiti, Mary, Stephen J. Redding and David, E. (2019) The Impact of the 2018 Tariffs on Prices and Welfare, The Journal of Economic Perspectives, Vol. 33, No. 4, pp. 187-210

Araujo, S. and Flaig, D. (2016) Quantifying the effects of trade liberalization in Brazil: a CGE model Simulation. OECD Econ Dep Working Paper No. 1295.

Aredo, F. and Kebede (2012) Trade Liberalization and Poverty: A Macro-Micro Analysis in Ethiopia. Poverty & Economic Policy Research Network. PMMA Working Paper 04.

Artuçv, E. and McLaren, J. (2015) Trade Policy and Wage Inequality: A Structural Analysis with Occupational and Sectoral Mobility," Journal of International Economics vol. 97(2) pp. 278-294.

.Chitiga M, Mabugu R. (2005) The impact of tariff reduction on poverty in Zimbabwe: a CGE top-down approach. S Afr J Econ Manag Sci 8: 102–116.

Cockburn, J., B. Decaluwé V. and Robichaud (2008) Trade liberalization and poverty: A CGE analysis of the 1990s experience in Africa and Asia," Poverty and Economic Policy (PEP) Research Network.

Diallo, K. and Kamagaté (2010) Trade liberalization and Income Distribution in Côte d'Ivoire: a Simulation with a Dynamic General Equilibrium Model" Poverty & Economic Policy Research Network. PMMA Working Paper 2010-05.

Edwards, S. (1989). Tariffs, Terms of Trade and the Real Exchange Rate" Economical Forthcoming.

International Monetary Fund (2019) IFS CD-ROM

International Monetary Fund (IMF) (2019) Direction of Trade Statistics Manual.

Khan H. A. (2005). Assessing poverty impact of trade liberalization policies: a generic macroeconomic computable general equilibrium model for South Asia. ADB Institute Discussion Paper, No. 22. List F (1841) The National System of Political Economy, Philadelphia:

Krugman, P. (1994) Peddling Prosperity: Economic Sense and Nonsense in the Age of Diminished Expectations, New York, W.W. Norton & Company, 1994.

Naron, H.C. (2003). Trade liberalization: a Cambodia perspective," Working Papers 03-8, Asia Pacific School of Economics and Government.

National Bureau of Statistics (2019) National Accounts of Nigeria, NBS, Abuja, Nigeria

Nigeria Customs Service (NCS) (2020) Federal Government of Nigeria, Federal Ministry of Finance, Abuja

Nkang, N. M., Omonona, B.T., Yusuf, S.A & Oni, O.A. (2013). Simulating the Impact of Exogenous Food Price Shock on Agriculture and the Poor in Nigeria: Results from a Computable General Equilibrium Model. Economic Analysis & Policy, 43(1), 79-94

Odior, E. S. O. (2018). Welfare and Macroeconomic Effects of the Sale of Fuel For ₦200 Per Litre in Nigeria: Policy Analysis in a Structuralist CGE Model: *Sokoto Journal of the Social Sciences*, Faculty of Social Sciences, Usmanu Danfodiyo University, Sokoto, Vol. 8. No 2, Pp, 22 – 43

Odior, E. S. O. (2019) Comparative analysis of the effects of 0, 20, 50, and 66.5% fuel subsidy removals on household wellbeing in Nigeria: A Structuralist CGE Approach, *BizEcons Quarterly*, Vol. 5. Pp, 22 – 44.

Odior E. S. O. and Sabastine Arinze (2022) The Concept Of Computable General Equilibrium Models, International Journal of Research in Commerce and Management Studies (IJRCMS) 4 (2): 01-18

OECD (2003), The Doha development Agenda: Welfare Gains from Further Multilateral Trade Liberalisation with Respect to Tariffs, Organisation for Economic Co-operation and Development, Paris.

Ostry, J. D. (1988). Intertemporal Optimizing Models of Small and Large Open Economies with Nontradable Goods" Unpublished Ph.D. Dissertation

Pradhan and Amarendra (2006) The Impact of Trade Liberalization on Household Welfare and Poverty in India. Poverty & Economic Policy Research Network. PMMA Working Paper 2006-01.

Raihan, S. (2010). Welfare and Poverty Impacts of Trade Liberalisation: A Dynamic CGE Microsimulation Analysis. Journal of Microsimulation, 3(1), 123-126.

Razin, A. and Svensson, L. (1983) "Trade Taxes and the Current Account" Economics Letters13–155–57.

Robertson, D. (1972) Macmillan Studies in Economics, International Trade Policy

Sapkota and Cockburn (2008) Trade Liberalization and Poverty in Nepal: An Applied General Equilibrium Analysis. Poverty & Economic Policy Research Network. PMMA Working Paper 2008-13.

Shoven, B.J. and Walley, J. (1992) Applying general equilibrium. Cambridge surveys of economic literature, Cambridge University Press.

Suranovic, S. (2010) International Trade: Theory and Policy. vol 1. George Washington University.

The Initiative on Global Markets (IGM) (2016). Import Duties

The World Bank (2010) The World Integrated Trade Solution (WITS)

Van Wijnbergen, S. (1987) Tariffs, Employment, and the Current Account" International Economic Review28–3691–706.