Structural Model for the Analysis of 'The Impacts of Import Tariff Changes on Domestic Industrial Production' in Nigeria

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ABSTRACT: *This study has investigated the ability of import tariff changes to match the relationship between import tariff changes and domestic industrial production in Nigeria. The study used a Static Computable General Equilibrium model of an archetype country to run simulations that indicate the nature of the static effects of import tariff changes on Nigeria. This study identifies four different scenarios to investigate the impacts of the changes in the import tariff rates on domestic industrial production in Nigeria. Scenarios try to get macroeconomic and welfare variables changes after the tariff rate changes compared to the base case scenario 2019 in which the benchmark equilibrium parameters are calibrated. The results shows that the growth of domestic industrial production have direct relationships with import tariff changes. That is, import tariff increase will provide increases in domestic industrial production. On the basis of our findings, this study recommends that, economic policies aiming to establish a level of import substitution seems to be more favourable in Nigeria, therefore, they should be encouraged. Also, a coordinated interplay of monetary and fiscal policies will be required to minimise contemporaneous distortions that arise from trade restrictions*.

KEYWORDS: tariff changes, domestic industrial production, Nigeria, CGE Model
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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). They do so through both the absolute levels of protection they impart and through distortions associated with their structure. 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.

The importance of these differences between developing and developed countries is reinforced by the fact that countries at lower stages of development are often struggling to sustain their macroeconomic stability (of which fiscal sustainability is an important aspect) and face potential adverse effects of revenue reduction on poverty reduction, redistribution, and development strategies. Potential revenue shortfalls can undermine economic programs and may result in a reversal of the trade reform itself. Because the major impetus for any trade policy reforms has been the strong desire of countries to harness the benefits embedded in international trade (this is as suggested by the recent experiences of economic growth in many economies particularly, the emerging market economies), and hopefully increase the standard of living of citizens (Erceg, et al. 2018).

We ask what the effects of changes in tariffs have been on several key variables of interest, including output, productivity, welfare, and the trade balance. We study tariffs rather than other types of protectionism for three reasons. First, tariffs are the preferred protectionist policy of rich governments, past and present. Second, tariffs are easier to measure in the aggregate than non-tariff barriers. Third, we try to be conservative when possible, and the costs of tariffs are a lower bound for the costs of protectionism since non-tariff barriers typically have more costly consequences than tariffs. We are most interested in the consequences of import tariffs changes on the domestic industrial production.

Nigeria employs a combination of tariffs and quotas for the double purpose of taxing international trade for revenue generation and protecting local industries from highly competitive imports. The country's tariffs are determined by the ECOWAS 2015–2019 Common External Tariff (CET) Book. 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. Nevertheless, effective rates tend to be higher since the Nigerian government may apply additional charges ((Tariff, Levy, Excise and Value Added Tax (VAT) where applicable) on the imports. Nigeria has an effective 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. However, the total effective rate of each line item is not to exceed 70% (NCS, 2020).

Nigeria has, with a certain degree of flexibility, implemented the five-band common external tariff structure- 0 per cent, 0.5 per cent, 10.0 per cent, 15.0 per cent and 20.0 per cent (World Trade Organisation, 2017). The average applied most favoured nation tariff rate increased from 11.9 per cent in 2011 to 12.7 per cent in 2017, while the disparity between the average final bound tariff rate (117.3 per cent) and low import tariff binding coverage (19.2 per cent) provided ample leverage for tariff changes, thus rendering the trade regime less predictable (World Trade Organisation 2017). By sectoral distribution, average tariffs on agricultural products are 16.6 per cent, which, is higher than that of nonagricultural goods at 12.0 per cent in 2017. Notably, the manufacturing sector is the most tariff-protected sector recording an average duty of 12.9 per cent, followed by agriculture (11.9 per cent), and mining and quarrying (5.1 per cent) (Shuaibu, 2016). 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.

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? What does the domestic industrial production look like in the aftermath of tariff changes? Will domestic industrial production 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 domestic industrial production

The overall objective of this study is to empirically ascertain if there is a relationship between the import tariff changes and output of domestic industrial production in Nigeria. In other words, this study examines the immediate implication of import tariffs changes on domestic industrial production. Because it is hypothesised that is no significant relationship between import tariff changes, domestic industrial production. 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 on domestic industrial production 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 on domestic industrial production is the main 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 on domestic industrial production, if so, at what rate?

REVIEW OF LITERATURE

The empirical evidence from recent literature shows that the potential gains from dismantling remaining tariff barriers are substantial. For example, Furceri et, al (2019), studied the macroeconomy effects after tariff changes. They estimate impulse response functions from local projections using a panel of annual data that spans 151 countries over 1963-2014. Tariff increases are associated with persistent, economically, and statistically significant, declines in domestic output and productivity, as well as higher unemployment and inequality, real exchange rate appreciation and insignificant changes to the trade balance. Output and productivity impacts are magnified when tariffs rise during expansions and when they are imposed by more advanced or smaller (as opposed to developing or larger) economies; effects are asymmetric, being larger when tariffs go up than when they fall. While firmly establishing causality is always a challenge, our results are robust to many perturbations to our baseline methodology, and hold using both macroeconomic and industry-level data.

Fasoranti, (2013) described Import duty as a levy on imports by custom authorities in Nigeria to raise revenue for the government and protect domestic industries from predator competitors abroad. Ibadin & Oladipupo (2015), stated that import duty is generally on the value of goods or on the weight, dimensions or some other criteria that are determined by the government. They are charged as a percentage of the value of import or a fixed amount of specific quantity (Fasoranti, 2013). Barattieri, Cacciatore, & Ghironi (2018) provide VAR-based evidence that protectionism acts as a supply shock, causing output to fall and inflation to rise in the short run. Moreover, protectionism has at best a small positive effect on the trade balance. Our results are qualitatively in line with theirs.

Olurotimi (2013) stated that import duties are either fixed or calculated as a percentage of the product's value, which can change sometimes, government may want to protect certain domestic product from foreign competition. One way of doing so is by imposing import duty, which makes foreign products more expensive, thus keeping the same domestic products more competitive (Ilaboya, 2012). Okoye and Gbegi (2013) maintained that government sometimes, imposes duties to hurt another country by making its exports more expensive. This is usually done as a retaliatory measure in a trade war. It is based on the value of goods called ad valorem duty or the weight, dimensions, or other criteria of the item such as its size (Ibadin & Oladipupo, 2015).

A host of other studies find either no or limited negative effects from tariffs (Reitz & Slopek, 2005). Ostry & Rose (1992) show that there is no theoretical presumption about the effects of tariffs on output, with the impact depending on the timing and the expected duration of the tariff shock, the behaviour of real wages and exchange rates, the values of the elasticities, and institutional factors (e.g., the exchange rate regime, degree of capital mobility). Consistent with their theoretical review, the authors find no significant effect of tariff changes on the real exchange rate, the real trade balance and real output (foreign or domestic) in their empirical work on five data sets and a non-structural VAR methodology.

Aghion and Howitt (2009) listed several channels on why trade should increase productivity and income. In the first place, trade openness increases the scale of production and so the scope for learning-by-doing externalities (Grossman & Helpman, 1995; Young, 1991). They also state that this market size effect is more important in small economies. Besides, trade serves to economic growth as increasing competition between foreign and domestic producers enhance productivity. It also stimulates knowledge spillovers especially from more advanced to less advanced economies

Araujo & Flaig (2016) also explain why barriers to international trade limit potential growth via several channels. Accordingly, trade barriers lead domestic firms to have lower incentives to innovate, and they seek efficiency by shielding them from international competition. Additionally, as import tariffs increase the cost of intermediate inputs and capital goods, the competitiveness of the domestic producers weakens. On the other hand, there are also some arguments that defend trade protectionism. These arguments generally based on the importance of satisfying adequate national defense, the infant industry argument, and the diversification argument. National defense argument is criticized as it ignores the possibility of purchases from friendly countries during the emergences (Caughlin et al., 1988). Thereby, we focus on the last two arguments. Infant industry argument goes back to List (1841) and it states that infant industries may suffer from comparative advantage because of foreign firms. Therefore, domestic firms must be protected to make them grow and benefit from the economies of scale. Otherwise, local firms may not be able to compete against foreign firms and will be pulled out of the market. Diversification argument states that trade protectionism contributes to the diversification of the domestic economy and the export, and thereby support economic growth and decrease the vulnerability in export income

Erica, (2018), stated that tariffs are intended to increase consumption of goods manufactured at home by increasing the price of foreign-produced goods. Generally, tariffs result in consumers paying more for goods than they would have otherwise to prop up industries at home. Though tariffs may afford some short-term protection for domestic industries that produce the goods subject to tariffs by shielding competition, they do so at the expense of others in the economy, including consumers and other industries. As consumers spend more on goods on which the duty is imposed, they have less to spend on other goods—so, one industry is propped up to the disadvantage of all others. This results in a less efficient allocation of resources, which can then result in slower economic growth. Tariffs also tend to be regressive in nature, burdening lower-income consumers the most.

Theoretical Framework

A Keynesian model:

The usual textbook analysis of the macroeconomic effects of a tariff considers a small country, with fixed prices, flexible output, and a fixed exchange rate. Output is demand determined and world prices are given; the model is completely static. The domestic country produces good Y at price P (supply is perfectly elastic) but consumes both the domestic good and a foreign good. The price of the foreign good in domestic currency is eP^*, where e is the exchange rate (defined as units of domestic currency per unit of foreign currency) and P^* is the price in foreign currency of a unit of the foreign good. Imports are a function of relative prices, $q = eP^*/p$, and real income in terms of domestic goods, Y, while foreign imports (our exports) are a function of relative prices only, foreign output being assumed constant (or rather unaffected by shocks emanating in the domestic country). The trade balance equals the excess of the value of exports over the value of imports. Measured in terms of the domestic good, the balance of trade, BT, may therefore be written as:

$$BT = M^*(q) - qM(q,Y) \tag{1}$$

where M^* denotes foreign imports and M denotes domestic imports from the rest of the world. Output equals the sum of domestic expenditure $E(Y)$, and net exports:

$$Y = E(Y) - BT(q,Y) \tag{2}$$

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Consider the imposition of an ad valorem tariff on imports at rate τ . The domestic relative price of imports rises to $q(1+\tau)$ while the world relative price is unchanged. If the tariff revenues are not redistributed (so that the government runs a budget surplus), then (2) becomes:

$$Y = E(Y) + BT(q, \tau, Y) - \tau q M(q(1+\tau), Y) \quad (3)$$

Net exports depend on the tariff rate because imports are a function of the internal relative price, $q(1+\tau)$ while exports are a function of the world relative price, q. The last term in (3) reflects the negative demand for domestic goods by the government (i.e., the budget surplus).

Differentiating equation (3) around an initial equilibrium of free and balanced trade yields:

$$dY / d\tau = M^*(\alpha - 1)/(1 - E_y + m) \quad (4)$$

where: α is the absolute value of the price elasticity of import demand; m is the marginal propensity to import; and $0 < 1 - E_y < 1$ is the marginal propensity to save.

Output rises if import demand is sufficiently price elastic (i.e., α exceeds unity) but falls otherwise. The intuition is straight forward. Because the tariff revenue is not redistributed, the tariff is a combination of an expenditure-switching policy and an expenditure-reducing policy. The expenditure-switching part serves to raise demand, and hence supply, of the domestic good. However, because the government does not redistribute the tariff revenue, there is in addition an income effect which tends to reduce demand for domestic goods. Only if import demand is sufficiently price elastic will the substitution effect dominate and the overall effect of the tariff be expansionary.

Differentiating the expression for the trade balance and using (4) yields:

$$dBT / d\tau = \left\{[\alpha(1 - E_y) + m]/(1 - E_y + m)\right\} M^* > 0 \quad (5)$$

A tariff switches domestic expenditure from foreign to domestic goods; the trade balance necessarily improves as a result. The improvement in the trade balance exceeds, falls short of, or is equal to the budget surplus, according to whether the tariff induces a rise, fall, or no change in output.

Several aspects of the analysis are noteworthy. First, the revenue-redistribution scheme adopted by the government will affect the magnitude, and possibly even the sign of the comparative static results. If the tariff proceeds are redistributed to consumers, then the only effect of the tariff is a pure substitution effect in favor of the domestic good, so that the output effect of a tariff is necessarily expansionary. At the same time, the trade balance effect will be lower (but still positive).

Second, the assumption that the exchange rate is fixed is crucial for the comparative static results. Suppose that the exchange rate adjusts to maintain external balance, so that $BT(\cdot) = 0$ Then it can be shown that a tariff which would improve the trade balance, were the terms of trade to stay

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constant, instead leads to a real appreciation (improvement in the terms of trade) to maintain external balance. In this case, (2) reveals that the tariff has no effect on the level of output.

Third, the analysis above assumed that the level of expenditure, $E(\cdot)$, is independent of relative prices. In general, however, there is no particular reason for this to be the case. There are two conflicting forces at work. A deterioration in the terms of trade serves to reduce expenditure on relatively more expensive foreign goods and hence raise spending on domestic goods via a substitution effect. In addition, however, the deterioration in the terms of trade lowers real income and this tends to reduce spending on domestic goods. The net effect is therefore ambiguous but is thought by some (e.g., Laursen and Metzler (1950) and Mundell (1961)) to be dominated by the substitution effect.

Suppose that the expenditure function in (2) is replaced by the more general function $E(q.Y)$, in which expenditure (in terms of domestic goods) depends on both relative prices and income, with $E_q > 0$ (the Laursen-Metzler assumption). If the exchange rate adjusts to maintain external balance, a tariff leads to an improvement in the terms of trade, i.e., to a fall in q, the effect of which is to raise real income and hence saving out of any given level of nominal income. The lower demand for domestic goods causes a fall in domestic production. This result (originally proved by Mundell (1961)) stands in sharp contrast to the case in which relative prices are fixed so that higher tariffs have an expansionary effect on output.

Further, a tariff may have contractionary effects even in the absence of a Laursen-Metzler effect on saving. In the Mundell-Fleming model of flexible exchange rates and perfect capital mobility, the interest rate is exogenous; therefore, the imposition of a tariff cannot have any lasting effect on the value of nominal income. Redistributed tariff revenues raise disposable income; therefore, income from production must fall when tariffs rise. Moreover, since the marginal propensity to spend is less than unity by assumption, the tariff engenders a trade deficit and corresponding capital account surplus. The intuition is simply that the tariff leads to an incipient interest rate differential which causes a real appreciation; the latter crowds out net exports. Eichengreen (1981) and Krugman (1994) have shown that, while these results are suggestive of the long-run effects of permanent tariffs, temporary tariffs in general have ambiguous effects on macro-economic variables of interest, at least in the short run.

Fifth, the model of equations (1) and (2) can be expanded to include repercussion effects due to changes in foreign output. Suppose that domestic exports, $M^*(\cdot)$, depend on the level of foreign output, Y^*, and relative prices, q, and that the domestic country is no longer "small" in the world economy so that changes in the tariff have effects on the level of foreign output. It is easily shown that the (domestic) output effect of a tariff is smaller in this case than in the original case in which

Y^* is exogenous. The intuition is simply that a tariff that increases domestic net exports has a negative effect on foreign output. The fall in Y^* reduces demand for domestic exports so that the repercussion effect on Y is negative.

Finally, the analysis thus far has assumed that foreigners do not respond to the tariff. If the foreign country retaliates by raising its own tariff, the effects on output (both foreign and domestic), the trade balance, and the real exchange rate are in general ambiguous.

To sum up, tariffs do not have clear-cut effects on the macro-economy in Keynesian models. Comparative static results depend critically on assumptions concerning inter alia fiscal policies (especially whether tariff revenue is redistributed); the exchange rate regime; the Laursen-Metzler effect; the degree of capital mobility; and repercussion and retaliation effects.

METHODOLOGY

Model Specification

The overall objective of this study is to analyse the immediate implication (investigate the percentage of impacts) of import tariffs changes domestic industrial production. 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; Odior and Arinze, 2022; Arinze and Arinze, 2023). 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 output production equations are specified as follows

Producer price for domestic output by activity

$$PDS_c = PDD_c - \sum_{c' \in CT} PQ_{c'} . icd_{c'c} \qquad (6)$$

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 (6) defines the demand prices as the supply price plus the cost of trade inputs per unit of domestic sales of the commodity in question

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Absorption/ Consumer price of composite commodity

$$PQ_c.(1-ts_c).QQ_c = PDD_c.GDP_c + PM_c.QM_c \qquad c \in CD \cup CM) \qquad (7)$$

where, QQ_c = Quantity of goods supplied to domestic market (industrial production)

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 (8) 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

Marketed Output Value/Composite price of output by activity

$$PX_c.QX_c = PDS_c.GDP_c + PE_c.QE_c \qquad c \in CX \qquad (8)$$

Where, PX_c = Price of aggregate output, QX_c = Quantity of domestic output of commodity c,

QE_c = Domestic output exported by activity,

$c \in CX (\subset C)$, is a set of commodities with domestic output

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. Domestic sales and exports are valued at the prices received by the suppliers, PDS and PE, both of which have been adjusted downwards to account for the cost of trade inputs

Consumer Price Index:

$$CPI = \sum_{c \in C} PQ_c.cwts_c = 1 \qquad (9)$$

CPI = Consumer Price index (exogenous variable).

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

Equations (9) 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

CES Technology: Value-Added Intermediate- Input ratio:

$$\frac{QVA_a}{QINTA_a} = \left(\frac{PINTA_a}{PVA_a} . \frac{\delta_a^a}{1-\delta_a^a} \right)^{\frac{1}{1-\rho_a^a}} \qquad a \in ACES \qquad (10)$$

Where, $PINTA_a$ = Price of intermediate aggregate

PVA_a = Price of (aggregate) value-added

QVA_a = Quantity of aggregate value-added

$QINTA_a$ = Quantity of aggregate intermediate input

δ_a^a = CES activity function, share parameter,

$a \in ACES(\subset A)$, is a set of activities with a CES function at the top of the technology nest. The user specifies the activities, if any, that belong to the set *ACES*. ρ_a^a *a*, is a transformation of the elasticity of substitution between value-added and the aggregate intermediate input: the higher this elasticity, the smaller the value of ρ_a^a and the larger the optimal change in the ratios between the quantities of value-added and the intermediate input aggregate in response to changes in their relative prices. CES: Trade substitution elasticity: rhoc = $\rho_a^a = (1/\sigma) - 1$ where, σ =sigma

Commodity Production and Allocation:

$$QXAC_{a\,c} + \sum_{h \in H} QHA_{a\,c\,h} = \theta_{a\,c}.QA_a \tag{11}$$

Where, $QXAC_{ac}$ = Quantity of commodity *c* from activity *a*

QHA_{ach} = Quantity of consumed home commodity *c* from activity *a* by household *h*

$\theta_{a\,c}$ = Yield of output *c* per u
nit of activity *a*.

QA_a = Level of domestic activity *a*

On the right-hand side, production quantities, disaggregated by activity, are defined as yields times activity levels. On the left-hand side, these quantities are allocated to market sales and home consumption

Output Aggregation Function:

$$QX_c = \alpha_c^{ac}.\left(\sum_{a \in A} \delta_{a\;c}^{ac}.QXAC_{ac}^{-\rho_c^{ac}}\right)^{-\frac{1}{\rho_c^{ac}-1}} \qquad c \in CX \tag{12}$$

Where,

QX_c = Quantity of domestic output of commodity *c*

α_c^{ac} = The shift parameter for domestic commodity aggregation function;

$\delta_{a\;c}^{ac}$ = The share parameter for domestic commodity aggregation function

ρ_c^{ac} = The domestic commodity aggregation function exponent.

$c \in CX(\subset C)$, is a set of commodities with domestic output. 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).

Output Transformation (CET) Function

The CET function between domestic production and exports

$$QX_c = \alpha_c^t.(\gamma_c^t.QE_c^{\rho_c^t} + (1-\gamma_c^t).GDP_c^{\rho_c^t})^{\frac{1}{\rho_c^t}} \quad (13)$$

where, α_c^t = A CET function shift parameter, γ_c^t = gamma, a CET function share parameter, ρ_c^t = A CET function exponent, substitution elasticity and ρ = rho and γ = gamma

Export-Domestic Supply Ratio:

$$\frac{QE_c}{GDP_c} = \left[\frac{PE_c}{PDS_c}.\frac{1-\gamma_c^t}{\gamma_c^t}\right]^{\frac{1}{1-\rho_c^t}} \qquad c \in CE \cup CD) \quad (14)$$

Equations (13) and (14) address the allocation of marketed domestic output, defined in equation (14), to two alternative destinations: domestic sales and exports. Equation (13) reflects the assumption of imperfect transformability between these two destinations. The CET function, which applies to commodities that are both exported and sold domestically, is identical to a CES function except for negative elasticities of substitution. The elasticity of transformation between the two destinations is a transformation of ρ_c^t, for which the lower limit is one. The values are restricted to assure that the isoquant corresponding to the output transformation function is concave to the origin.

Producers sells some of this output in the international markets, and the other part is traded in the domestic markets. Maximization of the gross domestic output subject to profits of the firms engaged in this transformation yields the export demand (QE_c) and the supply of the domestic good (PDS_c)

CET = Export transformation elasticity: $\rho_c^t = (1/\Omega)+1$. For CET functions, and $\Omega = 1/1+\rho$, where Ω = omega, the elasticity of transformation and ρ the exponent. As Ω varies from zero to infinity, the value of ρ_c^t varies from infinity to one. As ρ_c^t approaches one from above, the elasticity of the *QE-GDP* ratio with respect to changes in the *PE-PDS* ratio increases. Equation (14) defines the optimal mix between exports and domestic sales.

where, σ is the elasticity of substitution in CES functions. And Ω is the elasticity of transformation in CET functions (eq. 8) the values of which are estimated econometrically. The higher the value of σ

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and Ω, the smaller the value of ρ and the larger the optimal change in the quantity ratios in both types of functions in response to a change in relative prices. Therefore, both the degree of substitutability and transformability in CES and CET functions respectively will depend on the value of ρ and hence on the value of σ and Ω.

Armington function between imports and domestic production

$$QQ_c = \alpha_c^q.\delta_c^q.QM_c^{-\rho_c^q} + (1-\delta_c^q).GDP_c^{-\rho_c^q})^{\frac{-1}{\rho_c^q}} \quad (15)$$

Where, QQ_c = Quantity of goods supplied to domestic market (industrial production)

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:

$$\frac{QM_c}{GDP_c} = \left[\frac{PDD_c}{PM_c}.\frac{\delta_c^q}{1-\delta_c^q}\right]^{\frac{1}{1+\rho_c^q}} \qquad c \in CM \cup CD) \quad (16)$$

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 (15) 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 (15 & 16) 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

Market Clearing Block

Equilibrium (market clearing and macroeconomic closures): This study considered five (5) macroeconomic closures. The five macroeconomic balances of the model are; composite commodity market equilibrium, domestic supply and demand equilibrium, factor and foreign exchange market balances, government account balance and savings-investment balance. Only the related one to the study is presented.

Composite Commodity Market Equilibrium

$$QQ_c = \sum_{a \in A} QINT_{ca} + \sum_{h \in H} CD_{ch} + GD_c + QINV_c + qdst_c + QT_c \qquad (17)$$

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

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

Domestic Supply and Demand Equilibrium

$$DD_d = XDS_s / GDP_s \qquad (18)$$

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

4.2 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.

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Calibration Parameters
Production Coefficient Parameters (Elasticity Related Parameters)

Elasticity Parameter for Armington CES Function: $\rho_a^a = (1/\sigma) - 1$ (19)

Elasticity Parameter for Output Armington CET Function: $\rho_c^t = (1/\Omega) + 1$ (20)

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

Dummy Used to Estimate Delta : $predelta = \left(\frac{PM_c}{PDD_c} \cdot \frac{QM_c}{GDP_c} \right)^{1+\rho_c^q}$ (21)

Share Parameter for Armington CES Function: $\delta_c^q = \frac{(PM_c / PDD_c \times QM_c / GDP_c)^{1+\rho_c^q}}{(1.0 + \ predelta)}$ (22)

Shift Parameter for Armington CES Function: $\alpha_c^q = \frac{QQ_c}{(\delta_c^q . QM_c^{-\rho_c^q} + ((1-\delta_c^q).GDP_c^{-\rho_c^q}))^{-1/\rho_c^q}}$ (23)

Exports-Domestic Composite

Share Parameter for Armington CET Function: $\gamma_c^t = \frac{1}{(1 + PDS_c / PE_c \cdot (QE_c / GDP)^{\rho_c^t - 1}}$ (24)

Shift Parameter for Armington CET Function: $\alpha_c^t = \frac{QX_c}{(\gamma_c^t . QE_c^{\rho_c^t} + (1-\gamma_c^t).GDP_c^{\rho_c^t})^{1/\rho_c^t}}$ (25)

Import Tariff Rate

$$\text{Annual Growth Rate of Tariff Rate} = \left[\left(\frac{\text{Present tm}_c \times \text{exr}_\text{a}}{\text{Past tm}_c \times \text{exr}_\text{a}} \right)^{\frac{1}{n}} - 1 \right] \times 100 \quad (26)$$

Where tm_c is Import tariff rate and exr is 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; Arinze and Odior, 2023).

4.3 Definition of Policy Simulation Experiments

The main research hypothesised issues is that, import tariff changes is a negative function of the domestic industrial production 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 1: 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%

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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 domestic industrial production. 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 domestic industrial production revenue 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 domestic industrial production 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 industrial production.

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 on domestic industrial production 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 annual 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 6 to 12.

Simulation Results: Scenarios 1 to 4 Marginal Effects

Table 2 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 domestic industrial production 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 2: 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%**
		Marginal Effect	**Marginal Effect**	**Marginal Effect**	**Marginal Effect**
Domestic Industrial Production	31.247	31.366	31.453	31.587	32.022

Source: Authors' Computation.

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. Table 3 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 3: 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**
			Effect	**Effect**	**Effect**
	Domestic Industrial Production	31.247	31.366	0.119	11.9

Source: Authors' Computation.

Effect on Industrial Production

Table 3 shows that the simulation results of import tariff rates scenarios of 50% (6.19%) reduction from the actual 12.37% will have positive effects on industrial production, in the immediate run. That shows that, industrial production, we have positive changes of 11.9%, in the immediate-short run. The values of percentage (%) marginal deviation from the percentage (%) marginal deviation from base year in Table 3 simulated results show a little rise in growth rates for industrial production, when compared to its base year value in 2019.

Analysis of Simulation Results of Scenario 2: 20% Import Tariff Reduction

Scenario 2 aims to test the domestic industrial production 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%. With an import tariff rate of 9.90%, we ascertained the effects of import tariff changes on domestic industrial production and then compared to the base year values. Table 4 present the scenario 2 result of the percentage (%) of marginal deviation from base year values.

Table 4: Simulation Results of Scenario 2: Import Tariff Reduction By 20%

imulation 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**
			Effect	**Effect**	**Effect**
	Domestic Industrial Production	31.247	31.453	0.206	20.6

Source: Authors' Computation.

Table 4 shows that the simulation results of import tariff rates scenarios of 20% (9.90%) reduction from the actual 12.37% will have similar effects as 50% reduction on the industrial production in the immediate run when compared to their base year values in 2019. This implies that 20% reduction import tariff rate will positively affect commodity import in Nigeria but not at much as 50% reduction. It is also observed that the immediate and short run effect of import tariff rates on industrial production has a percentage deviation from base year value of 20.6% in the immediate-short run growth rates. The rise in industrial production above the 50% tariff reduction rate may be due to the increase of import substitution in the economy.

Comparative Analysis of Scenario 2 and 1

Table 5 illustrates the difference between percentage (%) marginal deviation from base year values in Table 3, scenario 1 and Table 4. scenario 2. In other words, Scenario 1 minus Scenario1.

Table 5: 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 (%)**
		Effect	**Effect**	**Effect**
	Domestic Industrial Production	20.6	11.9	8.7

Source: Authors' Computation

The result in Table 5 shows that if import tariff policy is change from -50% to -20% that is rise by 30% in the actual import tariff rate scenario, it will cause the growth rate of industrial production in Nigeria to rise by 8.7% in the short run. This might be as a result of import substitution.

Analysis of Simulation Results of Scenario 3 and 4: 50% & 100% Import Tariff Increase
Scenarios 3 and 4 aim to test the industrial production 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 the industrial production and then compared to the base year values. Table 6 present the scenarios 3 and 4 results of the percentage (%) of marginal deviation from base year values.

Table 6: Simulation Results of Scenarios 3 and 4: Import Tariff Increase by 50% and 100%

Simulation with 18.56% and 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**
			Effect	**Effect**	**Effect**
50%	Domestic Industrial Production	31.247	31.587	0.34	34.0
100 %	Domestic Industrial Production	31.247	32.022	0.775	77.5

Source: Authors' Computation

Effect on Industrial Production
The results in Table 6 reveal that 50% and 100% increase in the import tariff rates simulation scenarios will have greater increasing effect on industrial production than the import tariff rates reduction in scenarios 1 and 2. Table 6 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 macroeconomic variables. Also, the results in Table 6 reported that 100% rise in import tariff rates scenario will cause industrial production, to experience growth rates of 77.5%. Apart for industrial production, other macroeconomic variables experience declining growth rates as a result of a change in the import tariff rate from 50% to a 100%. Industrial production move from 34.0% to 77.5%. This might be due to higher level of import substitution in the economy.

Comparative Analysis of Scenario 4 and 3

Table 7 illustrates the difference between percentage (%) marginal deviation from base year values in Table 6, scenario 3 (50%) and scenario 4 (100%) in Table 6. In other words, Scenario 4 minus Scenario 3.

Table 7: Import Tariff Increase

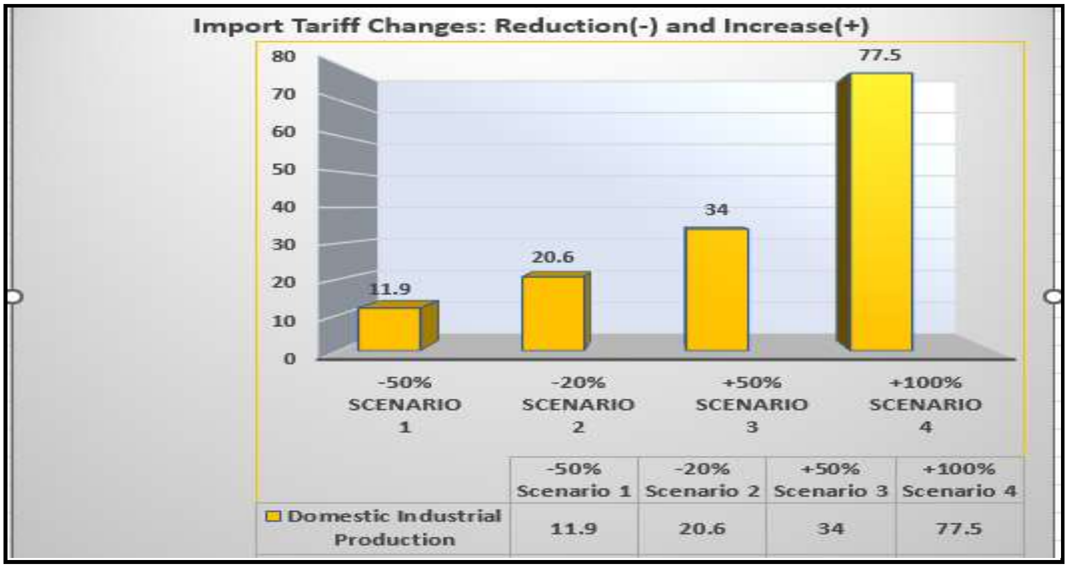
Scenario 4 and Scenario 3 Difference				
Summary of the Static Parameters Results % Deviation from Base Year Values Difference				
		100% Scenario 4	**50% Scenario 3**	**(4) – (3)**
Scenario Variables		**% Deviation from base year**	**% Deviation from base year**	**Difference**
		Effect	**Effect**	**Effect**
	Domestic Industrial Production	77.5	34	43.5

Source: Authors' Computation

The result in Table 7 shows that if import tariff policy is change from 50% to 100% in the actual import tariff rate scenario, it will cause the growth rate of industrial production in Nigeria to rise by 43.5% in the short run. This might be due to the volume of import substitution in the economy.

Graphical Representation of Scenarios

The Figure 1 shows the graphical representation of import tariff rate change from -50 to +100% with domestic industrial production. The graph shows that domestic industrial production has direct relationships with import tariff changes. These research findings confirm with previous findings in the literature on the effects of import tariff changes on domestic industrial production. 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 overall objective of this research is to analyse the effects of import tariff changes on domestic industrial production in Nigeria and measure the magnitude of such effects on these variables from the immediate-short run period, using a static computable general equilibrium model to run simulations that indicate the nature of the effects. The model is applied to a stylized country-level data set that reflects the structural characteristics of the Nigerian economy on the country's aggregate variables. 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 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 domestic industrial production 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. Based on the four scenarios results, it was obvious that 50% and 20% reductions in actual tariff rate will have negative effects on domestic industrial production. But 50% import tariff rate reduction, we have a higher negative impact than 20% reduction. Also, our findings reveal that 50% and 100% increases in the import tariff rates will have positive increasing effects on the growth rate of domestic industrial production in the short run than the reductions scenarios -50% in scenario 1, and -20% in scenario 2. The results reveal that, the immediate-short run effects of tariff changes in Nigeria shows direct trend with domestic industrial production. This implies that domestic industrial production will maintain negative annual growths in the immediate if the import tariff rate policy is reduced.

The simulation scenarios show that -50% to 100% import tariff changes we have a direct relationship with the growth rate of industrial production in Nigeria in the immediate-short run. From the results, it is shown that 50% reduction in import tariff rate will have immediate and short run effects on domestic industrial production, 11.9%, on the growth rates. While 20% reduction import tariff rate will positively affect the variable 20.6%, respectively in its immediate-short run growth. The rise in domestic industrial production from 11.9% in scenario 1 to 26.0% in scenario 2 may be due to the increase in import substitution in the economy. The findings also reveal that 50% and 100% increase in the import tariff change scenarios will have an increasing effect on domestic industrial production but greater than scenarios 1 and 2 values. The findings from this study tend to confirm a priori expectations on the effect of import tariff changes on domestic industrial production in the Nigeria. We concluded that this analysis provides insights into possible strategies to control high tariff rates in Nigeria and provides a basis for recommendations

Policy Recommendations

Our policy analysis examines the impact of changes on domestic industrial production in Nigeria. The quantitative findings in this study suggest that domestic industrial production has direct relationships with import tariff changes. The following policy recommendations are suggested to address the side effect of import tariff changes on the domestic industrial production:

i. 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, therefore, they should be encouraged.

ii. For this macroeconomic variable, a coordinated interplay of monetary and fiscal policies will be required to minimise contemporaneous distortions that arise from relaxing trade restrictions.

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