Tariff and Factor Allocation in a Small Open Economy: Nigeria

Dipo T. Busari and Elias A. Udeaja*

Using a small three-sector static general equilibrium model, this paper examines the likely impact of import tax reduction and its subsequent elimination on factor re-allocation under alternative exchange rate regimes in Nigeria. The study observed that the patterns of re-allocation are quite qualitatively similar under alternative exchange rate regimes. Particular findings suggest that, under both exchange rate regimes, as import tariff is reduced progressively, the services industry loses labour employment to the manufacturing and agricultural sectors while the agricultural sector loses capital to both the manufacturing and service sectors. Under the different exchange rate regimes, the manufacturing sector is a net employer of labour and capital. The study observed that the amount of re-allocation under flexible exchange rate is higher than under a fixed exchange rate regime. Furthermore, labour is observed to be relatively more mobile amongst sectors than capital. However, in general, percentage factor reallocation is considered small as no sector lost significant amount of factor employed to other sectors. These findings indirectly points to the limited role of trade policy in generating employment and enhancing efficiency in production in a small open economy.

Keywords: **Tariff Reduction, Exchange Rate Regime, Intra-Industry Reallocation.**

JEL Classification**: F160, F310, O240.**

* Busari *is a staff of the United Nations African Institute for Economic Development and Planning, while* Dr. Udeaja *is a staff of the Central Bank of Nigeria, Abuja. The views expressed herein do not represent the views of the institution to which they are affiliated.* *The authors acknowledge the comments and suggestions of anonymous reviewers.*

I Introduction

Undoubtedly, the theory of tariff (tax on external trade) is one of the difficult areas in international trade literature. Disregarding the several secondary effects of tariff, the literature suggests that the immediate effect of tariff (at least under optimal market conditions) is to raise the price of the good on which duty is levied. Consumption will fall as the price of the good in the domestic market has increased, while domestic production (hence, employment) at the same time increase and imports fall. In other words, the direct impact of tariff will be on prices, consumption, production (employment) and imports. The literature, however, suggests that a "production cost of protection" usually exist which is the difference in cost arising from domestic production rather than importing the good. In other words, tariff brings about (mis-) allocation of resources. Interestingly, these results are by and large true even within the context of more refined general equilibrium analysis.

In another way, the traditional Stolper-Samuelson theorem analyses how tariff can (re) allocate factors. Specifically, the theorem suggests that a tariff on the import good means that domestic prices of importable goods will rise. Domestic producers then change their production plan, increasing production of the import good and decreasing production of the export good. Factor intensity will change in both sectors. The reason being that, as producers start expanding production of importable goods they are especially eager to employ more of the input that they use more intensively. Hence, the relative price of that input which they use more intensively is bid up. Producers then try to substitute other (cheaper) factors for the more expensive input. Hence, factor intensity will change due to tariff changes. In a more general form, the theorem suggests that tariff favours the factor used intensively in the import-competing sector, because, as the tariff raises the price of the import good, domestic production of it will expand, and the demand for the factor used intensively in this industry

will increase, and its price will rise. In the short run, protection could lower a country's welfare. However, in the long run internal economies can be reaped and there will be an outward shift in the country's production possibility frontier.

However, empirical studies do not tend to be as conclusive as theoretical constructs in terms of the impact of tariff on factor allocation, employment and growth. Studies like Mclure (1989), Choi (1997) and Skinner (1987) have examined the impact of tax generally on factor allocation, growth and consumption. Other related studies include that by Blejer and Cheasty (1990), Khalizadeh-Shirazi and Shah (1991), Tanzi and Zee, (1997), Easterly and Rabelo (1994) and Mendoza, Razin and Tesar (1994). Many of the above studies have been largely partial in analysis. This partial analysis have been criticised because they omit the terms of trade effects and neglect other features that can be well capture only in a disaggregated CGE model (see Hamilton and Whalley 1985a and Mendez and Rouslang, 1989). Though most of the general equilibrium analyses have focused on welfare gain (like Hamilton and Whalley, 1985; Cox and Harris, 1985; and Wigle, 1988) it is possible, as demonstrated by Polo and Sancho (1990), that other economic impacts could well be analysed in a general equilibrium framework.

This paper examines the impact of tariff on domestic factor allocation in Nigeria and then compares the results with the predictions of the traditional tariff theory. To accomplish this task, the paper develops a static Computable General Equilibrium (CGE) model that allows for an explicit evaluation of alternative tariff policy in Nigeria (though with many competitive features). Specifically our focus is on import duty as against export duty because it is the more widely used, relevant and analyzed theoretically. The rest of the paper is arranged as follows. Section II discusses the practice of tariff in Nigeria in the recent past[1]. Section III reviews the literature. Section IV presents a brief description of the CGE model, the solution strategy and summarizes the results of the policy simulations. Section V presents the results and the policy implications of the results. Section VI concludes the paper.

---

[1] Data on the structure of the Nigerian factor market is generally scarce and unreliable; hence we omit a discussion of the stylised features of the Nigerian factor market.

II. Tariff System during the Liberalisation Era

Trade policy and exchange rate reform measures are the most profound policy reform measures introduced since 1986 in terms of getting prices right and boosting productivity and employment. At the commencement of the reform measures, it was argued that the domestic currency, which was administratively fixed by the relevant monetary authority, was highly overvalued (see Olofin 1992; Abebefe 1995; and Agbaje and Jerome 2004).

Domestic economic policy in the late 1980s was directed at achieving sustained economic growth and development under the structural reform efforts. Specifically, policy measures were aimed at stemming the severe pressures on domestic prices and the external sector, stimulating private sector investment and generating more employment. In line with the policy objectives, fiscal policy (including tariff measures) was generally aimed at increasing revenue, guaranteeing effective protection to domestic industries, reducing escalating transport cost and promoting Research and Development (R and D). Hence, import duties on a number of intermediate products (such as battery parts) used in local industries were reduced. Import duty on component parts of commercial vehicles and tractors was also reduced from 25 to 5 per cent by 1989. Major exchange rate re-alignments were needed if the goal of stimulating agricultural production and export was to be achieved. It should be noted that exchange rate reforms were aimed not only at boosting domestic production but also aimed, amongst other things, at ensuring external balance and improving competitiveness. Hence, it was expected that the prices of (non-oil) exports will rise in domestic currency value terms if major reform measures (in the form of series of devaluations) were carried out. The thinking was that a rise in the price of tradables in domestic currency term will lead to re-allocation of resources and stimulate production and employment, particularly, amongst the import-competing firms. Hence, the rate at which the domestic currency will exchange for major international currencies were left to be determined by market forces, with some intervention by the government as deemed appropriate (see Ajayi, 1988; Adubi and Okunmadewa, 1999; Odubogun 1996; and Sanusi,

2004 for detailed discussion of various exchange rate measures introduced since 1986).

The broad focus of tariff policy in the early 1990s was the provision of effective protection for local industries and enhancement of locally sourced inputs. Hence, import duties on a number of products (such as jewellery, tooth brush and wheel-barrow) were increased by 1991. Further, the government set up two study groups in 1991 to review the entire tax structure and administration with a view to improving tax collection through reducing tax evasion and encouraging voluntary compliance with tax regulations. Hence, there was the review of the import duties on a number of items and inputs used in manufacturing with a view to stimulating production. Products affected included steel products, spinners and dyers, automatic circuit breakers, etc. By 1992 when the generation of budget surplus became a major thrust of fiscal policy, the government still found itself engaging in tariff reforms encompassing the removal of import duties on CKD (Completely Knocked Down) components and spare parts for commercial vehicles, cement, and inputs used in the cement industry and the reduction of tariffs on some other imported goods, including polyester chips, drugs and fully built-up commercial vehicles. Between 1993 and 1996, fiscal policy was aimed at achieving overall macroeconomic stability. Hence, tariff measures were generally unchanged. The main focus of fiscal policy during this period was to ensure fiscal viability through aggressive revenue drive and public sector expenditure restrain. Hence, much attention was given to the value-added tax that was introduced effectively in 1994. By 1998, the focus of fiscal policy was to stimulate the economy by raising the level of disposable income of households through generous personal and corporate tax relief. There was a review of import duty rates to protect local industries and stimulate competition. The government further liberalised the imports of used vehicles and motorcycles at the appropriate duty rates to enhance government revenue from import duties. The number of items in the import prohibition list was reduced, and the items were made dutiable at rates ranging between 20 and 150 per cent. Generally, average import tariff have been declining over time for most intermediate and many final goods.

Some specific trade liberalization measures undertaken under the SAP include the removal of bureaucratic controls on trade. Furthermore, the import licensing system, together with exchange control on current transactions was abolished as soon as exchange liberalization began in September 1986. The abolition of commodity marketing boards was also followed by abolition of the export prohibition for most items and a reduction in the number of prohibited imported items. The early years of the reform saw the introduction of a new export finance facility and a financing and rediscounting facility was put in place to assist private exporters by providing refinancing for the export of both agricultural and non-agricultural products. These measures were supported with the introduction of a duty drawback/suspension scheme which was aimed at enabling exporters to import raw materials and intermediate products for use in the manufacturing of export products. It could be observed that trade policy measures were not only aimed at diversifying the export base of the country, but also to add value to the export of agricultural produce. By 1995, more emphasis was placed on market-oriented exchange rate system to enhance export competitiveness. A new seven-year tariff reform programme was also introduced in 1995 with frequent adjustments and changes to the tariff structure. As at 2004, the applied tariff rate averaged about 25 percent, with some exceeding 100 percent. Currently, Nigeria maintains a 150 percent ceiling rate binding on all agricultural goods. In general, recourse to quantitative restrictions on imports is on the decline, although Nigeria still maintains a ban on imports of such products as maize, sorghum, millet, wheat flour, vegetables and plastic articles. Nigeria also enforces a ban for health reasons on all types of meat.

The above review suggests that trade policy in Nigeria has focused both on relative price incentives (in terms of exchange rate and tariff adjustments) and quantitative restrictions in term of quota and outright ban. As discussed earlier the broad objectives of trade policy practice in Nigeria are the diversification of export earnings from oil to non-oil, stimulation of production and, hence, generation of employment. Akin to this is the fact that trade policy practice in Nigeria aims at minimising external imbalance. In other words, it is aimed at curtailing incessant importation of consumer goods and protecting domestic production.

III. A Review of Related Literature

Conceptual Framework

The basic channel through which trade policy (in the form of tariff changes) impacts on the factor market is through the impact of trade policy on relative prices. This proposition is essentially relevant in a small open economy (i.e., an economy that has no power to affect international prices of traded goods). Another relevant assumption is that the input market (particularly the labour market) functions well such that nominal and real wages are flexible[2]. Hence, domestic prices of imports (p_m) and exports (p_x) are determined by world prices and policy variables such as exchange rate, subsidies, and tariffs. Finally, it is usually assumed that the price of non-tradable goods (p_n) is determined largely by supply and demand conditions in the home country. Hence, allocation of resources will depend to a large extent on these three prices, while in the long-run resource allocation will depend on relative prices only, such as p_x / p_m and p_x / p_n. For a given trade liberalization episode, say a reduction in tariffs, p_x / p_m will increase, providing the necessary incentive for inputs to move into the export sector from the import sector. It is important to note that whether (p_m) falls or (p_x) rises will make a lot of difference in the short-run and will depend, amongst other things, on the exchange rate regime in place. In general, as plants or firms raise their efficiency in response to fiercer foreign competition (due to lower tariff), workers are displaced and productive capital needs to be put to alternative use. This is the prediction of the traditional trade theory in a Ricardian sense, in which factors are allocated based on comparative advantage. In the next section we review the observations of empirical studies on the subject.

---

[2] Other assumptions that are carried along are that we have constant returns to scale and that domestic and import goods are perfect substitutes.

Recent Empirical Studies

In a recent study, Melitz (2003) attempts to characterize the impact of trade on aggregate productivity by assuming that producers have heterogeneous productivity levels and models intra-industry reallocations among firms under increasing trade liberalization. The study observed that amongst firms that are faced with increased foreign competition there is a shifts in the relative performances of monopolistic competitors reflected in inter-firm reallocations towards more productive firms. By making alternative assumptions, Eaton and Kortum (2002) model heterogeneous producers in a perfectly competitive environment. The study assumes that constant-returns producers are subject to idiosyncratic shocks while consumers search internationally for lowest prices of each output variety. The study argues that foreign trade allocates demand to producers able to supply output at the lowest price. The study argues further that efficient technology (i.e., low production costs), minimal geographic impediments (i.e., low transportation costs) and limited institutional distortions (i.e., low transaction costs) allow producers to price competitively. A common front in the findings of the two studies is that they both predict productivity-enhancing reallocations, within industries, induced by trade. Hence, the proposition that protectionism shelters inefficient producers and that openness makes more productive firms flourish seems to be corroborated by their findings.

Several other studies have provided evidence in support of 'self-selection' into export markets by more productive plants. Such studies include those by Clerides, Lach and Tybout (1998) for Colombia, Mexico and Morocco; by Bernard and Jensen (1999a) for the U.S.; and by Aw, Chung and Roberts (2000) for Taiwan. Most of the studies are based on the underlying assumption of the existence of substantial sunk costs to enter the export markets as documented by Roberts and Tybout (1997) for Colombia and by Bernard and Jensen (1999b) for the U.S. In some respect, studies such as Hallward-Driermayer, Iarossi and Sokoloff (2002) have argued that the selection process is not necessarily driven by exogenous shocks but rather by investments made by firms in anticipation of foreign markets opening up. Haltiwanger *et. al*. (2004) argued that decisions regarding organization,

training and retooling to gain access to export markets raise relative exporter productivity in East Asia most significantly in Indonesia, the Philippines and Thailand. Hence, the study opined that heterogeneity in the performance of different investment strategies leads to trade-induced reallocation.

As argued in Haltiwanger *et. al.* (2004), trade not only facilitates the expansion of more productive firms but also causes the downsizing of less productive plants. In terms of job loss and firm downsizing induced by international trade, Aw, Chung and Roberts (2000) find that exposure to trade forces the exit of the least efficient producers in Korea and Taiwan. Also, Pavnick (2002) finds that market share reallocations contributed significantly to productivity growth following trade liberalization in Chile. Finally, Bernard and Jensen (1999b) find that intra-industry reallocations to higher productivity exporters can explain up to 20 percent of productivity growth in U.S. manufacturing.

Several studies have observed some impact of international competition on factor mobility, particularly labour allocation. The evidence is generally inconclusive as some plant-panel data evidence suggest the existence of negative effect of trade policy on employment. However, it is observed that the results differ substantially across countries and studies. For example, in their study of some US firms, Klein, Triest and Schuh (2003) use establishment panel data to analyze how the pattern of gross job flows is affected by the path of the real exchange rate. They observed that changes in the trend of the real exchange rate affect reallocation of jobs but not net employment. The study went further to observe that cyclical variation of the real exchange rate induces changes in net employment mainly via job losses. As a follow-up to this study, Klein, Triest and Schuh (2004) further investigate the joint impact of tariff and real exchange rate changes in the US, with particular focus on NAFTA. The study observed that the way in which the reduction in tariffs impacted upon job flows is similar to the effect of a shift, inducing appreciation of the currency, in the trend of the real exchange rate path.

Focusing on the manufacturing sector for US firms, Gourinchas (1999) studies the exchange rate response of gross job flows at the four-digit level using data from the Longitudinal Research Database. The study observed that times of appreciation are associated with substantial job losses while times of depreciation display very limited reallocation. Furthermore, the study observed that a 10 percent depreciation increases employment by 0.3 percent in the tradable sectors, mostly due to job creation in import competing industries. Some other studies conducted for the U.S. include Aronson, Goldberg and Tracy (1999) which used CPS data and observed that exchange rate movements have a small effect on employment and that job destruction is not substantially affected. The study by Davidson and Matusz (2005) for the U.S. find higher sectoral net exports to be associated with less job destruction and more job creation, while the study by Revenga (1997) finds that in the U.S. import competing industries reduce employment overall during currency appreciations. In the study by Campa and Goldberg (2001) they observed that in the U.S. the labour market adjustment to variations in the real exchange rate is primarily through wages rather than employment. The prevalence of price as against quantity adjustment was rationalised on the bases of the fact that there exist lower labour demand which is associated with currency appreciation and it is being offset by cheaper imported inputs, including equipment and machinery.

Based on the study of some French firms, and using firm-level data, Gourinchas (1999) examines the impact of real exchange variations on gross job flows. The study observed that exchange rate appreciations reduce net employment growth as a result of lower job creation and increased job losses. The study argued that the observed patterns imply little additional reallocation as a result of exchange rate fluctuations. However, the study by Bentivogli and Pagano (1999) finds for a number of European countries a limited effect of currency value fluctuations on job flows. Studies such as Haltiwanger *et. al.* (2004) have argued that divergences in results across countries may be explained by differences in labour market institutions. This argument is corroborated by studies such as Burgess and Knetter (1998) which observed that in the G-7 countries with the most

rigid labour institutions, such as Germany and Japan, employment is insensitive to exchange rates. However, in other countries appreciations appear related to drops in employment. Using cross country data, Wacziarg and Wallack (2004) examined the extent of inter-sectoral reallocation of labour in the wake of trade liberalization events. The study finds no evidence of increased reallocation of labour across sectors defined at the 1-digit level, although they find evidence of a small increase in inter-sectoral reallocation using manufacturing data at the 3-digit level of aggregation.

Generally, it is expected that in developing countries undergoing liberalization in both the external and financial sectors, large reallocation effects are to be observed due to the sudden and substantial increase in the exposure to international competition. Though the literature on the reallocation effect of trade policy reform is quite scanty for developing countries, in a study on Chile, Levinsohn (1999) reports evidence from firm-level data during a period of tariff reductions and large swings of the real exchange rate. The paper observed that there was a tremendous amount of job churning in Chile, both in expanding and contracting industries, not associated with changes in aggregated employment. Hence, the paper argued that changes in trade exposure yield an effect on gross job flows without a substantial effect on net flows.

IV. Estimating the Impact of Tariff on Factor Allocation

Model Description

Drawing from studies by Wigle (1988), Revenga (1997) and Wacziarg and Wallack (2004), the model distinguishes three productive sectors – agriculture, manufacturing and services. The first two represents the tradable sectors while the service (which includes construction) sector is treated as largely non-tradeable. The model also distinguishes two input markets - labour and capital. Two other sectors, representing the government and external trade, complete the model. We invoke the small country assumption such that tariff will not alter the terms of trade of the country and monetary

effects are excluded[3]. This further implies that foreign prices are constant. In the short run we assume that the production possibility frontier of the economy is constant which translates to fixed stock of factors inputs. We further assume that the rate of substitution of inputs is constant for each sector but can differ across sectors.

Production and Factor demand

There are two primary factors of production – capital and labour – each of which is homogenous, mobile among sectors. The productive sector of the economy is characterized by a Leontief aggregation function between value-added index and an intermediate input index.

$$X_j = \min\left\{\frac{VA_j}{a_{vj}}, IG_j; \quad (j = 1,...3)\right\} \qquad \text{.....} \qquad (1)$$

$$IG_j = \min_i\left[\frac{x_{ij}}{a_{ij}}; \quad i = 1,...3\right] \qquad \text{.....} \qquad (2)$$

Where X_j *(Va$_j$)* is gross output (value added) of sector *j*; IG_j is intermediate input index of sector *j*, x_{ij} = intermediate demands and α_{ij} = input-output coefficient, a_{vj} is the value added requirement per unit of output *j*. The production possibility frontier of the economy is defined by a constant elasticity of transformation (CET) function between domestic supply and export.

$$X_i = at_i\left[\gamma_i E_i^{R_i} + (1-\gamma_i)D_i^{sR_i}\right]^{\frac{1}{R_i-1}} \qquad \text{.....} \qquad (3)$$

where E_i is export supply, D_i^s is domestic supply, αt_i is CET function shift parameter, γ_i is CET function exponent and g_i is CET function share parameter. We also define composite commodity (Q_i^s) made up of domestic demand (D_i^d) and imports demand (M_i^d), which is consumed by both the household and the government. We assume that a constant elasticity of substitution (CES) exist between domestic demand and import demand.

---

[3] This implies that we are dealing with a barter economy. This assumption is not expected to significantly alter our findings since we are dealing with the real side of the economy.

$$Q_i^s = ac_i\left[\lambda_i M_i^{d-\mu} + (1-\lambda_i)D_i^{d-\mu}\right]^{-\frac{1}{\mu}} \quad \text{.....} \quad (4)$$

where αc_i is CES (constant elasticity of substitution) function shift parameter, λ_i is CES share parameter and μ_i is CES function exponent. A fixed input-output matrix describes intermediate input demand as follows:

$$V_i = \sum_j a_{ij} X_j \quad \text{.....} \quad (5)$$

where V_i is intermediate demand for good *i*. Capital (K_i^d) and labour (L_i^d) produce value added according to a CES value-added function of the form:

$$VA_i = \phi_i\left[\delta_i L_i^{d(\sigma_i-1)/\sigma_i} + (1-\delta_i)K_i^{d(\sigma_i-1)/\sigma_i}\right]^{\frac{\sigma_i}{(\sigma_i-1)}} \quad \text{.....} \quad (6)$$

for each industry, where ϕ_i and δ_i are parameters for production scale and input weighting respectively, and σ_i is the elasticity of substitution. A single output is produced by each industry, under constant returns to scale. Producer behaviour is characterised by cost minimisation for each unit of output. Minimisation of factor costs subject to the constraint that $VA_i=1$ yields the factor demand per unit of value added for each industry, these demands are:

$$L_i^d = \phi_i^{-1}\left[\delta_i\left(\frac{(1-\delta_i)PL_i^*}{\delta_i PK_i^*}\right)^{1-\sigma_i} + (1-\delta_i)\right]^{\frac{\sigma_j}{(1-\sigma_i)}} \quad \text{.....} \quad (7)$$

$$K_i^d = \phi_i^{-1}\left[\delta_i\left(\frac{(1-\delta_i)PL_i^*}{\delta_i PK_i^*}\right)^{1-\sigma_i} + (1-\delta_i)\right]^{\frac{\sigma_j}{(1-\sigma_i)}} \quad \text{.....} \quad (8)$$

where producers are required to pay ad valorem taxes at rate tL_i and tK_i on labour and capital employed, respectively, which (may) differ by sector such that:

$$PL_i^* = PL(1+tL_i) \quad \text{.....} \quad (9)$$

$$PK_i^* = PL(1+tK_i) \quad \text{.....} \quad (10)$$

are gross-of-tax factor costs. PL_i and PK_i are the (income tax inclusive) cost of labour and capital, respectively

Consumption

A representative consumer has a utility function of the Cobb-Douglas type:

$$U(Q_i^{hd}) = U(D_i^{hd}, M_i^{hd}) = \sum_i ap^j \ln Q_i^{hd} \quad \text{.....} \quad (11)$$

Where $Q_i^{hd}, D_i^{hd}, M_i^{hd}$ are composite goods demand, domestic demand for domestic goods and import demand by the household. The ap^i are private (household) share parameters. Hence, the solution to the constrained optimization produces the following demand functions for both private and government sectors for *D* and *M*. The superscripts *hd* and *gd* represent household and government demand parameters respectively.

$$D_j^{hd} = \frac{adp^j((1-sp).YD}{P_j} \quad \text{.....} \quad (12a)$$

$$M_j^{hd} = \frac{amp^j((1-sp).YD}{pm_j} \quad \text{.....} \quad (12b)$$

$$D_j^{gd} = \frac{adg^j((1-sp).YG}{p_j} \quad \text{.....} \quad (12c)$$

$$M_j^{dg} = \frac{amg^j((1-sg).YG}{pm_j} \quad \text{.....} \quad (12d)$$

The following relations are to be observed:

$$\sum_j adp^j + \sum amp^j = 1; \quad \text{.....} \quad (13a)$$

$$\sum_j adg^j + \sum_j amg^j = 1; \quad \text{.....} \quad (13b)$$

$$D_i^{hd} + D_i^{gd} = D_i^d; \quad \text{.....} \quad (13c)$$

$$M_i^{hd} + M_i^{gd} = M_i^d \quad \text{.....} \quad (13d)$$

where;

adg^j and amg^j are government demand share parameters for domestic and imported goods; adp^j and amp^j are household demand share parameters for domestic and imported goods; D_i^d and M_i^d are total domestic demand and import demand, respectively; *sp* and *sg* are private and government marginal propensity to save respectively; p_j and pm_j are the market price of domestic goods and domestic price of imports, respectively; *YD* and *YG* are household and government income, respectively. This implies that final household demand (C_i) and government demand (G_i) for good i are given as:

$$C_i = D_i^{hd} + M_i^{hd} \quad \text{.....} \quad (14a)$$

$$G_i = D_i^{gd} + M_i^{gd} \quad \text{.....} \quad (14b)$$

Factor Remuneration and Institutional Disposable Income and Savings

The model distinguishes two types of factor income. These are wage income ($wagebill_i$) and nonwage income ($nonwage_i$). Nonwage income represents income from initial endowment, savings (investment), interest earnings, profit distribution, etc. which are part of income flow or output. For simplicity, we assume nonwage income to be the difference between value of output (PX_iX_i) and wage income such that[4]

$$wagebill_i = VA_i L_i^d PL(1 - tW_i) \quad \text{.....} \quad (15)$$

$$nonwage_i = (PX_i X_i - wagebill_i)(1 - tNW_i) \quad \text{.....} \quad (16)$$

$$YG = \sum_i L_i^d VA_i PL_i (tL_i + tW_i) + \sum_i tK_i K_i^d VA_i PK_i + \sum_i tNW_i nonwage_i + \sum_i tm_i M_i^d pm_i + \sum_i te_i E_i pe_i + tD_i pd_i D_i^d + \sum_i \sum_j a_{ji} X_j PX_j VAT_j \quad \text{.....} \quad (17)$$

$$YD = \sum_i wagebill_i + \sum_i nonwage_i \quad \text{.....} \quad (18)$$

---

[4] *Nonwage bill as defined above implies what a particular sector is expected to distribute to the household.*

where tW_i and tNW_i are wage and nonwage taxes, respectively, E_i represents export supply, tm_i and te_i are import and export taxes, respectively, pe_i is the domestic price of exports, tD_i is indirect (sales) tax, pd_i is producer price of domestic goods, PX_i is price of aggregate output, VAT_j is value-added tax. The equation for *YG* states that government income is the sum of taxes on labour employment, wages, capital employment, nonwage income, tariffs, sales and value-added. *Govsav* and *privsav* are government and private savings, respectively, and are defined as;

$$Govsav = YG - \sum_i G_i \quad \text{.....} \quad (19)$$

$$\Pr ivsav = YD - \sum_i C_i \quad \text{.....} \quad (20)$$

Prices

Price of composite goods (PQ_i)

$$PQ_i = \frac{pm_i M_i^d + P_i D_i^d}{Q_i^s} \quad \text{.....} \quad (21)$$

Q^s_i is the supply of composite goods. Price of aggregate output (PX_i) is given as

$$PX_i = \frac{pe_i E_i + pd_i D_i^s}{X_i} \quad \text{.....} \quad (22)$$

pd_i is the domestic supply price of good *i*. Import price (in domestic currency terms)

$$pm_i = \overline{pwm_i}(1+te_i).ER \quad \text{.....} \quad (23)$$

pwm_i is the international price of imports and *ER* is the exchange rate. Export price (in domestic currency terms) is given as:

$$pe_i = \overline{pwe_i}(1+te_i).ER \quad \text{.....} \quad (24)$$

pwe_i is the international price of exports. Market price of domestic goods (p_i) is given as:

$$p_i = pd_i(1+tD_i) \quad \text{.....} \quad (25)$$

Value-added price (p_i^v) is given as

$$p_i^v = p_i - \sum_j p_j a_{ji}(1+VAT_j) \quad \text{.....} \quad (26)$$

Foreign Trade

Exports supply and import demand equations are, respectively, given as:

$$E_i = D_i^s \left[\frac{pe_i(1-\gamma_i)}{pd_i.\gamma_i} \right]^{\frac{1}{R_i}} \quad \text{.....} \quad (27)$$

$$M_i^d = D_i^d \left[\frac{p_i \lambda_i}{pm_i(1-\lambda_i)} \right]^{-\frac{1}{1+\lambda_i}} \quad \text{.....} \quad (28)$$

Equilibrium Conditions

$$pe_i E_i - pm_i M_i - \overline{F} = 0 \quad \text{.....} \quad (29a)$$

$$Q_i^d - Q_i^s = 0; \quad \text{.....} \quad (29b)$$

$$D_i^d - D_i^s = 0; \quad \text{.....} \quad (29c)$$

$$\sum_i VAL_i^d = \overline{L^s} = L^d; \quad \text{.....} \quad (29d)$$

$$\sum_i VA_i K_i^d = \overline{K^s} \quad \text{.....} \quad (29e)$$

where *F* is foreign capital inflow, which can also be interpreted as trade balance. $\overline{K^s}$ and L^d are total capital stock and labour demand, respectively. $\overline{L^s}$ is labour supply. The over-bar implies fixation of stock

Some Identities

$$PX_i X \equiv pe_i E_i + pd_i D_i^s \quad \text{.....} \quad (30a)$$

$$PQ_i Q_i^s \equiv pm_i M_i^d + p_i D_i^d \quad \text{.....} \quad (30b)$$

Solution Strategy

The solution strategy involved three basic steps. In the first step, a highly aggregated Social Accounting Matrix (SAM) is constructed. For this purpose, different types of data are linked to form a consistent circular flow of the economy for a particular year (1999). The input-output matrix used to represent intermediate transactions was for 1999 as published by the Federal Office of Statistics (FOS). The second step involved the calibration of parameters for the model in the base year (1999). Price, income, and substitution elasticities were chosen so as to obtain a reasonable (static) base case solution. Other parameters, including production elasticities, intercept terms, and sectoral shares were derived in a way that ensures overall consistency of the data. The third and final step involved the solution, using the General Algebraic Modelling System (GAMSÔ) package. After the model had been solved, a sensitivity analysis was performed. The results suggest that the solution of the model would remain largely unaffected by changes in the key parameters giving us some degree of confidence that the results are not particularly sensitive to the parameter choice made.

Analyzed Scenarios

The tariff structures considered could be described as averages of what obtained in Nigeria between 1990 and 2003 (the period of extensive trade and exchange rate reforms). On the average, import duties have been generally lowered. Export duties are virtually non-existent for most goods. We assume that the production possibility frontier is constant ($X_i = \overline{X_i}$) throughout the analysis. This implies that we hold the level of aggregate factor employment constant; however, we allow for intra-industry re-allocation of existing employment level. Our neglect of net investment implies that our focus is on short run analysis. Further, our interest is on qualitative implication of tariff reform on factor allocation, hence, we consider tariff reduction with the assumption that tariff increase will have a reverse effect. To mimic the tariff structure practiced between 1990 and 2003, we use 30 percent, 50 percent, 70 percent reduction and total elimination of tariff. Base case solution value of all variables is indexed to 100. Simulation results are then reported relative to the base year index.

That is, figures in Tables 1 and 2 are percentage changes with respect to the base year values. Since we are using a simple static CGE model, the analysis is conducted using a once-and-for-all adjustment in tariff rates. We conducted the simulation under fixed and flexible exchange rate regimes.

V Results

The results from the simulations are presented in Tables 1 and 2. Table 1 is the result when the nominal exchange rate is fixed while Table 2 presents the results under a flexible nominal exchange rate regime. In general, the pattern of factor re-allocation is similar for both exchange rate regimes.

Under the fixed exchange rate regime, we observed that as import duty is reduced (except under the 30 percent and 50 percent simulation scenario), labour moves from the service sector to other sectors. Reducing import duty by 30 percent leads to 0.3 percent labour exit from the service industry and 0.5 percent exit from the agricultural sector. The manufacturing sector witnessed increased employment. However, beyond the 50 percent decrease in tariff, we observed that both the agricultural and manufacturing sectors gained in terms of employment. Consistently, the service sector witnessed employment loses. In terms of capital re-allocation, we observed that both the service and manufacturing sectors gained in terms of capital employed while there was exit of capital from the agricultural sector. The results show that about 2.4 percent of the labour employment in the service sector can be re-allocated to other sectors and about 0.9 percent of the capital employed in the agricultural sector can be re-allocated to other industries. Under the fixed exchange rate, we observed that percentage labour re-allocation is greater than percentage capital re-allocation as tariff is reduced.

The results for the flexible exchange rate are not qualitatively too different from the fixed exchange rate scenario. However, the percentage re-allocations are higher in values than under the fixed exchange rate. As under the fixed exchange rate regime, labour moves out of the service sector to other sectors with the manufacturing sector having the larger

labour gain. When tariff is eliminated, about 4.8 percent of labour employed in the service sector is re-allocated with manufacturing capturing about 3.4 percent and the remaining 1.4 percent goes into agriculture. In terms of capital re-allocation, the agricultural sector lost capital employed to the other two sectors. The manufacturing sector gains more than the service sector. As tariff is reduced, more capital leaves the agricultural sector for the other sectors. When tariff is finally eliminated, about 1.6 percent of the capital employed in the agricultural sector relocated to other sectors with the manufacturing sector attracting about 1.2 percent and service sector 0.4 percent.

Again, we observed that even under a flexible exchange rate regime, capital is relatively less mobile across industries than labour. However, more re-allocation of both factors occurred under flexible exchange rate than under the fixed exchange rate scenario.

Table 1: Sectoral Responses to Tariff Imposition (Fixed Exchange Rate)

Sectoral Resource Allocation; Import Tariff Reduction								
	Changes in Labour Employed				**Changes in Capital Employed**			
Sectors	30%	50%	70%	No Tariff	30%	50%	70%	No Tariff
Agric.	-0.5	-0.7	+0.8	+0.9	-0.6	-0.8	-0.8	-0.9
Mfg.	+0.8	+1.0	+1.5	+1.5	+0.4	+0.5	+0.5	+0.6
Serv.	-0.3	-0.3	-2.3	-2.4	+0.2	+0.3	+0.3	+0.3

Source: Simulation results. Figures are in percentage.

Table 2: Sectoral Responses to Tariff Imposition (Flexible Exchange Rate)

Sectoral Resource Allocation; Import Tariff Reduction								
	Changes in Labour Employed				**Changes in Capital Employed**			
Sectors	30%	50%	70%	No Tariff	30%	50%	70%	No Tariff
Agric.	+0.8	+1.1	+1.4	+1.4	-0.8	-1.2	-1.5	-1.6
Mfg.	+2.4	+3.0	+3.1	+3.4	+0.6	+0.9	+1.1	+1.2
Serv.	-3.2	-4.1	-4.5	-4.8	+0.2	+0.3	+0.4	+0.4

Source: Simulation results. Figures are in percentage.

VI. Concluding Remarks

Using a three-sector model, we examined the likely impact of import tax reduction and subsequent elimination on factor re-allocation under alternative exchange rate regimes in Nigeria. The study observed that the patterns of re-allocation are quite similar under alternative exchange rate regimes. As tariff is reduced progressively, the services industry loses labour employment to the manufacturing and agricultural sectors while the agricultural sector loses capital to both the manufacturing and service sector. Under the different exchange rate regimes, the manufacturing sector is a net employer of labour and capital. The study observed that the amount of re-allocation under flexible exchange rate is higher than under a fixed exchange rate regime. Furthermore, labour is observed to be relatively more mobile amongst sectors than capital. However, in general, percentage factor reallocation is considered small as no sector lost significant amount of factor employed to other sectors. These findings indirectly points to the limited role of trade policy in generating employment and enhancing efficiency in production. The results obtained in this study obviously depend on the assumptions and specifications of the model. Furthermore, investment and growth dynamics were completely neglected in the current study. These restrictions make interpreting the results with caution necessary.

REFERENCES

Abebefe, H. A. (1995). The Structure of Nigeria's External Trade: A Focus on Exports. Central Bank of Nigeria *Bulletin*, 19(4):

Adubi, A. A. and F, Okunmadewa. (1999) Price, Exchange Rate Volatility and Nigeria's Agricultural Trade Flows: A Dynamic Analysis. AERC *Research Paper* 87 African Economic Research Consortium. Nairobi March.

Agbaje, A. and A. Jerome (2004) "Institutional Framework and the Process of Trade Policy Making in African Countries: The Case of Nigeria", Final Report Submitted to the African Economic Research Consortium, January.

Ajayi, S. I. (1988). "Issues of Overvaluation and Exchange Rate Adjustment in Nigeria". Prepared for Economic Development Institute (EDI). The World Bank, Washington, D.C.

Anam, Mahmudul and Atipol Bhanich Supapol (1992) "Protection, Terms Of Technology Transfer And Foreign Investment: A Welfare Analysis" International Economic Journal, Winter, 6(4):75-83.

Aronson, S., L. Goldberg and J. Tracy (1999) "Exchange Rates and Employment Instability: Evidence from Matched CPS Data". American Economic Review Papers and Proceedings.

Aw, Bee Yan, Dukkyun Chung and Mark Roberts. (2000). "Productivity and Turnover in the Export Market: Micro-level Evidence from the Republic of Korea and Taiwan (China)," *World Bank Economic Review*, 14(1): 65-90.

Bentivogli, Chiara and Patrizio Pagano. (1999). "Trade, Job Destruction and Job Creation in European Manufacturing," *Open Economies Review,* 78(1): 165-184.

Bernard, Andrew and Bradford Jensen. (1999a). "Exceptional Exporter Performance: Cause, Effect or Both," *Journal of International Economics*, 47(1): 1-38.

Bernard, Andrew and Bradford Jensen. (1999b). "Exporting and Productivity," NBER Working Paper No. 7135.

Blejer, M. and A. Cheasty (1990) "Fiscal Implications of Trade Liberalization", in Tanzi, V. (ed.), *Fiscal Policy in Open Developing Economies*, (Washington D.C.: International Monetary Fund).

Burgess, Simon and Micheal Knetter. (1998). "An International Comparison of Employment Adjustment to Exchange Rate Fluctuations," *Review of International Economics*, 6(1): 151-163.

Campa, Jose and Linda Goldberg. (2001). "Employment versus Wage Adjustment and the U.S. Dollar," *Review of Economics and Statistics*, 83(3): 477-489.

Choi, Kwang (1997) "Tax Policy and Tax Reform in Korea" in Thirsk ed. *Tax Reform in Developing Countries*: 233-286.

Clerides, Sofronis, Saul Lach and James Tybout. (1998). "Is Learning by Exporting Important? Micro-dynamic Evidence from Colombia, Mexico, and Morocco," *Quarterly Journal of Economics*, 113(3): 903-960.

Cox, D. and R. Hariss, (1985) Trade Liberalisation and Industrial Organisation: Some Estimates for Canada, *Journal of Political Economy* 93(1): 115-145.

Davidson, Carl. and Steven J. Matusz, (2005). "Trade and Turnover: Theory and Evidence," *Review of International Economics*, 13(5):861-880, November.

Easterly, W. and S. Rebelo (1994), "Fiscal Policy and Economic Growth: An Empirical Investigation", *Discussion Paper No. 885 Centre for Economic Policy Research.*

Eaton, Jonathan and Samuel Kortum. (2002). "Technology, Geography and Trade," *Econometrica*, 70(5): 1741-1795.

Gourinchas, Pierre-Olivier. (1999). "Exchange Rates Do Matter: French Job Reallocation and Exchange Rate Turbulence, 1984-1992." *European Economic review*, 43(7): 1279-1316.

Hallward-Driermayer, Mary, Giovanni Iarossi and Kenneth Sokoloff. (2002). "Exports and Manufacturing Productivity in East Asia: A Comparative Analysis with Firm-Level Data," NBER Working Paper No. 8894.

Haltiwanger, John., A. Kugler, M. Kugler, A. Micco, C. Pagés (2004) "Effects of Tariffs and Real Exchange Rates on Job Reallocation: Evidence from Latin America" Discussion Papers in Economics and Econometrics (No. 0410), Economics Division, School of Social Sciences, University of Southampton.

Hamilton, B and J. Whalley, (1985a) "Geographically Discriminatory Trade Arrangements" *Review Of Economics and Statistics* 67(3): 446-455.

Hamilton, B., and J. Whalley (1985b) "Tax Treatment of Housing in a Dynamic Sequenced General Equilibrium Model." *Journal of Public Economics* 27, 157-75.

Khalizadeh-shirazi, J. and Shah, A. (1991), "Tax Policy Issues for the 1990s", *World Bank Economic Review*. 5(3): 459-71.

Klein, Micheal, Scott Schu and Robert Triest. (2003). "Job creation, job destruction, and the real exchange rate," *Journal of International Economics*, 59(2): 239-265.

Klein, Micheal, Scott Schu and Robert Triest. (2004). *Job Creation, Job Destruction and International Competition*. The Upjohn Institute, Washington D.C.

Levinsohn, James. (1999). "Employment Responses to International Liberalization in Chile," *Journal of International Economics*, 47(2): 321-356.

Mclure, C.E. Jr (1989), "Income Distribution and Tax Incidence Under VAT" in Gillis M, Shoup C.S. and Sicat G.P. (1989) *Value Added Taxation in Developing Countries* (World Bank, Washington D.C.)

Melitz, Marc. (2003). "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71(6): 1695-1726.

Mendez, J. A. and D. J. Rouslang (1989) "Does the Central American Common Market Benefit its Members? *Economic Inquiry* 27(3): 473-487.

Mendoza, E.G, Assaf Razin and L.L. Tesar (1994) "Effective Tax Rates in Macroeconomics: Cross-Country Estimates of Tax Rates on Factor Incomes and Consumption" *Journal of Monetary Economics*. 34(3): 297-323.

Muendlerz, Marc-Andreas (2003) "Trade and Growth: The Case of Brazil" www.econ.ucsd.edu/seminars/seven_ssrc/muendler_brazil.pdf (Accessed: 16/08/2006)

Odubogun, K. (1996) Institutional Reforms and the Management of Exchange Rate Policy in Nigeria. African Economic Research Consortium (AERC) *Research Report* 36. Nairobi, Kenya.

Olofin, S. (1992) "Trade Policies in Nigeria," in Salvatore, D. (Ed.) *National Trade Policies: Studies in Comparative Economic Policies*, Vol.2, North Holland.

Pavnick, Nina. (2002). "Trade Liberalization, Exit and Productivity Improvements: Evidence from Chilean Plants," *Review of Economic Studies*, 69(1): 245-276.

Polo, P. and F, Sancho, (1990) "An analysis of Spain's Integration in the EEC, Mimeo. (Universidad Autonoma de Barcelona, Bercelonal).

Revenga, Anna. (1997). "Employment and Wage Effects of Trade Liberalization: The case of Mexican Manufacturing," *Journal of Labor Economics*, 15(3): S20-S52.

Roberts, Mark and James Tybout. (1997). "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs," *American Economic Review*, 87(4): 545-571.

Sanusi, J. O. (2004) "Exchange Rate Mechanism: The Current Nigerian Experience" http://www.cenbank.org/OUT/SPEECHES/2004/Govadd-24Feb.pdf (accessed 23/04/05)

Skinner, J. (1987), "Taxation and Output Growth: Evidence from African Countries," Working Paper 2335, Cambridge, *NBER*.

Tanzi, Vito and H.H. Zee (1997) "Fiscal Policy and Long Run Growth" *IMF Staff Papers.* 44(2): 179-209.

Wacziarg, Romain & Wallack, Jessica Seddon, (2004). "Trade liberalization and intersectoral labor movements," *Journal of International Economics*, Elsevier, 64(2):411-439, December.

Wigle, R., (1988) "General Equilibrium Evaluation of Canada-U.S. Trade Liberalisation", *Canadian Journal of Economics* 21(3): 539-564.