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Rice Trade Protectionism Versus Liberalization in Nigeria: A CGE Analysis of Economic and Welfare Effects

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60- RICE TRADE PROTECTIONISM VERSUS LIBERALIZATION IN NIGERIA: A CGE ANALYSIS OF ECONOMIC AND WELFARE EFFECTS

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Abstract

Nigeria's rice trade has been characterized by intermittent shifts between protectionist and liberalization trade policies over the years and little is known about the effects of these reforms on the entire economy. Past studies on Nigeria have only assessed the policies within the partial equilibrium framework. This study uses a static computable general equilibrium model to assess the effect of protectionist policy of 80% tariff increase and liberalization policy of 5% tariff reduction on production sectors, macroeconomic aggregates and households' welfare in Nigeria. Simulation results reveal that output in the rice and other agriculture sectors increased more, by about 1%, under the liberalized policy than protectionist policy. Manufacturing and services sector increased in labor, composite price and returns to capital by less than 1% while the same fell under the protectionist policy. Almost all macroeconomic aggregates fell under both policies but with a greater magnitude under the protectionist policy. Wage rate increased under the liberalized policy only, by less than 1%. Although rural households' incomes increased under protectionist policy, social welfare declined under both policies but was less with the 5% reduction in tariff. Hence this policy was recommended for adoption in order to increase growth of sectors and minimize welfare losses to households.

Keywords: Rice trade policy; tariff; household welfare; computable general equilibrium

1. Introduction

Rice is the principal source of calorie intake for about half the world's population, especially the poor; it makes up one in five calories consumed worldwide (FAO, 2006). In Sub-Saharan Africa (SSA) where the problem of hunger and poverty has been a global concern, rice has become important to food security in Africa (Akpokdje et al, 2001). Nigeria is the largest consumer and importer of rice in the SSA region (FAO, 2007). Rice consumption constitutes the largest proportion of total household food expenditure in the country; about 24% (Erhabor and Ojogho, 2011). The demand for rice is growing at a rate of 10% annually; the fastest growing amongst all domestically cultivated staple foods in Nigeria (Akpokodjie et al, 2001, Akande, 2002 and WARDA, 2008) hence, the rice demand is expected to increase given the country's population growth rate of 2.1% (NPC, 2006), changing consumer preferences, rapid urbanization, changes in family occupational structures and increased income levels (Akpokdje et al, 2001).

Nigeria is the largest rice producer in the West African region with a relatively higher comparative advantage than other countries of the region (Nwanze et al, 2006). About 83% of domestic rice output is produced in the northern part of the country while the

south accounts for the remaining 17% (NBS, 2007). Domestic supply of about 3.2 million tons (MT) milled rice falls short of demand which is about 5.0 MT (FAO, 2007). The shortfall of about 1.8 MT is made up by importation which cost the government over $2 billion annually. Government intervention in rice trade has been mainly through the use of protectionist trade policy to protect local rice producers while liberalized trade policy only was used whenever consumers' welfare was in focus. Thus rice trade policies have wavered around bans, quantity restrictions on imported rice and high, low and even zero tariffs which were applied as adhoc measures taken to address problems in the short run. Nigeria does not have a consistent and sustainable trade policy for rice although since the lifting of the ban on rice imports in 1995, tariffs have been majorly used; both increases and decreases.

Inconsistencies in trade policies have been identified severally in the literature as a disincentive to domestic rice production, rice farmers' welfare and attainment of rice self sufficiency (Akande, 2002, Daramola, 2005, Ezedinma, 2005, UNEP 2005 and Nwanze et al, 2006). Decision-making and planning become highly uncertain and investments are put at great risk thus, leading to income losses for producers which worsen their welfare status and plunge them deeper into poverty. On the other hand, consumers' incomes are also affected as they pay as much as four times the world price for imported rice under high tariff regimes thus, worsening their welfare and poverty status (Griswold, 2006). About 69% of Nigerians are poor (NBS, 2010) indicating a lack of welfare and well-being. Public policy must bring about improvement of social welfare which would, hence, the question of how these policies affect the welfare of individuals in that country must be addressed (Slesnick, 1998). However, the government's policy stance has been found to be a major factor affecting poverty level in Nigeria over the years (Aigbokhan, 2008). Important questions therefore arise such as: how do the different rice trade policy measures of the country affect the rice sector with other sectors of the economy and key macroeconomic aggregates, given the importance of rice to the nation's economy? How do the rice trade policy measures affect the welfare of households in the different regions (north and south) of the country and which rice trade policy best improves the social welfare of Nigerian households?

Several studies have analyzed the impact of trade policies, especially trade liberalization, on Nigeria's economy. Okunmadewa (1999) and Ogundele (2001) used partial equilibrium models to analyze the effects of trade liberalization on the economy. These studies found negative implications for the economy but could not incorporate households in their models neither was rice trade specifically analyzed. Olofin et al (2001) used a computable general equilibrium (CGE) model with one household to assess the impact of a 50% tariff reduction on all imports and reported that the policy had a positive effect on consumption but was negative for production. The study's use of a

single household, however, could not show which specific households benefitted while rice trade was not assessed in the study also. Nwafor et al (2007) used a CGE model with two households (rural and urban) and found that rural household incomes were negatively affected while urban household incomes were positively affected. Rice trade was, again, not specifically assessed in the study. Moreover, a higher disaggregation of households would reveal which rural or urban households benefit from the policy. Wailes (2005) analyzed the welfare effects of a full liberalized rice trade policy on the economy using a partial equilibrium model and found that social welfare declined. Nigeria's preference for liberalized policy of rice tariff reduction on the economy was not assessed neither was the effect on specific household groups shown. Obih et al (2008) analyzed the effect of protectionist rice trade policies of a ban and tariff on social welfare using a partial equilibrium model. The study found that social welfare improved under the tariff regimes than under the ban but could not give the specific households who gained welfare neither the effects on different sectors of the economy or macroeconomic aggregates such as foreign savings, investments, wage rate and exchange rate. Hence, rice trade policy effects on other sectors of the economy, macroeconomic aggregates and the winners and losers of either class of policy (protectionist and liberalized) in addition to their effects on specific households' welfare are not known. This therefore highlights the importance to evaluate the rice trade policy options of the country in view of their economy-wide effects.

This paper aims to analyze the effects of Nigeria's rice trade policy preferences of increase in tariff by 80% and a small reduction in tariff by 5% on the Nigerian economy and welfare the households. The rest of the paper is organized as follows: Section two presents a description of rice trade policy in Nigeria since 1970. Section three gives the theoretical underpinning upon which this study is based while section four describes the methodology used for the analysis. Section four presents the results and section five concludes the paper.

2. Rice trade policies in Nigeria

Nigeria's rice trade policy can be described within four important policy periods. These are: the pre-ban, import quota, ban and post-ban periods. The pre-ban period which spanned from 1970 to 1978 was largely characterized by liberal policies on rice imports. There was a high inflow of imported rice and other food items into the country at relatively cheap prices. Rice tariffs ranged between 10% and 20% and the government was actively involved in the distribution and marketing of the imported rice in addition to bearing the costs of their marketing activities instead of passing the same to consumers. As the country's foreign reserves became depleted, a period of economic crisis set in paving the way for the second policy period- import quota period. This was the period of quantitative restrictions spanning between 1979 and 1984. Restrictive measures such as

the use of import licenses and quotas were used to curb the influx of rice imports into Nigeria. Only few individuals and government agencies were issued import licenses at no tariff charge. The third policy period was the period of an outright ban on imported rice into the country. This period spanned from 1985 to 1995. The ban on rice importation was enforced along with the Structural Adjustment Program (SAP) which was introduced in 1986 to reinforce the ban. Other measures adopted by the government in this period include exchange rate deregulation and depreciation of the country's currency (naira). However, illegal rice importation thrived due to the country's porous borders thus limiting the gains of the protectionist policy.

The fourth policy period was the post-ban period spanning from 1995 to date. Although the ban on rice importation was lifted, trade policy was still largely protectionist as tariff was set at 100%. This represented the highest increase of 81% (from the last official tariff of 19% in 1978) that has been imposed. In addition, increased efforts were made by the government to help domestic producers take advantage of the policy protection of tariffs in order to encourage local rice production. For instance, the Presidential Initiative on Increased Rice Production Processing and Export was set up to close the existing gap between demand and supply of rice in order to attain self-sufficiency and export level in rice production. Tariff increases have characterized Nigeria's rice trade policy reforms since the lifting of the ban in 1995. The highest tariff charged on rice imports was 120% which occurred in 2004. However, in 2007, Nigeria assumed a more liberalized policy stance in the wake of the global grain crisis and by 2008, rice imports were allowed into the country at no tariff charge. The country's move to a more liberal trade policy was also a step to join the on-going globalization trend occurring in all nations of the world being due to the World Trade Organization (WTO) requirement of which Nigeria is a member. However, in recent times, a more protectionist stand on rice imports has recommenced. Since 2012, rice tariffs have been raised to 100% from 30% and 50% on paddy and milled rice respectively (USDA, 2012). This shows that the country is still oscillating between protectionist and liberalization policies of rice trade.

3. Theoretical framework

The introduction of a tariff can have varying effects on a country's economy as illustrated in Figure 1. The country here is a small open economy having no power to affect world prices of traded goods. We assume that the country has labor markets that function well where nominal and real wages are flexible. There are two traded sectors X_1 and X_2 and production in the free trade economy occurs at A while consumption occurs at C_1. Also, N represents the world price ratio, PW_1/PW_2 (where PW_1= world price of X_1 and PW_2= world price of X_2). The world price ratio equals the domestic price ratio P_{X_1} / P_{X_2} (where P_{X_1} = domestic price of X_1 and P_{X_2} = domestic price of X_2). Thus, the country can either sell or purchase goods at the world relative prices. World price of the commodities X_1 and

Figure 1: Effect of a trade policy of tariff on the economy.
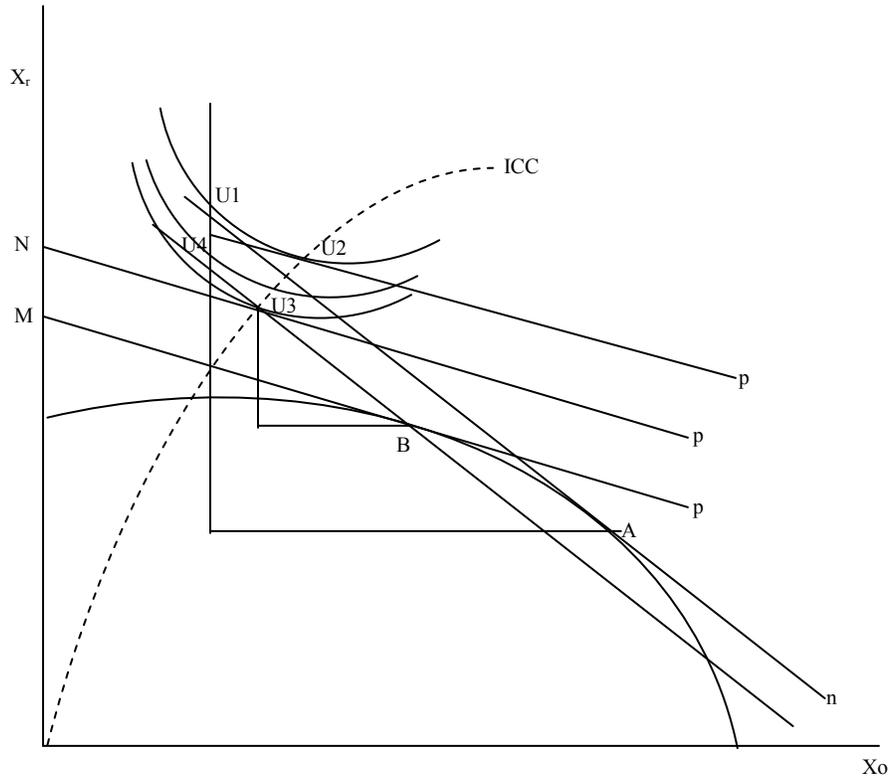
X_2 are exogenously determined and the exchange rate is the link between world price and domestic price. If relative price P_{X_1} / P_{X_2} increases, consumers shift demand for X_2 from home to foreign produced goods. The difference between consumption of X_2 and domestic output equals import of X_2. Domestic resources then shift to production of more of X_1 and the excess production can be exported. If the government imposes a tariff on the imports of X_2, this lowers the relative domestic price below the world price as shown by the lines *p*. This raises the price of both the imported commodity and the import-competing commodity and results in a price increase which creates an incentive for domestic production of the importable. Hence, if the tariff rate is further increased, the prices of the imported and the import-competing commodities increase also. A tariff imposition thus results in firstly, a production effect because producers shift towards the production of the importable; from *A* to *B* in Figure 1. Secondly, there is a government-revenue effect as government revenue increases due to tariff collection, hence it moves from *G* to *H*. Thirdly, the volume of trade reduces; as indicated by the relative size of the

two trade triangles and fourthly, there's a welfare effect because the society loses welfare and moves to a lower indifference curve C_3. The social welfare loss occurs due to the cost of producing inefficiently; from C_1 to C_4 and the cost of consumption at distorted prices; from C_4 to C_3. Similarly, a lowering of the tariff would in turn lower the price of both imported and the import-competing commodities but they will not be equivalent to the world price.

4. Methodology
The distributional effects of a trade policy are more appropriately captured using a general equilibrium model (de Janvery and Sahoudalet, 1989; Lofgren et al, 2003; Fiestas, 2005; Warr, 2005 and Adenikinju et al, 2009). A general equilibrium treatment provides a framework which accounts for the interactions among sectors and households while, at the same time, satisfying all relevant market clearing conditions and macroeconomic constraints. It also allows economic parameters to be varied in order to determine the sensitivity of the results to the assumed values of the parameters (Warr, 2005). The policy simulations in the study of 80% and 5% reduction in rice tariff are thus achieved using a Computable General Equilibrium (CGE) model for Nigeria. The model requires the presentation of a set of benchmark data called a Social Accounting Matrix (SAM) which is a summarized version of the structure of an economy in the form of a square matrix. It shows the circular flow of income and expenditure, sectors and their commodities, in addition to the production factors and institutions in the economy, within an accounting period (usually a year).

4.1 Data
The 2004 input-output (I-O) table for Nigeria, obtained from the Nigerian Institute for Social and Economic Research (NISER), is used to construct the SAM for the study. This was the most recent I-O available at the time the study was conducted. The production sectors in the SAM are: Rice (RC), Other agriculture (OA), Oil and mining (OM) and Manufacturing and services (MS). The commodities in the SAM also follow as the sectors. Factor inputs employed in production are labor and capital. The SAM has four households namely: rural north, rural south, urban north and urban south. The first two households are net producers of rice while the latter two are net consumers of rice. Shares of household income and expenditure are obtained from the Nigerian Living Standard Survey for 2004. The base year data on the sectors, macroeconomic aggregates and households are presented on Tables 8, 9 and 10 in the appendix. Elasticity values for import and export functions are obtained from CBN (2005) while production elasticity values for rice re obtained from NBS (2007).

4.2 Structure of the model

The model used for the study is a static Computable General Equilibrium (CGE) model which follows Dervis et al (1982) and Olopoenia and Aminu (2007). The model assumes that value added is a Cobb-Douglas function of labor and capital employed in the sector. Output produced in each sector comprises value added which is a function of two main inputs: factors (labor and capital) and intermediate inputs which are derived from inter-sector input demand and from the external market. Producers maximize profits subject to a Leontief production function which combines the two primary inputs. Hence, The production function combines two primary inputs of labor (*LAB*) and capital (*CAP*) to produce output in each sector i with value added (*XV*)

$$XV = avLAB_i^\alpha . CAP_i^{(1-\alpha)} \tag{1}$$

Where *av* is the value added shift parameter and α is the value added share parameter for a given sector.

The minimization of the value added equation (1) gives the demand for the primary input. Hence, capital in each sector *i* is given as

$$CAP_i = (1 - \alpha_i) PV_i \frac{X_i}{PK_i} \tag{2}$$

Where PV_i, PK_i and X_i are the value added price, price of capital and domestic output for sector *i* respectively.

Labor in each sector *i* is also given by,

$$LAB_i = \alpha_i . PV_i \frac{X_i}{W} \tag{3}$$

Where *W* is the prevailing wage rate in the economy.

Capital is modeled as being immobile across sectors. Gross capital income (*CAPY*) is the sum of capital income of each sector multiplied by the price of capital in the sector. Thus,

$$CAPY = \sum CAP_i PK_i \tag{4}$$

Labor is modeled as being mobile across sectors. Gross labor income (*LABY*) is the sum of labor income of each sector multiplied by the ruling wage rate. Thus,

$$LABY = \sum LAB_i . W \tag{5}$$

Each household *h* earns its income (*HHY_h*) from labor and capital employed in production and is a function of labor supplied at the ruling wage rate (*W*) and capital stock of the households at the ruling price of capital (*PK*) and depreciation rate ($depr_i$).

$$HHY_h = \sum hfyls_{hi} (LAB_i . W) + \sum hfyks_{hi} CAP_i PK_i (1 - depr_i) \tag{6}$$

Where $hfyls_{hi}$ the share of factor income from labor is received by household *i* and $hfyks_{hi}$ is the share of factor income from capital received by household *i* and $depr_i$ is the depreciation rate in sector *i*. Households spend their income on goods produced by the

sectors including their import competing commodities. However, imports and domestic demand are assumed to be imperfect substitutes in line with the Armington assumption (Armington, 1969). Hence, the quantity of composite commodity i consumed by household h ($HEXPQ_{(h,i)}$) is given by

$$HEXPQ_{(h,i)} = \frac{h\exp s_{hi}.HHY_h}{P_i}$$ (7)

Where $h\exp s_{hi}$ is the expenditure share for household h on goods from sector i and P_i is the price of composite commodity in sector i. Each household maximizes a Cobb-Douglas utility function subject to their income thus the household utility (HHU_h) is given by

$$HHU_h = \sum h\exp s_{hi} \log HEXPQ_{hi}$$ (8)

Household savings (SAV_h) are specified as the difference between household income and its expenditure while total household savings of all the households ($HSAV$) is obtained from the sum of the savings of each household put together.

$$SAV_h = HHY_h - \sum h\exp s_{i.}HHY_h$$ (9)

$$HSAV = \sum SAV_h$$ (10)

Total import tax (*IMTAX*) collected by government is obtained from the sum of import taxes from final and intermediate imports. Final imports in each sector are given by the world price of the final import (*PWM*) in sector i multiplied by its import duty rate (tm_i) and the exchange rate (*ER*). Intermediate imports in each are given by the world price of the intermediate import (*PWN*) in sector i multiplied by its import duty rate (tn_i) and the imported intermediate good (*N*).

$$IMTAX = \sum tm_{im}.PWM_{im}.ER + \sum tn_{in}PWN_n.N_{in}$$ (11)

Total indirect tax (*INDTAX*) collected by government is obtained from the sum of indirect taxes paid by each sector. Indirect taxes paid sector i is given by the product its excise duty (td_i), output (*X*) and its price (PX_i).

$$INDTAX = \sum td_i PX_i X_i$$ (12)

Total government revenue (*GRT*) is obtained from the sum of all import and indirect taxes less subsidy to the sectors. Thus,

GRT = IMTAX + INDTAX - GOVSUB (13)

Domestic price of final imports (*PM*) is a function of the nominal exchange rate, the world price of the commodities and import taxes. Exchange rate is endogenized in this model.

$$PM_{im} = ER.PWM_{im}\left(1 + tm_{im}\right)$$ (14)

Domestic price of exports (*PE*), is a function of the nominal exchange rate, the world price of the export commodities (*PWE*) and export tax (*te*) by sector. All export their goods except RC which only imports. Thus,

$$PE_{ie} = ER.PWE_{ie}\left(1+te_{ie}\right)$$ (15)

The composite price is a function of the value of production of domestic goods and value of imports. The value of production of domestic goods is given by domestic supply of locally produced goods (*D*) multiplied by its price (*PD*) by sector. Similarly the value of imports is a function of the import of final goods (*M*), domestic price of import (*PM*) and the composite final good (*Q*) in sector *i*.

$$P_i = PD_i.D_i + PM_i.M_i.\frac{M_i}{Q_i}$$ (16)

The price index (*PINDEX*) is the sum of the shares of the output or the consumer price index weights (*pwts*) from the sectors multiplied by the price of composite. The price index is also the numeraire. Thus,

$$PINDEX = \sum pwts_i.P_i$$ (17)

Foreign savings (*FSAV*) or external balance is obtained by the expenditure on final and intermediate imports less the revenue from exports. Thus,

$$FSAV = \sum PWM_{im}M_{im} + \sum PWN_{in}.N_{in} - \sum PWE_{ie}.E_{ie}$$ (18)

In line with the neo-classical assumption of full employment, the goods market is cleared when the sum of demand for commodities equals the composite supply; where ($INTD_i$) represents the intermediate input demand, CD_i is the private consumption and ID_i the investment demand in sector *i*. Hence,

$$Q_i = INTD_i + CD_i + SECGOV_i + ID_i$$ (19)

Similarly, factor markets are in equilibrium when total labor demand also equals total labor supplied

$$L = \sum LAB_i$$ (20)

Also the factor markets are in equilibrium when total capital demand equals total capital supplied

$$K = \sum CAP_i$$ (21)

Gross domestic product (*GDP*) is the sum of the value of production and all taxes collected and this gives the objective function. Hence,

$$GDP = \sum PV_i.X_i + IMTAX + INDTAX$$ (22)

Where *PV* is the value added price. Evaluation of welfare implications of rice trade policy on households are estimated by calculating welfare gains/losses from simulation results in equation (8) with Hicksian Equivalent Variations (EV) following Olopoenia and Aminu (2007), Annabi et al (2006) and Devarajan et al (2001). The Hicksian EV is given by

$$EV^h = \left[\frac{U_n^h - U_o^h}{U_o^h} \right] Y_o^h \qquad (23)$$

Where Y_o^h is the income of household h before the policy change, U_o^h is the utility of household h before the policy change, U_n^h is the utility of household h after the policy change and EV^h is the Equivalent Variation of a household h.

4.3 Simulation experiments in the model

Two policy scenarios are simulated in this study: protectionist policy of 80% increase and liberalization policy of a small reduction of 5% in rice tariff. Tariff increase and small reductions in tariff represent the major measures of rice trade policy that have been used in Nigeria since after the lifting of the ban on rice imports in 1995. The study chooses to simulate the highest increase in tariff from one year to another, which was an increase of about 80% when tariffs were increased from 19% in 1978 (the last tariff rate before the ban) to 100% in 1995 (after the lift of the ban). On the other hand, reductions in rice tariffs have been less frequently applied in relation to protectionist policy. Hence, the study simulates the smallest reduction in tariff. The smallest tariff cut used since 1970 was 1% followed by 10%.The study simulates a tariff reduction of 5% as this is an approximate mean value of the two lowest reductions in rice import tariffs. Simulating 1% reduction may not show any appreciable change in the base solution considering that rice makes up less than 1% of the entire economy (see table 8 in the appendix). Moreover, a 5% and 10% change in import tax have been found to be not so different from one another (see Olopoenia and Aminu, 2007). The tariff in the base year was 120%.

5. Empirical results

Protectionist rice trade policy

Table 1 shows that 80% tariff increase on rice imports increases domestic output in both RC and OA by 0.1%, price of capital by 1.8% and 0.1% respectively while exports increases in OA by 0.6%. This implies that the policy favored both sectors and may be because the two sectors are complimentary. However, OM and MS are negatively affected by the tariff increase as output falls in both sectors by 0.9% and 0.3% respectively and export by 0.9% in OM. All sectors also experience a fall in composite. The fall is expected in the RC due to the tariff increase which caused the rise in composite by 2.7%. This result follows Griswold (2005) who found that tariffs increase the price of the commodity by as much as four times the world price thus serving to discourage trade. The rise in export price coupled with a fall in composite price may account for the fall in composite in OA while that of both OM and MS may be due to the fall in their output coupled with a rise in their export prices which encouraged more

export than domestic supply. This implies that the protectionist policy general favored RC and OA but negatively affected OM and MS.

Table 2 presents the changes in key macroeconomic aggregates in the economy in response to 80% increase in rice import tariff. The increase in tariffs leads to a fall in all major macroeconomic aggregates while exchange rate increased by 0.2%.

Table 1: Percentage changes in sectors due to 80% increase in rice import tariff

Variables	Rice (RC)	Other agriculture (OA)	Oil and mining (OM)	Manufacturing and services (MS)
Domestic output	0.1	0.1	-0.9	-0.3
Composite commodity	-1.9	-0.3	-0.7	-0.4
Exports	-	0.6	-0.9	0
Labor	2.1	0.3	-0.4	-0.1
Capital	0	0	0	0
Composite price	2.7	-0.3	0.3	0
Price of capital	1.8	0.1	-0.7	-0.4
Export price	-	0.2	0.2	0.2
Import price	0.2	0.2	0.2	0.2

Source: CGE simulations

Import tax, indirect tax, government revenue and government savings each fall by about 0.3%. Contrary to expectation that the tariff increase would in turn increase import tax revenue and government revenue, these aggregates actually fall. The fall in import tax may be due to inefficiency in tariff collection in Nigeria. This agrees with Olopoenia and Aminu (2007) who found that even when tariffs were charged, only a proportion of the revenue are actually collected due to the problems of inefficiency and corruption in the system. Moreover, the fall in overall indirect tax is expected since decreases in domestic output, composite, exports and labor employed are recorded in different sectors. The fall in both import and indirect tax leads to the fall in government revenue. Since government savings is a function of its revenue, government savings also fall. Nominal and real GDP, wage rate and investment also fall by 0.4%, 0.3%, 1.6% and 0.3% respectively. The decline in both nominal GDP and real GDP shows that, the value of the output produced by all the four sectors in the economy falls when valued at both current and constant

prices as a result of the tariff increase. This explains the reduction in overall investment. In addition, government investment in the four sectors also reduces due to the fall in its revenue.

Other macroeconomic variables such as foreign savings, consumer price index and the total quantities of labor and capital are not affected by the tariff increase. This may be due to the fact that the policy effects are not large enough to change the value of all the labour and capital employed in the economy.

Table 2: Percentage changes in macroeconomic aggregates due to 80% increase in rice import tariff

Variable	Percentage change
Import tax	-0.3
Indirect tax	-0.3
Government revenue	-0.3
Government savings	-0.3
G.D.P	-0.4
Real G.D.P.	-0.3
Foreign savings	0.0
Investments	-1.6
Wage rate	-0.3
Exchange rate	0.2
Consumer price index	0.0
Total quantity of labor	0.0
Total quantity of capital	0.0

Source: CGE simulations

Table 3 shows the effect of the policy on households in the economy. The results reveal that the protectionist policy favors the rural north household as its income and utility increased by 0.1% and 0.01% respectively while rural south household income shows no appreciable change due to the policy. The fact that the rural north households account for over 80% of rice production in Nigeria may account for this (NBS, 2007). The results of the Equivalent Variation (EV) for each household which gives the welfare gains from the policy are shown on Table 4. The results show that the rural north and rural south

households' welfare improved by ₦0.46 billion and ₦0.41 billion respectively. This shows that net producers are the winners under the protectionist policy of tariff increase. On the other hand, the urban households' incomes and utility decline under the protectionist policy. The urban south household's incomes declined by almost twice that of their northern counterparts.

Table 3: Percentage changes in households due to 80% increase in rice import tariff

Households	Household income	Household savings	Household utility
Rural north	0.11	0.11	0.01
Rural south	0.00	0.00	0.00
Urban north	-0.31	-0.31	-0.03
Urban south	-0.62	-0.62	-0.04

Source: CGE simulations

Table 4: Welfare effect of the rice trade policies on Nigerian households (₦billion)

Households	EV from 80% increase in rice import tariff	EV from 5% reduction in rice import tariff
Rural north	0.46	-0.69
Rural south	0.41	0.00
Urban north	-8.57	0.00
Urban south	-14.65	-7.33
Total	-22.35	-8.02

Source: Computations from Hicksian measures.

The fact that a greater proportion of imported rice is consumed by the urban south households than the urban north households may account for the greater impact on the household (Lancon et al, 2003). Similarly, the EV results on Table 4 shows that the tariff increase results in a welfare loss ₦14.65 billion for the urban south household and ₦8.57 billion for the urban north household while the overall welfare loss to the country as a result of the protectionist policy is ₦22.35 billion. The economy in this case ultimately loses under a tariff increase.

Liberalized rice trade policy
The results for the effect of a liberalized policy of a small reduction of 5% in rice tariff on production sectors are presented on Table 5. The results reveal that tariff reduction positively affects the RC and OA as output increased in each sector by 1.1% and 0.5% respectively. This shows that the liberalized policy encourages a higher output in both RC and OA than the protectionist policy.

Table 5: Percentage changes in sectors due to 5% reduction in rice tariff

Variables	Rice (RC)	Other agriculture (OA)	Oil & mining (OM)	Manufacturing & services (MS)
Output	1.1	0.5	-0.1	-0.6
Composite	1.0	0.3	-0.3	-0.2
Exports	-	0.6	-0.1	-1.6
Labour	-2.5	-0.1	-0.6	0.2
Capital	0	0	0	0
Composite price	-3.1	-0.5	-0.5	0.2
Price of capital	-2.4	0	-0.5	0.3
Export price	-	-0.4	-0.4	-0.4
Import price	-2.5	-0.4	-0.4	-0.4

Source: CGE simulations

The increase in domestic output may be as a result of increased efficiency in production and processing which arise from competition coupled with increased demand for the commodity due to the lower composite price. This result is consistent with Warr (2005) and Panagariya (2005). Expectedly, composite also increases in both RC and OA by 1.0% and 0.3% respectively. The composite increase occurs as a result of the tariff reduction which lowers prices which, in turn, increases demand. This result is consistent with Griswold (2005) and Nwafor et al (2007) who found that trade liberalization leads to increased composite. However, labor employed in RC, OA and OA declined by 2.55%, 0.1% and 0.6% in respectively but increased in MS by 0.2%. This may be due to the fact that MS is the only sector in which returns to capital and composite price increase, hence labor moves away from RC, OA and OM to MS. Nwafor et al (2007) also found that trade liberalization leads to reduction in employment in the agriculture sector.

Table 6 reveals the effect of the liberalized policy on major macroeconomic aggregates. Generally, the tariff reduction also leads to a fall in major macroeconomic aggregates but with less magnitude than we observe under the protectionist policy. Import tax, indirect

tax, government revenue, and government savings all fall by 0.2%. 0.1%, 0.2% and 0.2% respectively. The fall in government revenue is consequent upon the fall in both import and indirect tax revenues which, in turn, lead to a fall in savings. Nominal and real GDP and investment both fall by 0.1% each and exchange rate by 0.4%. The reduction in both nominal GDP and real GDP shows that, the value of the output produced by all the four sectors in the economy declines when valued at both current and constant prices as a result of the general fall in prices which follows from the liberalization policy. This also explains the reduction in overall investment since government investment into the four sectors will reduce due to the fall in revenue. Conversely, wage rate increases by 0.1% and this may be due to the increased employment in MS; the sector that employs the largest proportion of the labor force in the country (see Table 8 in the appendix). The non-change in foreign savings, consumer price index and the total quantities of labor and capital, as in the protectionist policy scenario, further goes to confirm that rice trade policies do not affect these aggregates in Nigeria.

Table 6: Percentage changes in macroeconomic aggregates due to 5% reduction in rice tariff

Variable	Percentage change
Import tax	-0.2
Indirect tax	-0.1
Government revenue	-0.2
Government savings	-0.2
G.D.P	-0.1
Real G.D.P.	-0.1
Foreign savings	0.0
Investments	-0.1
Wage rate	0.1
Exchange rate	-0.4
Consumer price index	0.0
Total quantity of labor	0.0
Total quantity of capital	0.0

Source: CGE simulations

The results for the effect of a small reduction of 5% in tariff on households are presented on Table 7. The rural south household is not affected by the liberalized trade policy

whereas the rural north household's income, savings and utility decreases by 0.1%, 0.1% and 0.01% respectively while that of the urban south household decreases by twice as much. This implies that even a minimal reduction in tariff hurts the rural north household income. This may because of inefficiency in production which occurs under protectionist policy as is evident in the base year tariff of 120%. Conversely, the urban north household's income, savings and utility increased by 0.11%, 0.11% and 0.00% respectively. Furthermore, the EV results from Table 4 shows that welfare of rural south and urban north households does not change while welfare losses of ₦0.69 billion and ₦7.33 billion respectively occurs in the rural north and urban south households. This is less than the welfare loss observed under the protectionist policy for the urban south household. This shows that that the urban south household welfare is more affected by rice trade policy than the urban north. The social welfare loss of ₦8.03 billion is also less than observed with the protectionist policy (₦22.35). This shows that a minimal reduction in tariff, whilst not improving the welfare status of any household, causes less welfare loss to all households than the protectionist policy. This is consistent with the findings of Olopoenia and Aminu (2007). This shows that a small reduction in tariff will hurt Nigeria's welfare less than a large tariff increase.

Table 7: Percentage changes in households due to 5% reduction in rice import tariff

Households	Household income	Household savings	Household utility
Rural north	-0.1	-0.1	-0.01
Rural south	0.00	0.00	0.00
Urban north	0.1	0.1	0.01
Urban south	-0.2	-0.2	-0.2

Source: CGE simulations

6. Conclusion

The study investigated the policy implications of a protectionist policy of 80% increase and liberalization policy of a small reduction of 5% on rice tariffs on the Nigerian economy and its households' welfare. Tariff increases and small reductions are found to be preferred by the government with respect to rice trade. The study found that output in the rice and other agriculture sectors increased better under the liberalized policy than protectionist policy. Exchange rate increased under the protectionist policy while wage rate increased under the liberalized policy. Although rural households' experience gains in welfare under protectionist trade policy and urban households experience welfare losses, the social welfare loss is greater under protectionist trade policy than liberalized trade policy. Following from this, the major policy implication of the study's findings is that the small reduction in tariff should be adopted as Nigeria's rice trade policy as this option is less welfare-reducing for the country than the protectionist policy. In line with this, welfare improving policies targeted at the disadvantaged sectors like oil and mining,

and rural north and urban south households would also be needful to cancel out welfare losses to the sectors and households respectively.

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APPENDIX

Table 8: Base solution shares of sector variables in ₦billion

Variables	Rice	OTAGR	OLM	MANSV	Total
			Sectors		
Domestic output	0.7	27.5	28.9	42.9	100.0
Composite	0.8	17.9	3.7	77.6	100.0
Exports	-	32.1	66.6	1.3	100.0
Labor	0.8	31.6	9.7	57.9	100.0
Capital	0.8	30.4	35.0	33.8	100.0

Source: Computation from CGE model solution

Table 9: Base solution values of macroeconomic aggregates (₦billion)

Variable	Base Solution
Import tax	902.962
Indirect tax	263.719
Government revenue	1163.160
Government savings	670.639
G.D.P	9427.532
Real G.D.P.	10573.570
Foreign savings	-856.132
Investments	1382.458
Total quantity of labor	181.887
Total quantity of capital	8078.965

Source: Computation from CGE model solution

Table 10: Base solution shares of household variables in (%)

	Households				
Variables	Rural north	Rural south	Urban north	Urban south	Total
Labour income	40.0	30.2	18.6	11.2	100.0
Capital income	9.7	13.3	33.1	43.9	100
Total income	10.4	13.7	32.8	43.1	100
Expenditure	40.1	30.2	18.5	11.2	100
Savings	-76.9	-64.4	92.9	148.4	100
Household utility	47.6	36.9	8.8	6.7	100

Source: Computation from CGE model solution