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Effect of Rice Trade Policy on Household Welfare in Nigeria

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Abstract
Inconsistence in the use of trade policy reform has characterized Nigeria's rice imports over the years and little is known about the welfare implications of these reforms on the Nigerian households. This study uses a static computable general equilibrium model to assess the effect of rice trade policies of an import ban, 80% tariff increase, 5% tariff reduction and 0% rice import tariff on the welfare of households in the country. Simulation results show that no rice trade policy improved social welfare, although producing households' incomes increased under protectionist policies of ban and tariff increase. All households lost welfare with 0% tariff while only the major producing and consuming households lost welfare with the 5% reduction in tariffs. The least loss to social welfare also occurred in this scenario, hence this policy was recommended for adoption in order to minimize welfare losses to households.
Keywords: Rice; trade policy; tariff; households; welfare; computable general equilibrium

1. Introduction

1.1 Nigeria's Rice Problem

Nigeria is the largest consumer of rice in Sub-Saharan Africa and 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 and FAO, 2007). However, domestic supply of rice has continued to fall short of demand and importation is undertaken to make up the shortfall. The country is currently the second largest importer of rice in the world. However, use of trade policy instruments for Nigeria's rice imports has been largely inconsistent over the years. Since 1970, the government has used protectionist policies such as import quotas, outright ban and tariffs as high as 120%. Liberalized policies of reduced tariffs, as low as 10%, have also been used including a six-month period of tariff elimination in 2008. Inconsistencies in trade policies have been identified severally in the literature as a disincentive to domestic rice production, rice farmers' welfare and the reason for the country's failure to attain self sufficiency in rice production (Akande, 2002, Daramola, 2005, Ezedinma, 2005, UNEP 2005 and Nwaeze et al, 2006). This is because 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 status also (Griswold, 2006). About 54.4% of Nigerians are poor and one in three of every poor Nigerian is a farmer residing in the rural area (NBS, 2005). A lack of welfare and well-being is linked to poverty (World Bank, 2001) and as a tool for achieving economic development, public policy must bring about improvement of social welfare which would ultimately reduce poverty. Slesnick (1998) posited that a full consideration of a public policy must address the question of how these policies affect the welfare of individuals in that country. However, Aigbokhan (2008) identified the government's policy stance was one of the factors which affected the poverty level in the country over the years. From these findings, important questions arise such as: how do the different rice trade policy measures of the country affect the welfare of producing and consuming households 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 into their models. 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. They found that the policy had a positive effect on consumption but was negative for production. The use of only one household does not give a clear picture of which household group is more affected by the policy. Nwafor et al (2007) used a CGE model with two households (rural and urban) to assess the impact of various tariff regime of 0% to 20% levied across all imports. They found that rural household incomes were negatively affected by the liberalization policy while urban household incomes were positively affected. However, their study did not focus on rice. 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. The effects of the protectionist policies on household groups (for instance, producing and consuming households) were not found neither did their study assess liberalized rice trade policies. Hence, the winners and losers of the either class of policy and their effects on social welfare are not known. This therefore highlights the importance to evaluate the rice trade policy options of the country in view of their welfare effects.

This paper aims to analyze the effects of the rice trade policy options of ban increase in tariff and liberalization by small reduction in tariff and a zero percent tariff charge on the welfare of households in Nigeria. The rest of the paper is organized as follows: Section 2 presents the theoretical underpinning upon which this study is based, section 3, describes methodology used for the analysis, section four presents the result while section 5 concludes the paper.

1.2. Theoretical framework

The theoretical underpinning of a trade policy's welfare effect is found in the utility theory and is analyzed within the normative framework provided by the utility theory. The welfare of households in a country is measured as their level of utility which is obtained by maximizing their utility function for a given income and price system. Figure 1 (in the appendix a) illustrates a small open economy and the effect of an introduction of a trade policy on it. Firstly comsider that the country operates a closed economy, such as a ban on imports and exports, consumption is constrained by a country's production possibilities. In figure 1 below, *DD* represents the Production Transformation Curve, and *A* represents equilibrium; the point where marginal rate of transformation, marginal rate of substitution and price ratio are equal. Here, a country maximizes welfare subject to a fixed distribution which is derived by producing and consuming X_1 and X_2 at equilibrium point *A*. In the case of a small open, we assume that the country has no power to affect world prices of traded goods and that labor markets function well, that is, 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 rather than domestic prices as in closed economy in Figure 1. World price of the commodities X_1 and 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 introduces a trade policy such as the imposition of a tariff on the imports of sector 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. Thus the tariff imposition results in:

1. A production effect- producers shift towards the production of the importable; from *A* to *B*.
2. Government-revenue effect- government revenue increases due to tariff collection; from *G* to *H*.
3. The volume of trade reduces; as indicated by the relative size of the two trade triangles.
4. The welfare effect- society loses welfare as it moves to a lower indifference curve C_3. This social welfare loss occurs due to:
   a. The cost of producing inefficiently; from C_1 to C_4.
   b. The cost of consumption at distorted prices; from C_4 to C_3

2. Materials and Methods

2.1. Structure of the model

The model used for the study is a static Computable General Equilibrium (CGE) model which follows Dervis, de Melo and Robinson (1982). The forms of the model are given in the appendix (c). The functions used are constant elasticity of substitution (CES) of both the Cobb- Douglas and the Leontief types. The production function combines two primary inputs of labour (*LAB*) and capital (*CAP*) to produce output in each sector *i* with value added (XV_i).

$$XV_i = avLAB_i^{\alpha}.CAP_i^{(1-\alpha)} \quad (1)$$

Households earn their income from labour and capital employed in production and total household income (HHY_h) received by the households is the sum the income received by each household which is a function of labour supplied at the ruling wage rate (W) and capital stock of the households at the ruling price of capital (PK).

$$HHY_h = \sum hfyls_{hi}\left(LAB_i.W\right) + \sum hfyks_{hi}CAP_iPK_i\left(1-depr_i\right) \quad (2)$$

Where $hfyls_{hi}$ the share of factor income from labour 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 were 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

$$HEXPQ_{(h,i)} = \frac{h\exp s_{hi}.HHY_h}{P_i} \quad (3)$$

Where $h\exp s_{hi}$ the expenditure is 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

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

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.

$$SAV_h = HHY_h - \sum h\exp s_{i.}HHY_h \quad (4)$$

$$HSAV = \sum SAV_h \quad (5)$$

2.2 Data

A Social Accounting Matrix (SAM) was constructed from the 2004 input-output (I-O) table for Nigeria which was the most recent I-O available at the time the study was conducted. The production activities /sectors in the SAM are: Rice, Other agriculture, Oil and mining and Manufacturing and services. Factor inputs employed in production are labour and capital, which encompasses all factors other than labour. 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 were obtained from the Nigerian Living Standard Survey for 2004. The base year data on the households are presented on Table 1 in the appendix (b). Elasticity values for import and export functions were obtained from CBN (2005) while production elasticity values for rice were obtained from NBS (2007).

2.3. Simulation experiments in the model

Four policy scenarios were simulated in this study. These policy scenarios represented the various rice trade policy measures that have been used in the since 1970 till date and/or are under consideration by the government. The four policy scenarios simulated in this study were grouped under two main types of rice trade policies, namely (i) the protectionist policies consisting of: ban and use of high tariffs, and (ii) the liberalization policies consisting of: a small reduction in tariff (5%) and zero (0%) percent charge/ total removal of tariff on rice imports. Thus, the four simulations carried out were:

A ban on importation of rice

The ban on importation of rice was used by the government from 1978 to 1979 and also from 1985 to 1995. This is considered an extreme protectionist policy in the study. In 2007 and 2011 the government had considered placing a ban on rice imports. This was due to several calls from pressure groups such as the Rice Farmers Association on Nigeria (RIFAN), in addition to government's concern about the country's rising food import bill.

Increase in tariff rate

Tariff increases have characterized Nigeria's rice trade policy reforms especially since after the ban was lifted in 1995. The highest tariff charged on rice imports was 120% which occurred in the base year. However, the study chose to simulate the highest increase in tariff from one policy year to another. This was an increase of 80% when tariffs were increased from 19% in 1978 to 100% in 1995 (in between these periods the quota system and bans were in effect).

A small reduction of 5% in tariff rate

Reduction of tariffs on rice imports occurred severally since 1970 till date. Tariff cuts have ranged from as small as 1% and 5% to as large as large as 69%. However, the study considered a small reduction in tariff of 5% for three reasons. Firstly, simulating 1% reduction may not show any appreciable change in the base solution which can inform policy. Secondly, a 5% and 10% change in import tax have been found to not so different from one another (see Olopoenia and Aminu, 2007). Thirdly, 5% is an approximate mean value of the two lowest reductions in rice import tariffs that have been used in Nigeria.

Zero percentage tariff rate

The fourth policy scenario of a no-tariff charge on rice imports was used in 2008 in the wake of the global grain crisis. This policy option represents a free trade scenario where no tariff is charged on rice imports. This is the policy option that the WTO would have all countries of the world re-engineer their trade policy towards in other to ensure free trade globally.

Evaluation of welfare implications of rice trade policy on households were estimated by calculating welfare gains/losses from simulation results with Hicksian Equivalent Variations (EV) following Olopoenia and Aminu (2007), Annabi et al (2006) and Devarajan et al (2001). The Hicksian EV was given by

$$EV^h = \left[\frac{U_n^h - U_o^h}{U_o^h}\right] Y_o^h \qquad (6)$$

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*.

3. Results and Discussion

Figures 2 to 5 in appendix (a) present the direction and magnitude of change in the household variables in response to the policy changes while Table 2 in appendix (b) presents the welfare gains/losses to each household arising from the policy scenarios simulated in the CGE model. Figure 2 shows that the rural households were better off while the

urban households were worse off under the protectionist policy of a ban. The rural north households' income, savings and marginal utility increased most (0.3%, 0.3% and 0.03% respectively) while that of the urban south households fell fastest (2.5%, 2.5% and 0.18% respectively). The EV results on Table 2 reveal further that the welfare gain for the rural north was the largest (₦2.33 billion) while the urban south had the biggest loss in welfare (₦65.93 billion). This may be due to the fact that the majority of rice farmers in Nigeria (83% according to NBS, 2007) are located in the rural north, hence as net producers they reaped the greatest benefit of the price effect of a rice import ban. Conversely, urban south households are net consumers of rice and they consume more imported rice than urban north households. Hence, the increase in price occasioned by the import ban caused the income of the urban households to fall. Poverty profile figures by NBS (2005) have shown that rural households in Nigeria are poorer than the urban households and that the rural north households were poorer than the rural south households. Hence, the protectionist policy of an import ban on rice is likely to improve the welfare and ultimately contribute to poverty reduction in these households. Overall, however, the country loses welfare up to ₦92.79 billion with the ban. This includes what the households lose as a result of reduced spending of government since there may be a loss of revenue which would have accrued to the government from tariffs charges. Hence, the economy ultimately loses with a rice import ban policy.

The results for an increase in tariff rate (about 80%) on Figure 3 show a similar pattern as observed on Figure 2. This indicates that the protectionist policies cause effects in the same direction but with varying magnitude depending on the extent of protection employed (ban is a more extreme protectionist policy than increasing tariffs). The rural households were better off with 80% tariff increase, while the urban households were worse off. Figure 3 shows that again, the rural north households' income, savings and marginal utility increased most by 0.1%, 0.1% and 0.01% respectively while that of the urban south households fell fastest by thrice as much. The EV results on Table 2 show that rural north households were the biggest winners under the tariff increase with a welfare gain of ₦0.46 billion. The urban south households lost the most welfare of ₦14.65 billion. This further goes to buttress the fact that the protective policy of tariff regime on rice imports is a favorable policy option for the rural households but negatively affects urban households. However, the reduction in the magnitude of welfare gain/loss, relative to the ban scenario, may be due to the fact that these net producers were not entirely shielded from competition while consumers could increase their rice consumption due to the availability of imported rice, although at higher prices.

The result of a liberalized scenario which involves a small reduction of 5% in tariff on Figure 4 shows that only the urban north households were better off while the rural north and the urban south households were worse off. The rural south households were unaffected by the trade policy. The urban north households' income and savings each increased by 0.11% and marginal utility did not change while that of the urban south households decreased by twice as much. The EV from Table 2 showed that welfare of rural south and urban north households did not change while welfare loss to the rural north was ₦0.69 billion and that of the urban south households was ₦7.33 billion. This was the least loss by the urban south households recorded across all simulations. This shows that a minimal reduction in tariff, while not changing the welfare of the rural households, causes less welfare loss to urban households than the protectionist policies. Also, the welfare loss to all households' (about ₦8.03 billion) represented the least loss to the country. This is consistent with the findings of Olopoenia and Aminu (2007). This shows that a small reduction in tariff will hurt national welfare least. Figure 5 shows that under the liberalized trade policy scenario of a zero tariff on rice imports, all households were worse off especially the rural households. The income, savings and marginal utility of the rural north households fell fastest by 17.9%, 17.9% and 1.42 respectively while that of the urban south only fell by about a third of this. The urban south households suffered the least loss of income because imported rice, which is consumed mostly by these households, was readily available and at reduced prices. However, the welfare loss to the rural north (₦115.02 billion) indicated on Table 2 was the least with this policy while that of the urban north households (₦261.49 billion) was the largest. These welfare losses may have arisen as a result of increases in prices of other goods and its attendant costs. Overall, national welfare decreased by ₦694.06 billion; the largest welfare loss across all scenarios. This may have been due to loss in government revenue arising from the effect of the full liberalization policy. Thus, a policy of complete removal of tariffs on rice imports will result in the greatest national welfare loss for Nigeria. The result is consistent with Wailes (2004) who found that trade liberalization would hurt Nigeria's welfare.

4. Conclusion

The study has found that rural households' welfare increase with extremity of policy protection (as with a ban), although at the expense of social welfare. On the other hand, an extreme liberalization policy of a zero percentage

tariff on rice imports hurts all households' welfare and national welfare most. However, the least loss in national welfare occurred with a small reduction in rice import tariff. A lesser number of households were also hurt with this policy. Thus, 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 for rice importation as this option is least welfare-reducing for the national welfare. In line with this, welfare improving policies targeted at the disadvantaged households, especially the rural north households, would also be needful to cancel out welfare losses.

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APENDIX a

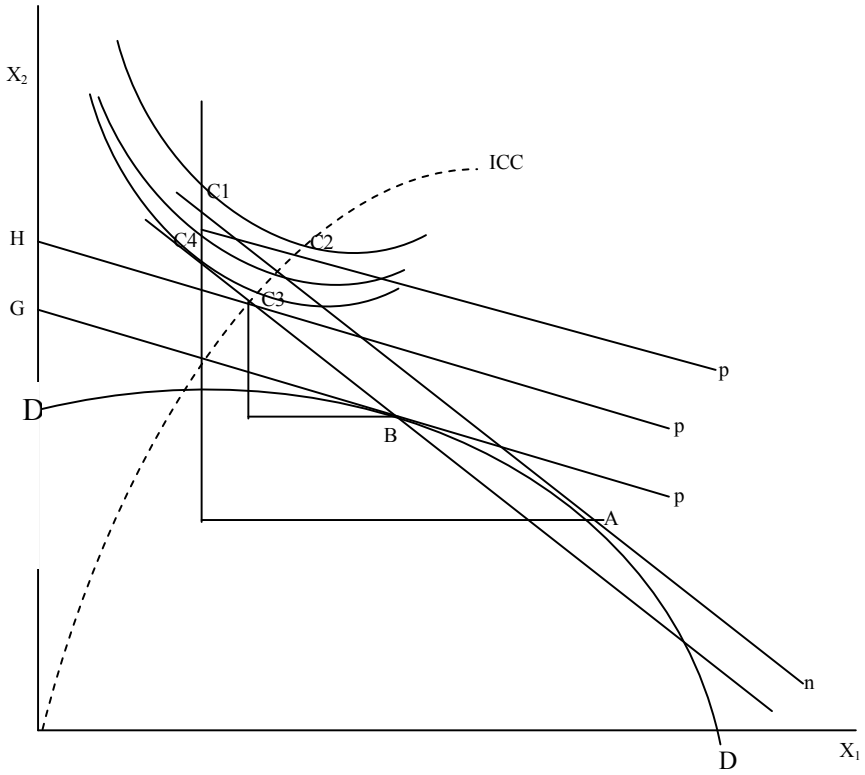

Figure 1: Trade policy effect.

The Figure shows the effect of a trade policy on production, consumption and trade.

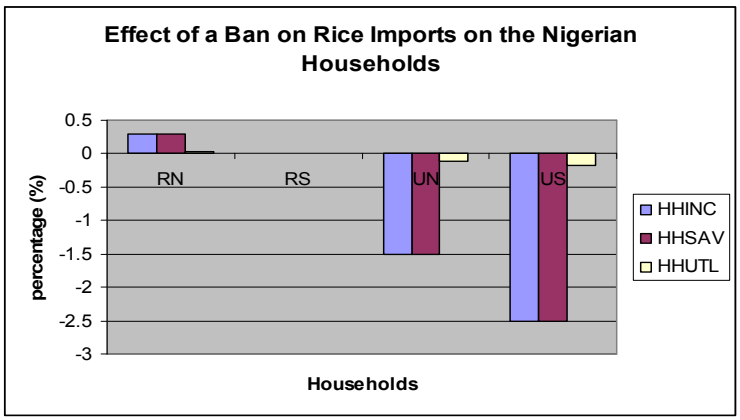

Figure 2: Effect of a ban on rice imports on the Nigerian households

The Figure shows the percentage changes in household income, savings and utility in response to a rice import ban

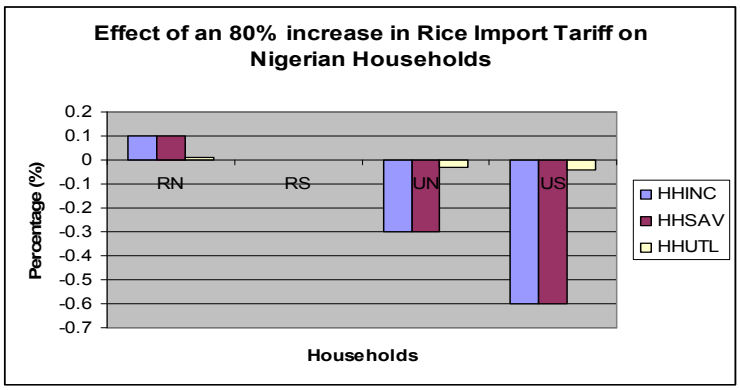

Figure 3: Effect of an 80% increase in rice import tariffs on the Nigerian households
The Figure shows the percentage changes in household income, savings and utility in response to 80% increase in rice import tariff

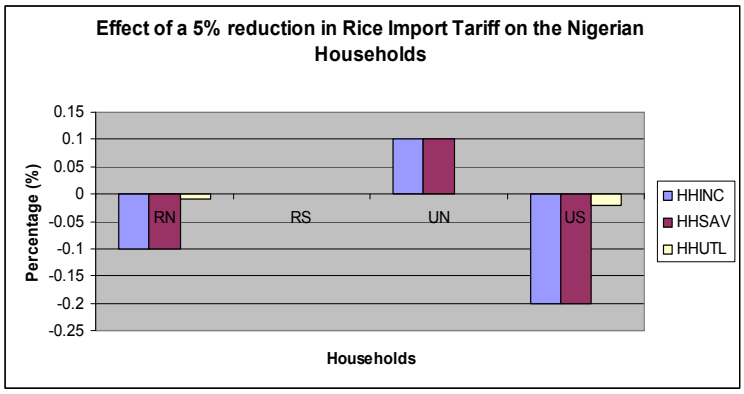

Figure 4: Effect of a 5% reduction in rice import tariffs on the Nigerian households
The Figure shows the percentage changes in household income, savings and utility in response to 5% decrease in rice import tariff

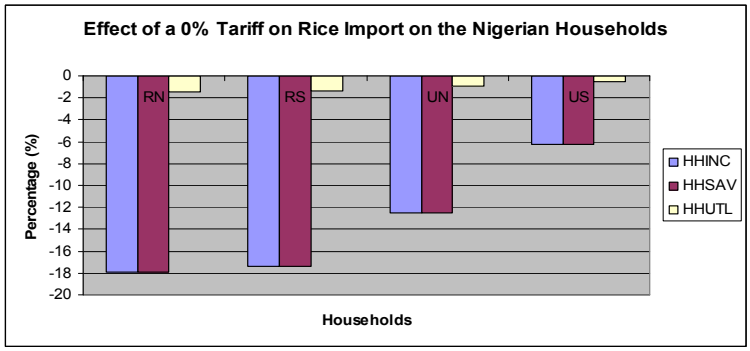

Figure 5: Effect of a 0% tariff on rice import on the Nigerian households
The Figure shows the percentage changes in household income, savings and utility in response to an elimination of rice import tariff
Where:

RN – Rural north

RS – Rural south

UN – Urban north

US – Urban south

HHINC – Household income

HHSAV – Household savings

HHUTL – Household utility

APENDIX b

Table 1: Base year values of households used in the model (₦billion)

Variables	Households				
	Rural north	Rural south	Urban north	Urban south	Total
Household income	8 126 (9.9)	10 924 (13.3)	27 310 (33.3)	35 772 (43.5)	82 134 (100)
Household savings	-12 070 (-79.4)	-10 059 (-66.2)	14 509 (95.4)	22 825 (150.1)	15 205 (100)
Household utility	34.8 (47.6)	27.0 (36.9)	6.4 (8.8)	4.9 (6.7)	73.1 (100)

Source: Computation from CGE model solution

Figures in parentheses are percentages

Table 2: Welfare effect of the rice trade policies on Nigerian households (₦billion)

Households	EV from a ban on rice imports	EV from an 80% increase in rice import tariff	EV from a 5% reduction in Rice Import Tariff	EV from a 0% Tariff on Rice Import
Rural north	2.33	0.46	-0.69	-115.02
Rural south	0.81	0.41	0.00	-149.05
Urban north	-30.00	-8.57	0.00	-261.49
Urban south	-65.93	-14.65	-7.33	-168.49
Social welfare	-92.79	-22.35	-8.02	-694.06

Source: Computations from Hicksian measures.

APENDIX c

The CGE model for the study

$$PV_i = PX_i\left(1-(td_i - sub_i)\right) - \sum(IO_{ji}.P_j) - PN_i.nx_i \quad 7$$

$$PM_{im} = ER.PWM_{im}\left(1+tm_{im}\right) \quad 8$$

$$PN_{in} = ER.PWN_{imn}\left(1+tn_{in}\right) \quad 9$$

$$PE_{ie} = ER.PWE_{ie}\left(1+te_{ie}\right) \quad 10$$

$$P_i = PD_i.D_i + PM_i.M_i.\frac{M_i}{Q_i} \quad 11$$

$$PX_i.X_i = PD_i.D_i + PE_i.E_i \quad 12$$

$$PINDEX = \sum pwts_i.P_i \quad 13$$

$$CAP_i = \left(1-\alpha_i\right)PV_i\frac{X_i}{PK_i} \quad 14$$

$$LAB_i = \alpha_i.PV_i\frac{X_i}{W} \quad 15$$

$$CAPY = \sum CAP_iPK_i \quad 16$$

$$LABY = \sum LAB_i.W \quad 17$$

$$IMTAX = \sum tm_{im}.PWM_{im}.ER + \sum tn_{in}PWN_n.N_{in} \quad 18$$

$$INDTAX = \sum td_iPX_iX_i \quad 19$$

$$GRT = IMTAX + INDTAX - GOVSUB \quad 20$$

$$GET = GRT \quad 21$$

$$SECGOV_i = g\sec.GRT\left(1-govsavr\right) \quad 22$$

$$CD_i = \sum HEXPQ_{hi} \quad 23$$

$$GOVSAV = govsavr.GET \quad 24$$

$$INVEST = SAVINGS \quad 25$$

Market clearing conditions

$$Q_i = INTD_i + CD_i + SECGOV_i + ID_i \quad 26$$

Where $PV_{(i)}$, $PX_{(i)}$, $PD_{(i)}$, $PE_{(i)}$, $PM_{(i)}$ and $PN_{(i)}$ are price of value-added by sector, price of goods produced by sector, price of goods sold locally by sector, domestic price of export by sector, domestic price of import by sector and domestic price of intermediate import by sector respectively. $PINDEX$ is the price index while $pwts_{(i)}$ is the consumer price index weights by sector. Also, $tm_{(i)}$, $tn_{(i)}$, $td_{(i)}$, $te_{(i)}$, $nx_{(i)}$ and $sub_{(i)}$ are import duty rate on final good by sector, import duty rate on intermediate good by sector, excise duty rate on domestic good by sector, export duty rate by sector, ratio of imported intermediate to output by sector and sector's subsidy rate. Q_i is the composite final good by sector while $X_{(i)}$, $D_{(i)}$, $E_{(i)}$, $M_{(i)}$ and $N_{(i)}$ are domestic output by sector, domestic supply of good produced locally by sector, export of goods produced locally by sector, import of final good by sector and imported intermediate good by sector. $LABY$ is total labour income, $CAPY$ is gross

capital income, $CD_{(i)}$ is households private consumption on sector I, $IMTAX$ is import duty, $INDTAX$ is the indirect tax, $INVEST$ is investment

$INTD_{(i)}$ is sectoral intermediate input supply and $SECGOV_{(i)}$ is sectoral expenditure of government. Finally, GR T , GE T, NGE , and $GOVSAV$ are government revenue, government expenditure, net government expenditure and government savings while $govsavr$ is the government savings rate.