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Household Welfare Impact of Trade Liberalization in Nigeria: A Computable General Equilibrium Model

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Abstract

Trade liberalization policy across countries of the world gathered momentum in the 1990s and has not abated ever since. The major impetus for these policy reforms has been the strong desire of countries to harness the benefits embedded in international trade (this is as suggested by the recent experiences of economic growth in many economies particularly, the emerging market economies), and hopefully increase the standard of living of citizens. While the empirical link between trade liberalization and its economic growth outcomes in Nigeria has received considerable attention in the literature, the household welfare impact or income distributional effect of this policy remains under-researched. This study examines the various household welfare scenarios that will result from the imposition of shocks on import tariffs in the Nigerian economy. To achieve this, the paper utilizes the computable general equilibrium model based on a 2006 social accounting matrix for Nigeria to conduct a macro-micro simulations of the economy. The computable general equilibrium model is implemented in a static module making it a good instrument for controlled policy simulations and experiments. The paper further tracks the patterns of possible welfare losses or gains for the rural and urban households under the various simulations. Some of the major findings suggest that a liberalization policy will particularly hurt the agricultural sector as the policy will induce a shift in consumption preferences within this sector from domestic production to imports. Overall, a complete or partial removal of import tariffs will also hurt the rural households more than the urban households in Nigeria.

1. Introduction

Trade liberalization policy across countries of the world gathered momentum in the 1990s and has not abated ever since. The major impetus for these policy reforms has been the strong desire of countries to harness the benefits embedded in international trade (this is as suggested by the recent experiences of economic growth in many economies particularly, the emerging market economies), and hopefully increase the standard of living of citizens. Data from the World Bank *World Development Indicators*, indicate a strong correlation between a reduction in the average tariff rate in the world and a rise in trade openness as measured by the ratio of imports plus exports to Gross Domestic Product (GDP). These figures also suggest a strong positive link between trade liberalization and economic growth in these countries. The figures further indicate that trade has grown faster than output during the period under review and also connote that accelerated economic growth has been largely driven by a more liberal trade policy in the African continent particularly in the Nigerian economy.

Nigeria embarked on its most ambitious and comprehensive program of trade reform in history under the structural adjustment program (SAP) of the country which commenced in 1986. The SAP itself was designed to address the lingering problem of structural imbalances in the economy then. Some of the problems that plagued the national economy then included an adverse balance of payments position, severe unemployment, a huge national debt profile, low capacity utilization in the industrial sector and a general decline in the quality of life. The country engaged a combination of fiscal, monetary and trade policies to re-direct the economy back on the path of balanced, non-inflationary and self-sustaining growth. The emphasis of the economic reform was on the trade and exchange rate areas of the external sector of the economy. Embedded in SAP

therefore, was a deliberate trade policy of liberalization of the exchange rate, relaxation of import restrictions, and reduction of tariffs on imports.

A major goal of the trade reform policy was to integrate the Nigerian economy into the global market by liberalizing the economy and enhancing the competitiveness of domestic industries. While a policy of diversifying the export base of the economy by de-emphasizing the dominant role of crude oil in Nigeria's exportable was pursued, a complementary policy of import liberalization that promotes efficiency and international competitiveness of domestic producers was considered compelling for the economy. Some of the inherent benefits envisaged in the policy of trade liberalization and integration into the multilateral trading system include an encouragement of fostering of productivity growth through the transfer, acquisition and adoption of appropriate technologies that will enhance the productive base of the Nigerian economy and ultimately improve the standard of living within the country (Bardhan, 2006, Belhaj Hassine, 2008).

While the empirical link between trade liberalization and its economic growth outcomes in Nigeria has received considerable attention in the literature, the household welfare impact or income distributional effect of this policy remains under-researched. For example, it is not clear from the literature whether the trade liberalization policy of the Nigerian government has the capacity to improve the general wellbeing of people and the overall standard of living in the country. Moreover, a number of key human development indices for the country do not seem to suggest a considerable improvement in the wellbeing of Nigerians over the years since trade liberalization was introduced. Curiously, a number of questions arising from the foregoing will bother on various "what if" scenarios for the Nigerian economy. For example, what if import tariff is further reduced in Nigeria? What if import restrictions on some imported goods is further relaxed in Nigeria? Are there substantial welfare gains to be derived by Nigerians from such policy shifts? Which sector(s) will benefit most from such policy changes? The answers to these questions will hopefully improve insights into the household welfare implications of trade liberalization in Nigeria.

This study examines the various household welfare scenarios that will result from the imposition of shocks on tariffs and other trade liberalization related parameters in the Nigerian economy. To achieve this, the paper utilizes the computable general equilibrium model based on a 2006 social accounting matrix for Nigeria to conduct a macro-micro simulations of the economy. The computable general equilibrium model is implemented in a comparative static mode making it a good instrument for controlled policy simulations and experiments. The paper further tracks the patterns of possible welfare losses or gains for the rural and urban households under the various simulations. An important question which the study attempts to address is; what category of households in Nigeria will benefit the most from a policy of tariff-income tax or tariff-production tax reform? This question is examined under the various simulation scenarios and it helps to determine the potential relative benefits of a tariff rationalization policy that is accruable to each identified household type within the Nigerian economy.

The remainder of the paper is organized in sections as follows: section two is the literature review, section three comprises the methodology and data which includes a description of the PEP-1-1 model and sources of information for the Social Accounting Matrix (SAM), the analytical framework as well as the simulation design. Section four comprises the simulation results and some policy implications of major findings. Section five is the concluding section and it provides some general concluding remarks.

2. Literature Review

In the view of the classical economists, the labour market provide the key transmission channel between international trade and household welfare in developing countries (Winters, 2000). Arguably, trade liberalization could have various impact on individuals and households depending on the price transmission mechanisms, and the sources of income of individuals and households (Porto, 2006). One of the main channels through which trade policy could impact households in an economy is the domestic prices of goods and factors of production, these include; wages, profits, returns to capital and rental on land and these will in turn, affect household welfare and income distribution (Winters et al., 2004). Another channel through which trade liberalization could have implications for household welfare is the employment channel. Rural households in their different roles as factors of production and economic agents may be adversely affected by the trade liberalization-welfare nexus. According to Bardhan (2007), the above group in their capacity as self-employed and formal markets workers, private consumers, beneficiaries of public services, and consumers of common resources may suffer severe welfare loss from a suboptimal policy of opening up the product markets without the required institutional and infrastructural adjustments.

Trade liberalization is often part of a broader policy of trade openness and integration into the global market. In this case, the issue of an enduring international labour mobility across national boundaries could create difficulties for generating employment in a globalized world economy. Ghose et al (2008) opined that while there are roles for domestic policy in offsetting negative welfare implications arising from the trade liberalization-employment channel, other policy challenges that can only be dealt with at the global level still remain. Trade liberalization may this sense raise governance questions *vis-à-vis* the compelling need for freer trade and factor mobility as it affects many developing countries with vulnerable structures.

A number of authors posit that factors specific to each country will determine the welfare impact of trade policy on households. In other words, welfare shocks confronted by households on account of trade liberalization could be either negative or positive and of course, country-specific. For example, McCulloch et al. (2001) is of the view that the poverty or welfare impact of trade liberalization is country specific, being pro-poor in some cases and anti-poor in others. Hoekman et al (2001) identify factors such as the initial size of the economy, import tariffs, the sectoral structure of import tariffs, the geographical distribution of the poor, as well as wage and employment as key determinants of trade liberalization on household welfare in a given country. Other authors who agree with this view include (Cockburn, 2001, McCulloch et al, 2001 and winters et al, 2002). Essentially, the nature or structure of the labour market according to Chan et al (2002) is what will determine the effects of trade liberalization on household welfare in each economy.

On the question of whether trade liberalization promotes household welfare, Dollar and Kraay (2004) believe that trade liberalization could lead to faster growth in average incomes, and also, growth decreases absolute poverty by increasing the incomes of the poor “proportionately”. They suggest that developing countries could adopt a strategy of trade liberalization to alleviate poverty. According to Chitiga, and Mabugu (2006), the halving of tariffs in Zimbabwe would favor the export-oriented sectors, mainly in agriculture, inducing a rise in unskilled wages relative to skilled wages and finally leads to a fall in poverty. Cho and Diaz (2008) also found that trade liberalization reforms in Slovenia would induce a fall in import prices, a rise in production within the export sector, and an improvement in aggregate welfare.

However, Ravallion (2007), utilizing both macro and micro modelling frameworks, queries the strong relationship between globalization and poverty reduction. The paper argues that it is not under all conditions that trade openness or liberalization would be effective in reducing poverty or increasing household welfare. Some studies found results in support of Ravallion. Pradhan and Amarendra (2006) found that a general cut in tariffs in India will lead to a decrease in overall welfare and reduction in poverty for urban households. Also, Sapkota and Cockburn (2008) found that trade liberalization in Nepal reduces the nominal returns to urban factors of production in comparison with rural factors of production, resulting in a reduction in the relative income of urban households. Diallo, Koné and Kamagaté (2010) found in their simulation results for a study on Côte d'Ivoire that a partial or complete unilateral liberalization would induce a decrease in GDP, household income and household welfare when compared to the baseline. However, multilateral trade liberalization would positively affect economic growth, income, consumption and wellbeing for almost all the household categories. Similarly, Aredo, Fekadu and Kebede (2012) found that a complete tariff cut in Ethiopia would result in an increase in poverty by 2.8 percent, while a uniform tariff scheme raises poverty by 2.3 percent.

3. Methodology and Data

3.1 The model

The PEP-1-1 (1 period – 1 country) model – version 2.1 (Robichaud, Lemelin, Maisonnave and Decaluwé, 2013), is adopted for this study. The PEP-1-1 model is a static computable general equilibrium (CGE) model designed for the study of a national economy. The static model as applicable to the Nigerian economy is built on the assumption that a typical agent optimizes an objective function subject to some constraints. Calibration of the model parameters was carried out using a 2006 social accountability matrix (SAM) developed for the Nigerian government by the International Food Policy Research Institute, IFPRI (2010). The structure of this SAM is described in Nwafor, Diao and Alpuerto (2010). The SAM was however reformatted for the purpose of this study and this involved some aggregation. Specifically, activities were sixty one in the main SAM but grouped into four sectors (agriculture, industry, services and public administration) in this study. Commodities in the main SAM were sixty two but grouped into five (agriculture, food, industry, services and public administration). Households were initially twelve in the main SAM but this was grouped into two (rural households and urban households). No adjustment was carried out on the factors of production included in the SAM, these remain three (labour, land and capital). Saving and investment, as well as the rest of the world (ROW), remained as in the main SAM. Inventory changes of composite commodity was introduced into the SAM and this was useful in balancing the aggregated SAM. All aggregation in the SAM was done on the basis of the group arrangements described above.

A description of the principal characteristics of the PEP-1-1 model as presented in Robichaud, Lemelin, Maisonnave and Decaluwé, (2012) is summarized in what follows. The model can manage multiple types of workers and capital, a homogenous labour category is used for this study. Two types of capital, CAP and LAND are also utilized. Both labour and capital receive income solely from the industries. The model does not accommodate any other income. Each industry uses labour and capital; the model also accommodate sectors that do not use capital, like the industry ADM, as well as industries that do not use labour. Labour income is distributed amongst the different types of households; no other agent can receive revenue from labour. On the contrary, all agents can receive income from capital. There are four types of institutions, or agents in the model: households, firms, government and the rest of the world. There can be several types of households

but there needs to be at least one. It is assumed that households have Stone-Geary utility functions (from which derives the Linear Expenditure System, or LES). For the purpose of this study, there are two types of households named HRR and HUR, representing rural households and urban households respectively. Households may receive income from labour and capital, and in the form of transfers from other agents. They use their income to pay income taxes, make transfers to other agents, purchase commodities, and save. There is at least one firm, and the model can manage multiple types of businesses. However, there is only one firm used for this study which is called FIRM. Firms' income consists of capital income and transfers; they use it to pay direct taxes, make transfers to other agents, and save.

The model can only manage with a single government. In other words, it cannot deal with SAMs that show multiple government levels. To summarize, government receives income from direct taxation, import duties, indirect taxes on locally consumed commodities, taxes on exports, wage-bill taxes, taxes on the remuneration of capital and taxes on production. It can also receive transfers from other agents. It uses its income to purchase commodities, make transfers and save. There can only be one rest of the world, ROW. In other words, the model cannot manage multiple trading partners. The ROW receives its income as capital income, as transfers from domestic agents, and from imports. It spends in the local economy through the purchase of export commodities and makes transfers to domestic agents. The surplus of ROW income over its expenditures, i.e. its savings (equal to minus the current account balance).

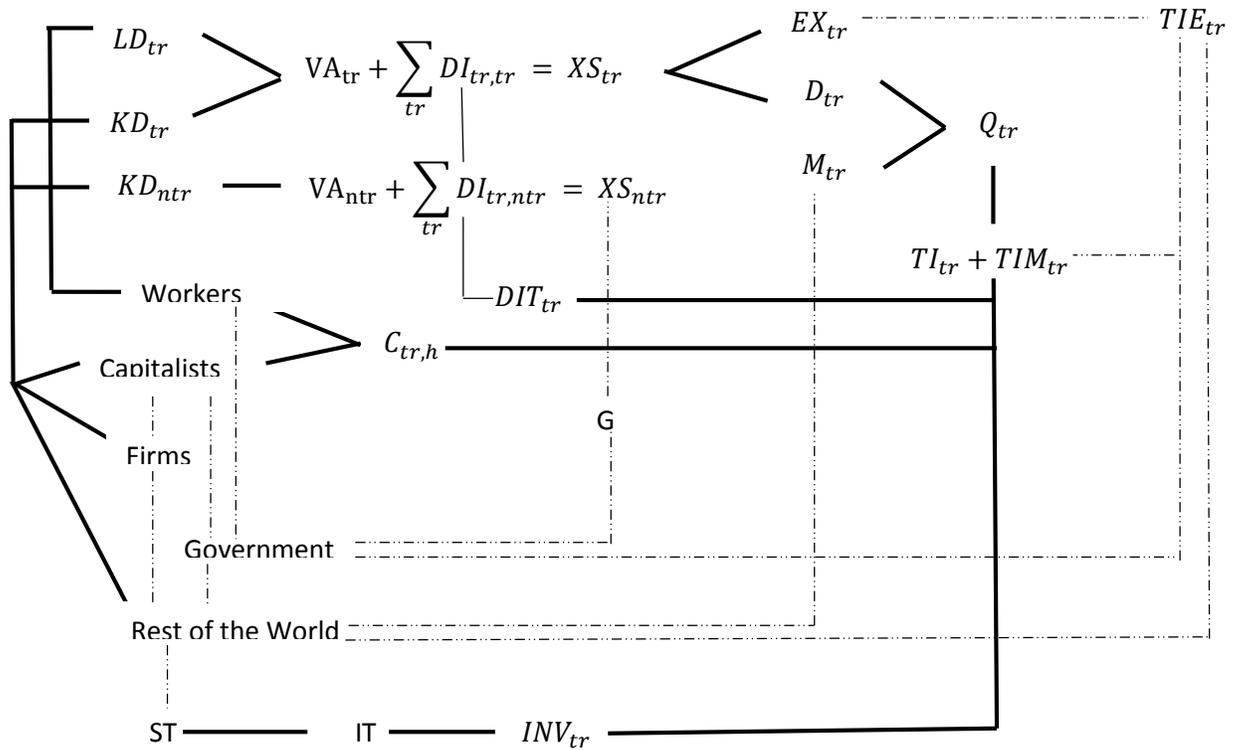
Commodities consist of the different goods and services produced and/or consumed in the economy. It is also important to note that the PEP-1-1 model does not manage re-exports. Only commodities that are produced locally can be exported, and imports can solely be purchased by local agents and industries. Demand for commodities consists in final private demand (purchases from households), current public consumption (purchases from government), intermediate demand (purchases from industries), demand for investment purposes and inventory changes. Each purchaser buys a composite commodity which is composed of local production and/or imports. Each industry can produce any commodity and sell it on the local market and/or on the export market. All sales are expressed at producer prices. To produce the different commodities, industries use production factors (i.e. labor and capital) as well as intermediate consumption. Industries may pay taxes on their wage bill, the remuneration of capital or other taxes on production. Intermediate consumption appears at purchaser prices and thus includes indirect taxes, duties and margins.

In order to avoid financing of welfare through an increase in external debt or a depletion of external reserve as the case may be, current account balance is fixed in this study. Furthermore, following the argument in Diallo, Koné and Kamagaté (2010), the volume of total investment and foreign saving are assumed exogenous so that any decrease in the saving of the other agents must be compensated by an equivalent increase in household savings so as to maintain equilibrium between saving and real investment. Moreover, since the budget deficit is held constant and given the assumptions that nominal exchange rate and international prices are fixed, equilibrium in the current account is made through adjustment in the real exchange rate.

3.2 Analytical Framework

The analytical framework for the study is presented in figure 1. The figure captures the essential characteristics of the PEP-1-1 model adopted in this study. It further shows the channels through which a negative shock on import duties (parameter) may be transmitted into welfare or otherwise for households in the economy. In addition, the figure demonstrates the inter-connectedness of the entire economy in a general equilibrium framework.

Figure 1: Schematic Representation of the PEP-1-1 Model



Source: Robichaud (2013) - adapted by the authour

From figure 1, a negative shock applied to tariffs for all imported commodities, TIM_{tr} will not have a uniform effect on all sectors in the economy. For sectors that are efficient in production and import dependent for raw materials, such negative shock on import duties will be favourable, otherwise there will be some undesirable consequences. In general, a negative shock on import duties will mean cheaper prices of goods imported by each sector into the economy. This will immediately stimulate domestic demand or consumption but at the same time, induce a shift of consumption preferences in favour of imported commodities. If the imports are raw materials or production inputs, then cost of production or producer's price will fall and consumption of the resultant locally produced commodities will increase. Intermediate consumption and value added in the concerned sector will also increase and this will in turn increase demand for labour or employment in that sector. Household income will increase and household welfare will also increase in the concerned sector.

If on the hand imports are finished goods and production in the concerned sector is inefficient, then the purchaser's price of locally produced substitute commodities will become relatively more expensive and less competitive. In this case, import demands, M_{tr} will increase and demand for home made goods, D_{tr} will fall. The probable trade-off between imported goods and domestically produced commodities, will leave the quantity demanded of composite tradeable commodity, Q_{tr} relatively unchanged. A fall in D_{tr} will depress total domestic output in the affected sector, XS_{tr} . Total intermediate demand in the same sector by the sector itself, $DI_{tr,tr}$ will also fall, value added for the sector in question, VA_{tr} will fall as well. The combined effect of all these will compel a reduction in labour demand, LD_{tr} meaning loss of employment. This will hurt the labour market. A reduction in labour demand will make capital in the concerned sector relatively abundant bringing about a reduction in rental on capital, KD_{tr} . Meanwhile, demand for capital in the non-tradeable sector, KD_{ntr} (LAND) will not really be affected. A fall in KD_{tr} will in turn result to a fall in capitalist income. In all, fewer workers, a fall in capitalists income and a fall in import tariffs will mean a fall in tax revenue for the government which also mean a decline in the provision of public services, G . Given a fall in income of agents (excluding ROW) and the assumption of a fixed current account balance, total savings(ST), indirect taxes (IT), and investment in the concerned sector (INV_{tr}) will all fall. In summary, cheaper imported goods alone is expected to leave households with more purchasing power and increase consumption of tradeable goods by households, $C_{tr,h}$. Overall however, household welfare will vary depending on the characteristics of the importing sector.

3.3 Simulation Design

This study involves simulations of two scenarios of trade liberalization policies:

- a complete and unilateral elimination of all import tariffs (SIM1)
- a unilateral 24% reduction in import tariffs in line with the Uruguay round (SIM2)

4. Simulation Results

The results of the simulations are presented in appendix 1 and discussed below. Given simulation 1 and assuming a unilateral and complete removal of all import tariffs in the country, demand for some commodities (agricultural and food products) will increase by 0.57% and 1.98% respectively. While those of industry and services will decrease by 4.54% and 0.1% respectively. At the same time, imports of agricultural and food products will increase while those of industry and services will fall. The increase in demand for agricultural and food products will be satisfied by rising imports as local output of these commodities sold in the domestic market will fall by 0.49% and 3.06% respectively. Domestic production in the agriculture sector will also fall by 2.83% while those of the industry and services sectors will increase by 1.09% and 1.24% respectively. This will also affect value added in these sectors in a similar percentage. Therefore, labour demand or employment in the agriculture sector will decrease by 4.02% while labour demand for industry and services sector will increase by 8.90% and 2.33% respectively. Wage rate will decrease in agriculture sector by 5.87% owing to the decrease in demand for labour in that sector. Similarly, wage rate will fall by the same percentage, 5.87% in the other sectors where

labour have become relatively abundant. This will translate into a decrease in household income by 6.92% for rural households and 4.57% for urban households. Apart from consumption of food products by rural households which will increase by 1.56%, consumption of agriculture and industry products as well as services by rural households will decrease by 0.21%, 3.25% and 1.82% respectively. Conversely, urban households consumption of agriculture and food products as well as services will increase by 1.08%, 1.64% and 0.06% respectively while that of industry products will decrease by 1.33%. Consequently, there is a loss of welfare for all households in terms of income and consumption of industry goods due to a complete unilateral elimination of import duties. In addition, rural households will also loose welfare in terms of consumption of agriculture and industry products as well as services.

Given simulation 2 and suppose a unilateral reduction of import tariffs in the country by 24%, demand for some commodities (agricultural and food products) will increase by 0.13% and 0.38% respectively. Demand for services will also increase by 0.004% while for industry products will decrease by 0.80%. Imports of agricultural and food products will also increase while those of industry and services will fall. The increase in demand for agricultural and food products will be satisfied by rising imports as local output of these commodities sold in the domestic market will fall by 0.17% and 0.60% respectively. Domestic production in the agriculture sector will also fall by 0.56% while those of the industry and services sectors will increase by 0.22% and 0.27% respectively. This will also affect value added in these sectors in a similar percentage. Therefore, labour demand or employment in the agriculture sector will decrease by 0.80% while labour demand for industry and services sector will increase by 1.69% and 0.48% respectively. Wage rate will decrease in agriculture sector by 1.18% owing to the decrease in demand for labour in that sector. Similarly, wage rate will fall by the same percentage, 1.18% in the other sectors where labour have become relatively abundant. This will translate into a decrease in household income by 1.40% for rural households and 0.92% for urban households. Apart from consumption of food products by rural households which will increase by 0.29%, consumption of agriculture and industry products as well as services by rural households will decrease by 0.004%, 0.63% and 0.36% respectively. Conversely, urban households consumption of agriculture and food products as well as services will increase by 0.25%, 0.69% and 0.02% respectively while that of industry products will decrease by 0.24%. As in simulation 1, there is a loss of welfare for all households in terms of income and consumption of industry goods due to unilateral reduction of import tariffs in the country by 24%. In addition, rural households will also loose welfare in terms of consumption of agriculture and industry products as well as services.

4.1 Policy Implication of Findings

Given the results of this study, it is evident that a policy of full or partial trade liberalisation of the Nigerian economy will not increase the overall welfare needs of Nigerian households in the short run. A liberalisation policy will particularly hurt the agricultural sector as the policy will induce a shift in preferences within this sector from domestic production to imports. Overall, a complete or partial removal of import tariffs will also hurt the rural households more than the urban households.

4.2 Concluding Remarks

The study examined the welfare implications of trade liberalisation policy for households in Nigeria. Two simulation scenarios involving a complete removal of import tariffs and a 24% reduction of import tariffs was conducted. The results revealed that trade liberalisation policy will not be largely consistent with the welfare expectations of households in Nigeria at least in the short run. The results also reveals that the agricultural sector will be worse off under a trade liberalisation policy thereby suggesting a problem of vulnerability of this sector to external trade competition. It will therefore be helpful to pursue a trade liberalisation policy on a sectorial basis with emphasis on those sectors that will not severely undermine the welfare needs of Nigerian households.

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Appendix 1 : Simulation Results

Definition	Symbol	Benchmark	Sim1: ($tm_i - 100\%$)	Sim2: ($tm_i - 24\%$)
PRICES				
LABOUR				
Wage rate	W	1	0.941317465 (-5.87%)	0.988227703 (-1.18%)
Exchange rate (numeraire)	e	1	1 (0.00%)	1 (0.00%)
GDP Deflator	PIXGDP	1	0.959527374 (-4.05%)	0.991895552 (-0.81%)
RENTAL ON CAPITAL				
Agriculture	$R_{agr, cap}$	1	0.991192903 (-0.88%)	0.99833539 (-0.17%)
	$R_{agr, land}$	1	0.910612411 (-8.94%)	0.981794835 (-1.82%)
Industry	$R_{ind, cap}$	1	0.991192903 (-0.88%)	0.99833539 (-0.17%)
	$R_{ind, land}$	1	1 (0.00%)	1 (0.00%)
Services	$R_{ser, cap}$	1	0.991192903 (-0.88%)	0.99833539 (-0.17%)
	$R_{ser, land}$	1	1 (0.00%)	1 (0.00%)
Administration	$R_{adm, cap}$	1	0.991192903 (-0.88%)	0.99833539 (-0.17%)
	$R_{adm, land}$	1	1 (0.00%)	1 (0.00%)
VALUE ADDED PRICE				
Agriculture	PVA_{agr}	6530105.668	6345598.828 (-2.83%)	0.991231765 (-1.34%)
Industry	PVA_{ind}	7880637.052	7966587.096 (1.09%)	0.99953325 (-0.21%)
Services	PVA_{ser}	4581901.003	4638659.708 (1.24%)	1.011688597 (-1.04%)
Administration	PVA_{adm}	915888.8044	956500.2708 (4.43%)	0.988238712 (-1.18%)
PRODUCER PRICE				
Agriculture	P_{agr}	1.117555411	1.053091462 (-5.77%)	1.104243899 (-1.19%)
Industry	P_{ind}	1.029256667	0.996832259 (-3.15%)	1.022932907 (-0.61%)
Services	P_{ser}	1.280117447	1.221925717 (-4.55%)	1.268468697 (-0.91%)
Administration	P_{adm}	1	0.957541605 (-4.25%)	0.991473282 (-0.85%)
Food	P_{food}	1.302096979	1.217928372 (-6.46%)	1.285163767 (-1.30%)

Definition	Symbol	Benchmark	Sim1: ($tm_i - 100\%$)	Sim2: ($tm_i - 24\%$)
CONSUMER PRICE				
Agriculture	PC_{agr}	1	0.940401669 (-5.96%)	0.987738614 (-1.23%)
Industry	PC_{ind}	1	0.968751878 (-3.12%)	0.997118259 (-0.29%)
Services	PC_{ser}	1	0.953070608 (-4.69%)	0.990816263 (-0.92%)
Administration	PC_{adm}	1	0.957541605 (-4.25%)	0.991473282 (-0.85%)
Food	PC_{food}	1	0.928156991 (-7.18%)	0.985568333 (-1.44%)
PRODUCTION AND FACTORS				
OUTPUT				
Agriculture	XS_{agr}	6362518.161	6182746.473 (-2.83%)	6326660.416 (-0.56%)
Industry	XS_{ind}	9374177.642	9476416.964 (1.09%)	9394381.607 (0.22%)
Services	XS_{ser}	6633696.962	6715872.471 (1.24%)	6651362.431 (0.27%)
Administration	XS_{adm}	3108960.071	3246814.609 (4.43%)	3135697.278 (0.86%)
VALUE ADDED				
Agriculture	VA_{agr}	6530105.668	6345598.828 (-2.83%)	6493303.437 (-0.56%)
Industry	VA_{ind}	7880637.052	7966587.096 (1.09%)	7897622.021 (0.22%)
Services	VA_{ser}	4581901.003	4638659.708 (1.24%)	4594102.56 (0.27%)
Administration	VA_{adm}	915888.8044	956500.2708 (4.43%)	923765.4923 (0.86%)
LABOUR				
Agriculture	LD_{agr}	3958624.786	3799678.348 (-4.02%)	3926770.754 (-0.80%)
Industry	LD_{ind}	300773.417	327556.2462 (8.90%)	305879.523 (1.69%)
Services	LD_{ser}	3925373.409	4016889.95 (2.33%)	3944237.873 (0.48%)
Administration	LD_{adm}	914883.6071	955530.6754 (4.44%)	922767.0697 (0.86%)
Total	LS	9099655.219	9099655.219 (0.00%)	9099655.219 (0.00%)

Definition	Symbol	Benchmark	Sim1: ($tm_i - 100\%$)	Sim2: ($tm_i - 24\%$)
CAPITAL				
Agriculture	KD_{agr}	381436.8927	356420.7675 (-6.56%)	376372.7021 (-1.33%)
Industry	KD_{ind}	7579863.635	7639672.252 (0.78%)	7591772.473 (0.16%)
Services	KD_{ser}	656527.5938	621768.6786 (-5.29%)	649689.6431 (-1.04%)
Administration	KD_{adm}	1005.197289	971.6212303 (-3.34%)	998.5007309 (-0.67%)
Land	KD_{land}	2190043.989	2190043.989 (0.00%)	2190043.989 (0.00%)
INTERMEDIATE DEMAND				
Agriculture	$DI_{agr,agr}$	10168.50822	9881.19904 (-2.83%)	10111.20076 (-0.56%)
	$DI_{agr,ind}$	204903.1274	207137.9001 (1.09%)	205344.7507 (0.22%)
	$DI_{agr,ser}$	3981.064404	4030.380192 (1.24%)	3991.665939 (0.27%)
Services	$DI_{ser,agr}$	720389.097	700034.6465 (-2.83%)	716329.1439 (-0.56%)
	$DI_{ser,ind}$	273706.5913	276691.7679 (1.09%)	274296.5052 (0.22%)
	$DI_{ser,ser}$	711677.1935	720493.1578 (1.24%)	713572.3828 (0.27%)
	$DI_{ser,adm}$	1328154.413	1387046.167 (4.43%)	1339576.605 (0.86%)
Food	$DI_{food,agr}$	459786.2198	446795.0514 (-2.83%)	457194.9663 (-0.56%)
	$DI_{food,ind}$	57012.75097	57634.55964 (1.09%)	57135.62933 (0.22%)
	$DI_{food,ser}$	41180.04261	41690.16404 (1.24%)	41289.70465 (0.27%)
Industry	$DI_{ind,agr}$	194549.7206	189052.7568 (-2.83%)	193453.2814 (-0.56%)
	$DI_{ind,ind}$	804787.1276	813564.5258 (1.09%)	806521.6681 (0.22%)
	$DI_{ind,ser}$	973596.2044	985656.7137 (1.24%)	976188.8814 (0.27%)
	$DI_{ind,adm}$	475251.1806	496324.3144 (4.43%)	479338.3637 (0.86%)

Definition	Symbol	Benchmark	Sim1: ($tm_i - 100\%$)	Sim2: ($tm_i - 24\%$)
INCOME AND SAVINGS				
INCOME				
Rural Household	YH_{hrr}	6289097.012	5853650.279 (-6.92%)	6201045.083 (-1.40%)
Urban Household	YH_{hur}	9164102.57	8744979.892 (-4.57%)	9080133.359 (-0.92%)
Firm	YF	4865843.68	4822989.722 (-0.88%)	4857743.948 (-0.17%)
Government	YG	5767977.013	5461896.437 (-5.31%)	5713969.132 (-0.94%)
SAVINGS				
Rural Household	SH_{hrr}	58928.7381	54848.60919 (-6.92%)	58103.69294 (-1.40%)
Urban Household	SH_{hur}	2480851.501	2367389.095 (-4.57%)	2458119.854 (-0.92%)
Firm	SF	0.00	-3.27295	-3.26845
Government	SG	1879406.204	1584735.324 (-15.68%)	1827716.061 (-2.75%)
DISPOSABLE INCOME				
Rural Household	YDH_{hrr}	6289097.012	5853650.279 (-6.92%)	6201045.083 (-1.40%)
Urban Household	YDH_{hur}	9038697.399	8625310.16 (-4.57%)	8955877.255 (-0.92%)
RECEIPTS FROM DIRECT TAXATION				
Urban Household	DTH_{hur}	125405.1712	119669.7322 (-4.57%)	124256.1036 (-0.92%)
Firms	DTF	2233366.13	2213696.657 (-0.88%)	2229648.446 (-0.17%)
RECEIPTS FROM INDIRECT TAXATION				
Agricultural Products	TI_{agr}	4484.743698	4227.811033 (-5.73%)	4430.484028 (-1.21%)
Food Products	TI_{food}	47115.25039	43817.23583 (-6.99%)	46449.78397 (-1.41%)
RECEIPTS FROM DUTIES ON IMPORTS				
Agricultural Products	TIM_{agr}	9496.741109	0.00 (-100.00%)	7321.295407 (-22.91%)
Food Products	TIM_{food}	192997.6184	0.00 (-100.00%)	163441.0745 (-15.31%)
Industrial Products	TIM_{ind}	42705.60403	0.00 (-100.00%)	32122.12346 (-24.78%)

Definition	Symbol	Benchmark	Sim1: ($tm_i - 100\%$)	Sim2: ($tm_i - 24\%$)
DEMAND				
Rural Household - Consumption				
Agriculture	$C_{agr.hrr}$	194101.8744	193701.4991 (-0.21%)	194093.3228 (-0.004%)
Industry	$C_{ind.hrr}$	714429.139	691199.3562 (-3.25%)	709918.2824 (-0.63%)
Services	$C_{ser.hrr}$	507017.4815	497805.7816 (-1.82%)	505193.4381 (-0.36%)
Food	$C_{food.hrr}$	3465583.365	3519516.633 (1.56%)	3475930.123 (0.29%)
Urban Household - Consumption				
Agriculture	$C_{agr.hur}$	145526.0732	147099.3744 (1.08%)	145887.0958 (0.25%)
Industry	$C_{ind.hur}$	1384898.997	1366489.133 (-1.33%)	1381560.382 (-0.24%)
Services	$C_{ser.hur}$	1443544.675	1444444.088 (0.06%)	1443765.915 (0.02%)
Food	$C_{food.hur}$	2331825.997	2416799.175 (3.64%)	2348113.219 (0.69%)
TOTAL INTERMEDIATE DEMAND				
Agriculture	DIT_{agr}	219052.7	221049.4794 (0.91%)	219447.6174 (0.18%)
Industry	DIT_{ind}	2448184.233	2484598.311 (1.49%)	2455502.195 (0.29%)
Services	DIT_{ser}	1593149.1	1684196.446 (5.71%)	1611116.349 (1.13%)
Food	DIT_{food}	557979.0133	546119.775 (-2.13%)	555620.3003 (-0.42%)
INVESTMENT DEMAND				
Industry	INV_{ind}	772169.9636	530003.835 (-31.36%)	728879.4499 (-5.61%)
Food	INV_{food}	12009.62688	8856.600183 (-26.25%)	11493.13626 (-4.30%)
Services	INV_{ser}	402136.3396	281778.8321 (-29.93%)	381028.1683 (-5.25%)
Total	IT	976108.9795	563895.5651 (-42.23%)	900862.1441 (-7.71%)

Definition	Symbol	Benchmark	Sim1: ($tm_i - 100\%$)	Sim2: ($tm_i - 24\%$)
LOCAL OUTPUT SOLD ON DOMESTIC MARKET				
Agriculture	D_{agr}	455238.1682	453027.8127 (-0.49%)	454452.892 (-0.17%)
Food	D_{food}	5873675.543	5693931.637 (-3.06%)	5838208.154 (-0.60%)
Industry	D_{ind}	2065168.779	2017844.919 (-2.29%)	2056326.701 (-0.43%)
Services	D_{ser}	6284787.093	6347791.449 (1.00%)	6298744.203 (0.22%)
Administration	D_{adm}	3108960.071	3246814.609 (4.43%)	3135697.278 (0.86%)
COMPOSITE COMMODITY				
Agriculture	Q_{agr}	554471.5847	557641.2899 (0.57%)	555218.9731 (0.13%)
Food	Q_{food}	6262620.838	6386515.019 (1.98%)	6286379.614 (0.38%)
Industry	Q_{ind}	5452681.791	5205291.271 (-4.54%)	5408859.997 (-0.80%)
Services	Q_{ser}	7376158.927	7368787.845 (-0.10%)	7376452.745 (0.004%)
Administration	Q_{adm}	3108960.071	3246814.609 (4.43%)	3135697.278 (0.86%)
INTERNATIONAL TRADE				
IMPORTS				
Agriculture	M_{agr}	99233.41651	104292.4786 (5.09%)	100660.1755 (1.44%)
Food	M_{food}	388945.2951	642885.0444 (65.29%)	433395.2918 (11.43%)
Industry	M_{ind}	3387513.012	3188434.139 (-5.88%)	3352638.73 (-1.03%)
Services	M_{ser}	1091371.835	1022281.183 (-6.33%)	1077758.994 (-1.25%)
EXPORTS				
Agriculture	X_{agr}	5310.189074	5632.999239 (6.08%)	5371.884025 (1.16%)
Food	X_{food}	28294.26049	30014.28868 (6.08%)	28622.98947 (1.16%)
Industry	X_{ind}	7309008.863	7457823.224 (2.04%)	7338027.533 (0.39%)
Services	X_{ser}	348909.8691	367920.6955 (5.45%)	352612.4317 (1.06%)
Current account balance	CAB	3443077.463	3443077.463 (0.00%)	3443077.463 (0.00%)

Appendix 2: Variables Legend

1. VOLUME VARIABLES

$C_{i,h}$:	Consumption of commodity i by type h households
D_i :	Domestic demand for commodity i produced locally
$DI_{i,j}$:	Intermediate consumption of commodity i by industry j
DIT_i :	Total intermediate demand for commodity i
X_j :	Quantity of product exported by sector j
M_i :	Quantity of product i imported
INV_i :	Final demand of commodity i for investment purposes
KD_j :	Demand for capital by industry j
LD_j :	Demand for labor by industry j
LS :	Total supply of labor
Q_i :	Quantity demanded of composite commodity i
VA_j :	Value added of industry j
XS_j :	Total output of Industry j

2. PRICE VARIABLES

e :	Exchange rate; price of foreign currency in terms of local currency
PC_i :	Purchaser price of composite commodity i (including all taxes and margins)
$PIXGDP$:	GDP deflator
P_j :	Basic price of industry j 's output
PVA_j :	Price of industry j value added (including taxes on production directly related to the use of capital and labour)
$R_{j,k}$:	Rental rate paid by industry j for type k capital, including capital taxes
W :	Wage rate of industry j composite labor

3. NOMINAL (VALUE) VARIABLES

CAB :	Current account balance
IT :	Total investment expenditures
SF_f :	Savings of type f businesses
SG :	Government savings
SH_h :	Savings of type h households
ROW :	Rest-of-the-world savings
DTF :	Income taxes of type f businesses
DTH_h :	Income taxes of type h households
TI_i :	Total government receipts of indirect taxes on commodities
TIM_i :	Government revenue from import duties on product i
YDH_h :	Disposable income of type h households
YF :	Total income of type f businesses
YG :	Total government income
YH_h :	Total income of type h households

