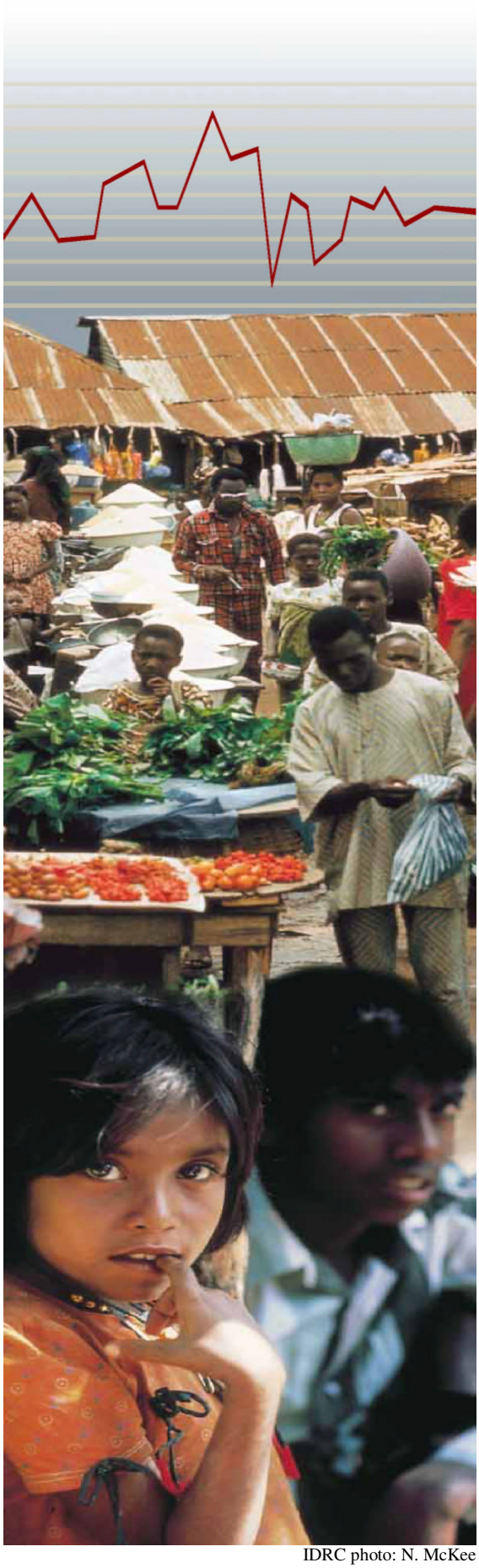

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Does Trade Liberalisation Lead to Poverty Alleviation? A CGE Microsimulation Approach for Zimbabwe

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ABSTRACT

A CGE microsimulation model is used to study the poverty impacts of trade liberalization in Zimbabwe. A sample of 14006 households from a 1995 household survey is individually modeled in a CGE framework. The experiment performed is a 50 percent reduction in all import tariffs. The sectors with the highest initial tariffs are the non-export agriculture sectors and the most export-intensive sectors are found in agriculture and in mining. The halving of tariffs favors export-oriented sectors, mainly in agriculture, whereas industrial sectors are hardest hit by the increased import competition. As agriculture is intensive in unskilled labor and industry is intensive in skilled labor, unskilled wages rise relative to skilled wages. The consumer prices fall and this, together with increased unskilled wages, leads to a fall in poverty. The fall in the price of manufactured food, which is consumed mainly in urban areas, coupled with the large number of unskilled workers in these urban areas, explains why poverty falls more here than in rural Zimbabwe.

JEL Classification: C68, D31, D58, I32

Keywords: Computable General Equilibrium, Trade Liberalisation, Microsimulation, Poverty.

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1. Introduction

Ever since the structural adjustment program was implemented in 1991, poverty has been on the increase in Zimbabwe. This has led people to blame the reforms for causing heightened poverty in the 1990s. During the 1990s, it was difficult to pinpoint the policies which had an adverse effect on poverty and income distribution. This is because a wide range of policies were implemented, ranging from trade, to exchange rate, to monetary, to fiscal and other social policies, often at the same time. In addition, there were other exogenous shocks such as droughts that occurred during the reform period, which would have contributed to poverty. Since it is difficult to pinpoint specific policies as the culprits for the growing suffering of Zimbabweans, it is equally difficult for policy makers to react to these increasing problems. Isolating the impact of policy effects has the advantage of enabling researchers and policy makers to know how serious an impact a policy has on income distribution and poverty, thus facilitating informed policy making.

Trade policies have made up a large part of the country's policy in the nineties and have contributed significantly to changes in growth, employment and ownership of resources. These policies affect terms of trade between agriculture and industry, wages, resource ownership, prices and composition of commodities, economic performance, and employment within the economy. These issues are interlinked, and in order to get a comprehensive understanding of their effects on incomes and poverty, a general equilibrium approach is preferred in this study.

This paper aims to establish the medium to longer-term impact of a 50 percent import tariff cut on incomes and poverty in Zimbabwe. This is done using a microsimulation approach where household data is incorporated into the CGE model and simulations performed on the full data set. The rest of the paper is arranged as follows: we first discuss some key country information, then we give a brief review of the relevant literature. The next two sections discuss the model, and then the simulation results. The final section cites the study's conclusions.

2. Country background

2.1. Introduction

Zimbabwe became independent in 1980 after close to a century of colonisation. During most of the eighties, the government of Zimbabwe followed a system of tight import controls because of foreign currency shortages (see Elbadawi and Schmidt-Hebbel (1991) and Pakkiri and Moyo (1986)). Approaching the end of

the eighties, the tight system of controls had become progressively difficult to administer and deemed inefficient by all concerned parties. Pressure from the Bretton Woods institutions to open up trade was also mounting at that time. These reasons, coupled with the general stagnation of the economy and increasing unemployment, led to a decision by the government to adopt a World Bank/IMF supported structural adjustment program beginning in 1991.[1]

A major component of the structural adjustment was trade liberalisation, which involved (among other policies) tariff reduction. The two other components were macroeconomic policy reform and deregulation. A second phase of adjustment followed this programme commonly referred to as the Zimbabwe Programme for Reconstruction and Economic Development (ZIMPREST), which aimed to extend the reforms as well as to increase assistance for the vulnerable groups. However, ZIMPREST was short-lived due to the 1997 crash of the Zimbabwe dollar and the land invasions that followed thereafter. Land reforms were accelerated between 1999 and 2002. After this period the government proceeded with reforms at a slower pace with a view to ending the reform process and starting economic restructuring.

Summary performance indicators for the period between independence and 2000 are given in Table 1. As seen in the table, Zimbabwe's growth performance has been deteriorating over time, despite the boom in all economic sectors during the eighties.

Table 1: Zimbabwe's growth performance in key variables

Average annual growth	**1981-1991**	**1991-2001**	**2000**
GDP	3.6	1.8	-4.9
GDP per Capita	0.3	-1.3	-7.7
Exports of goods and services	6.2	7.4	-16.6
Agriculture	3.5	4.3	3.0
Industry	3.1	-0.4	-9.8
Manufacturing	3.3	-1.0	-10.5
Services	3.3	2.4	-3.6
Private consumption	4.0	4.2	-14.4
General Government consumption	2.8	-3.1	55.5
Imports of goods and services	6.3	5.0	-21.6

Source: World Bank (2002)

The major drivers of economic growth in the country were services and industry, as seen in Table 2. Services and agriculture continued registering growth in 2000 while manufacturing declined.

[1] The reform programme referred to as the Economic Structural Adjustment Program (ESAP) was documented in a publication: *Zimbabwe: A Framework for Economic Reform 1991-95* (GOZ, 1991), in early 1991.

Table 2: Sectoral contribution in GDP

% of GDP	1981	1991	2000
Agriculture	17.5	15.3	18.5
Industry	31.3	37.4	25.5
Manufacturing	21.5	27.2	15.8
Services	51.1	47.3	56.5
Imports of goods and services	6.3	5.0	-21.6

Source: World Bank (2002)

Before the liberalisation period of the 1990s, tariffs were mainly used for revenue raising purposes. Other import and exchange controls then performed the functions of protecting national industries. However, after this liberalisation period started, quantitative trade restrictions were abolished, leaving tariffs to not only serve as a revenue raising instrument but also as an instrument to protect the industry and to reduce import demand.

The tariff structure adopted in 1967 was in use until 1983. In 1983, Zimbabwe adopted the Customs Co-operation Council Nomenclature which increased the number of headings which had to be allocated duty rates, from 331 items to over 5000. However, some problems of inconsistencies were encountered due to this move. In 1988 the move to the Harmonised Commodity Description and Coding System, with over 7000 headings, worsened the problem. Duty rates were raised in that year in order to meet the increased need for revenue by the government. Between the implementation of the Economic Structural Adjustment Program (ESAP) in 1991 and 1996 there were frequent amendments to the tariff structure until it became necessary to revise the whole structure. An average tariff of 16 percent plus a surcharge of 15 percent on most goods was applied during this period, to illustrate the country's tariff situation at the time.

The new tariff structure came into effect in 1997 aimed at reducing rates and rationalising band structures, which are summarised in Table 3. With the new tariff structure, Zimbabwe's national government also wanted to lower duties on raw materials and other inputs so as to reduce tariff evasions that had been rife before that period. Some policy reversals occurred since this time. In 1998 tariffs on luxury goods were increased, and in 2000 some tariff lines and some maximum tariff rates were reduced. In March 2001 the government raised tariffs on certain processed items that had domestically produced substitutes, such as food. However, the government reduced rates on some raw material and capital goods such as machinery simultaneously. Meanwhile, a few non-tariff barriers were established, particularly in the agricultural sector.

Table 3: Structure of tariff rates

Goods	Previous rates of duty (before 1997) (%)	New rates of duty (from 1997) (%)
Raw materials	0-40	5
Merit goods:		
-Education	0-40	5
-Medical	0-20	0-20
-Goods for the blind	0-10	0
Capital goods	0-25	0
Tools	0-20	5-15
Spares	0-56	15
Partly Processed Inputs	0-55	15
Intermediate goods and consumables	0-35	20-30
Finished goods	0-85	40-85

Source: (Reserve Bank of Zimbabwe, 1997 p20).

The major sources of trade revenue were customs duties levied on CIF values of imports, and surtax and import tax charged on CIF value plus duty. Government revenue collection rose slightly in real terms between 1992 and the end of the nineties. The surtax contributed between 25 and 30 percent of total revenue collected in the nineties. Customs duties and excise taxes contributed an average of 19 percent to total tax revenue since 1992, while the highest contribution in the nineties was from income (43 percent), (Central Statistics Office, 2002: National Accounts 1985-2000 Table 7.9b).

2.2 Tariff reform outcomes

During the period before trade liberalization (1981-90) the US$ value of exports grew by only 2.4 percent per annum. In the early nineties, this fell to an average decline of 2.6 percent. Total exports grew steadily from about Z$5 billion in 1991 to slightly over Z$25 billion at the end of the nineties. Generally therefore, trade liberalization seems to have led to an increase in the country's exports. Between 1994 and 1998 export growth averaged 5 percent per year. The rate of growth was reversed in 1997 and there was a substantial decline in 1998. This downturn has continued through the new millennium although the main culprit now is the handling of the land reform policy started in 1999. At the beginning of ESAP, a consumption boom caused by the relative cheapening of imports led to a substantial increase in imports and a growing trade deficit. Imports grew steadily but less than exports from Z$5 billion in 1991 to Z$20 billion in 1996 (Reserve Bank of Zimbabwe, 1997, p22).

Manufacturing output declined since the start of the reforms. In 1990, the manufacturing sector comprised 22.8 percent of GDP. But, by the end of the ESAP period in 1996, this had declined to 20.7 percent and to 17.1 percent in 1998. During

the ESAP period, overall real GDP declined by 3.8 percent. The decline in the manufacturing sector alone accounted for most of this. If it were not for positive growth in Finance and other sectors, GDP would have fallen by more than 3.8 percent. After 1994, although there was positive growth in GDP (an 11.9 percent increase up to 1998) with most sectors growing, the manufacturing sector continued its decline, as seen in Tables 1 and 2. Bhalla *et al* (1999) argue that the falling share of manufacturing can be interpreted as de-industrialization rather than simply the relative shifts in sector sizes.

ESAP caused a change in employment structure with agriculture and some services increasing employment and manufacturing and public services decreasing as seen in Table 4. However, at the same time there were severe droughts that occurred in 1992 and 1994-95. Rattso and Torvik (1998) isolated the effects of trade liberalization and concluded that 'the deficit and the de-industrialization associated with it are the high short-run price of liberalization, even if the long-run effects may be favorable' (p. 336). They believed that trade liberalization may have created uncertainty, which could have reduced further investment (including FDI) and accelerated the process of de-industrialization. While there may have been gains in the economy after the reforms, many people continued to experience increasing poverty and hardships.

Table 4: Employment growth (in percent) before and during ESAP by sector

SECTOR	1980-1990	1985-1990	1991-1994
Agriculture	-1.2	1.2	2.8
Mining	-1.2	-0.9	0.2
Manufacturing	2.9	2.9	0.9
Electricity and water	2.6	3.0	-0.7
Construction	6.1	9.2	4.2
Finance, distribution	3.5	2.0	6.6
Transport and Comm.	1.9	1.0	-0.1
Public Admin.	2.3	0.8	-3.6
Health	5.5	4.9	-0.7
Private Domestic	-.07	0.7	0.0
Education	11.7	4.4	1.0
Hotel and Catering	3.6	3.7	2.6
Other services	5.2	5.0	6.1
Total	1.8	2.4	1.6

Source: Kanyenze, G, 1995.

2.3 Poverty and income distribution in Zimbabwe

Poverty incidence increased in the nineties ever since the start of the reform programme. Extreme poverty went up from 25 percent to 35 percent between 1991 and 1995, (World Bank 2004). The results from the 1995 Poverty Assessment Study Survey (PASS), conducted by the government of Zimbabwe through the Ministry of labour, gave higher poverty figures for 1995 than those for the World Bank, an indication that poverty had increased in the nineties (PASS, 1996). Poverty was reported to be more prevalent in rural areas; according to the study, 75 percent of households in the total poor category were rural compared to 39 percent in the urban areas (PASS, 1996). In the communal areas, 84 percent of households were poor, followed by the resettlement areas and small-scale commercial farms with 70 percent. On the other hand, large-scale commercial farms had 57 percent of the households living in poverty, while 39 percent of urban households were poor. Table 5 shows that rural areas had the highest distribution of all classifications of poverty.

As expected, the poorest households were the unemployed, and the least poor were those that were employers (Table 6). Table 7 shows that the unskilled workers were the poorest. These consisted of unskilled workers in agriculture, industry and in the informal sector. By 1999 the population below the poverty line had risen to 60 percent.

Table 5: Household distribution of poverty by region

	Very poor %	Poor %	Non poor %
National	45	16	39
Rural	60	15	24
Urban	21	18	61

Source: Table 3.2 PASS

Table 6: Employment status by poverty level (in percent)

Employment status	Very poor	Poor	Non poor	Total
Employer	15.0	9.7	75.3	100.0
Own account worker	44.8	19.8	35.4	100.0
Unpaid family worker	77.8	11.4	10.8	100.0
Paid employee	21.7	19.8	58.5	100.0
Unemployed	52.8	19.3	27.9	100.0

Source: Table 3.2.3 PASS

Table 7: Persons by poverty level and skill level by region (in percent)

	Rural			Urban		
Skill level	**Very poor**	**Poor**	**Non poor**	**Very poor**	**Poor**	**Non poor**
Professional	6.6	6.9	86.5	6.6	6.9	86.5
Skilled	12.8	10.6	70.5	12.8	10.6	70.5
Semi skilled	18.5	21.5	60	18.5	21.5	60
Unskilled	32.3	23.4	44.3	32.3	23.4	44.3

Source: Table 12.12 and 12.11 PASS

In this paper we investigate how far tariff reduction policies influenced income distribution and poverty in Zimbabwe during the nineties. We are interested as well in finding out how far such trade policies can be used in the future to try and influence the allocation of resources between various groups and sectors of the economy with a view to reducing poverty. The microsimulation model used allows us to comprehensively test the effects of alternative policies on income distribution and poverty in Zimbabwe.

3. Relevant literature review

In many developing countries, several policies are implemented simultaneously during structural reforms that include trade liberalization. In many countries, trade reforms in the form of trade liberalization are believed to have led to increased inequalities and heightened poverty. These results have been used in some instances to argue against particular policies included in a reform package as along with trade liberalization. Yet, common economic theory (e.g. the Stolper-Samuelson model) states that inequality should fall following a liberalized trade regime because remuneration of the abundant factor (unskilled labour) rises relative to that of the scarce (capital and skilled labour in developing countries) factors. Further, advantages from increased efficiency should enhance growth and likely reduce poverty. Thus, the question is whether it is trade liberalization or other policies that contribute to increased poverty and inequalities during reform periods.

Winters *et al* (2002), Reimer (2002) and Rajan and Bird (2002) among others give a comprehensive literature review of the impact of trade liberalization on poverty. There are many channels through which trade liberalization influences incomes and poverty. Understanding these channels assists in understanding the effects of trade liberalization on income and poverty. From Winters (2000), Reimer (2002) summarizes the main links between trade and poverty as follows:

1. The price and availability of goods;
2. Factor prices, income and employment;

3. Government transfers influenced by changes in revenue from trade taxes;
4. The incentives for investment and innovation, which affect long-run economic growth;
5. External shocks, in particular changes in terms of trade; and
6. Short-run risk and adjustment costs.

Most economists conclude that there is no simple generalization about the relationship between trade liberalization and poverty, and that it is difficult to take into account all these linkages in one study. It does seem though that there is no strong evidence that trade liberalization will increase poverty or vulnerability to it, but no guarantees either that the poor will always benefit from such. These conclusions seem to suggest that such evidence from a particular country must be obtained empirically. One popular way of doing this has been to use a general - as opposed to a partial - equilibrium model. The advantage of such a methodology is that it captures the linkages that exist among various sectors, institutions, and the rest of the world. This goes a long way in capturing, as many as possible, the links identified above.

In the past few years, the number of studies on trade liberalisation and poverty and income distribution using CGE models has increased dramatically. Generally there are several approaches that have been used to study these issues. The traditional method is to use an aggregated CGE model with representative households to infer changes in income distribution due to trade liberalisation. This type of analysis assumes that the households within a given group are the same and can be represented by a representative household. In such models, not much can be done in terms of poverty analysis since, by its nature, the study of poverty relies on micro data. As a result of this limitation, there have been attempts to try and pay attention to as much income distribution and poverty data as possible by greatly disaggregating the household types, (see for example Piggott and Whalley 1985). However, even in such studies comprehensive poverty analysis is not permitted.

In recent work, modellers have used national household survey data to incorporate all the households in a way that allows much more detailed and comprehensive poverty analysis. This suggests the use of microsimulation models, whose history dates back to Orcutt (1957). Two different types of microsimulation models have been mainly used (see Davies, 2004 for a comprehensive survey of this literature). One type makes use of two models, a macro CGE model and a micro model, based on household data working in sequence (see Robilliard 2002). The other type brings these two models into one model by incorporating household data into the CGE model itself (see Cogneau and Robilliard 2000, Cockburn 2001).

Work on trade liberalisation in CGE models has been done in Zimbabwe by, among others, Davies *et al* (1994 and 1998), Rattso and Torvik (1998), Bautista *et al* (1998), Mabugu (2001) and Chitiga-Mabugu (2001). The Davies *et al* (1994) model is the basis of the models used by most of the aforementioned researchers. The model is static and uses data from 1985. Trade is characterised by foreign currency rationing rules and a fixed exchange rate in the model, as was the case in Zimbabwe in the late eighties and early nineties. They simulate trade liberalisation experiments of removal of rationing rules and devaluation of the exchange rate. Mabugu (2001) investigates the consequences of reduction in trade taxes. On the other hand, Rattso and Torvik (1998), simulate trade liberalisation by the removal of foreign currency rationing in different stages without changing the tariffs. They find that, in the short run, there is a contraction of output and employment after trade liberalisation. They also find that there is a consumption boom as people run down previously accumulated forced savings leading to a rising trade deficit. Their income distribution results show that this type of trade liberalisation benefits the richer groups at the expense of the poor.

Bautista *et al* (1998) use a different type of model to the ones based on Davies *et al* (1994). They use a social accounting matrix (SAM) for 1991, which is the year of the start of the structural adjustment policies in Zimbabwe. They assume a fixed exchange rate and an endogenously determined current account balance to reflect the economy of the base year for their SAM. They also include quantitative import restrictions caused by rationing rules. One of their policy experiments is a policy of trade liberalization. This involves the removal of non-tariff barriers, a substantial lowering of the tariff rate to a lower uniform rate, and removal of foreign exchange controls. This is an experiment to reflect the events of the initial period of structural adjustment. They find trade liberalization to have benefits, but the distribution of the benefits favours the richer groups. All these models use the representative household assumption and thus can only give results pertaining to average changes in income distribution after policy shocks.

4. The model

The model used for this paper is of the Exter+ group of models developed by the University of Laval team.[1] The model is calibrated to a 1995 SAM for Zimbabwe, the construction of which was based on the 1991 SAM (Chitiga *et al* 2000). The

[1] See Decaluwe et al (1999), Cockburn and Cloutier (2002) and Cockburn et al (2004) for a general presentation of the EXTER+ model.

model has 16 production sectors and activities, eight of which are agriculture-based, 4 are in manufacturing, 1 in the mining sector, and 3 are in services, including electricity (see Table 8). Production uses 4 factors, skilled labour, unskilled labour, capital, and land.

Table 8: Sectors included in the model

Name used in GAMS code and reporting	Meaning of the name
Agrain	Grain crops
Ahoticu	Horticulture crops
Ateacoffe	Tea and coffee
Acottobc	Cotton and tobacco
Aothcrop	Other crops
Alivestock	Livestock
Afishery	Fishery
Aforestry	Forestry
Amining	Mining
Afoodproc	Food processing
Atextile	Textile
Allothemauf	All other manufacturing
Aconstrn	Construction
Aewtdts	Water, electricity and other trade services
Apubsv	Public services
Aprivsv	All other private services

The total production, XS, is a nested production function, which on top is determined by a Leontief function between value-added and intermediates. The produced commodities are all sold through the market with flexible prices equilibrating the market. The factors of production are modelled in a CES function between capital and labour. In the agricultural sector, land is also included in the CES function between the composite factor (capital and labour) and land. Labour skills are modeled as a CES function between skilled and unskilled labour. The producer maximizes profits constrained by their production function, which takes into consideration the substitution possibilities between factors. Capital and land are fixed. Land is used only in agriculture.

For the factors, we use a long run closure where factors are freely mobile between sectors. We must thus interpret the results as between medium- to long-term as opposed to short-term. An analysis of poverty and inequality does justify such a longer-term perspective. The returns of these factors adjust for equilibrium. Labour is allowed to be freely mobile, its volume is given, and wages for each skill type adjust to clear the market.

The exchange rate is taken as the numeraire. All other prices are variable. The local price is made up of the producer price plus tax. The local import price is the

world price adjusted by the exchange rate and import taxes. The import price and the domestic price then form the composite price for the composite commodity. The experiment of halving import taxes will have a direct effect on the composite price.

The produced output is either sold in the domestic market or in the export market. We assume an imperfect transformation of the aggregate good into exports and domestic goods given by a Constant Elasticity of Transformation (CET) function. Producers seek to maximize the revenue from their sales given the constraint in the transformation. They are guided by relative prices of domestic to export commodities. The price received by producers is given in local currency after adjusting for any export taxes.

The domestic market consists of households, the government, investorsand intermediate inputs users. In the domestic market imports and domestic goods combine in a Constant Elasticity of Substitution (CES) aggregation to form a domestic composite demand commodity (Armington 1969). International supply of imports are assumed to be perfectly elastic at the given world prices. The price in the domestic economy includes any import taxes levied. The two functional specifications, the CET and the CES functions, allow for two-way trade as well as some degree of independence in domestic prices, which reflects the situation in many countries.

There are 14006 households included in the model. These households are derived from the 1995 Poverty Assessment Study Survey. The income and expenditure data for the survey was extracted and reconciled to the SAM sectors, institutions and factors of production. Households receive income from factors of production and from transfers from the government, firms, other households and/or the rest of the world. The income is spent on payment of taxes and transfers to other institutions, on savings, and then on consumption of commodities. Average propensity to save is assumed constant, and instead an auxiliary variable that allows savings to adjust to given investment levels is included. A linear expenditure system in which the marginal budget share is fixed and each commodity has a minimum subsistence level describes consumption demand. Firms receive income from capital and transfers from other institutions. They pay taxes, save, and transfer income to other institutions, but do not consume any goods and services.

The government receives taxes from institutions, commodities, and activities. These taxes are given as fixed *ad valorem* rates. Government expenditure is on commodities and on transfers to other institutions, with transfers to households being

fixed. The government expenditure is fixed and a compensatory tax by means of a direct tax is instituted. Total investment is fixed (in volume), so as to enable poverty comparisons before and after simulations, and the current account balance is fixed so that there is no 'free lunch' from international resources. The Walrasian square model is solved as a system of simultaneous non linear equations.

5. Simulation results

The simulation conducted is a halving of all import tariffs. The first effect of the simulation is that it will lower import prices. We expect that this will make imports more attractive than locally produced commodities. The lower prices of imports and the reduced local demand are likely to lead to reduced prices in most other sectors. As most prices also fall in the economy, we expect that exports become more attractive for those sectors that are export-oriented. The policy is thus likely to lead to a switch in the production structure of the economy. This would lead to a change in factor demand as well as in their remuneration. The export oriented sectors are likely to benefit, thus also benefiting those factors that are used intensively in their production. The reduced sectoral prices will benefit all consumers as it makes possible increased consumption. The income effects through factors of production as well as the price effects ultimately determine what happens to poverty in the economy. For poverty, it will be important to see what happens to the prices of food and the factors on which the poor rely on the most for income.

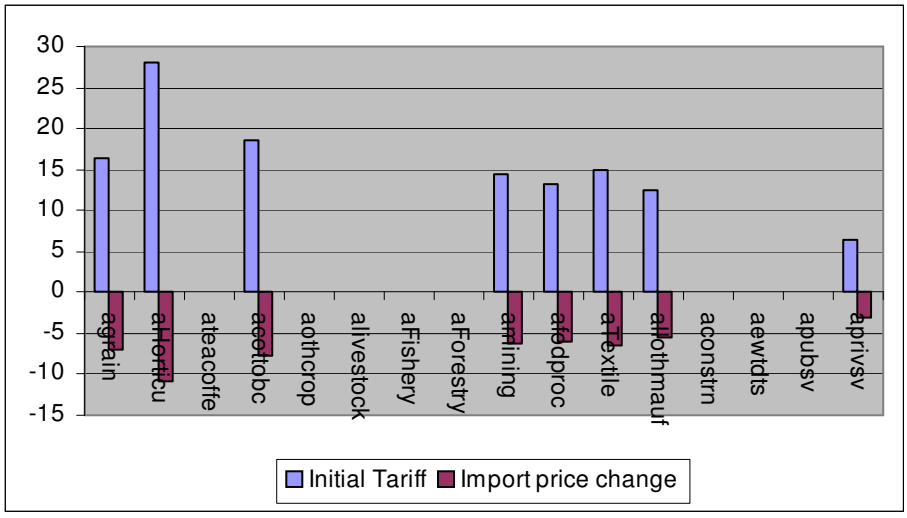
The sectoral and macro results of this experiment are presented first. The data in Table 9 show various base year statistics useful for understanding the results. We see, for example, that the sector 'all other manufacturing' has the largest share of imports while tobacco has the largest share of exports. Most agricultural goods are exported with almost all tobacco, tea and coffee being exported. We also see that the largest contribution to value added is from the tertiary sector, followed by the industrial sector, and then the primary sectors. Table 9 also shows various base case sectoral shares of imports, exports and total output. Figure 1 shows that three of the agricultural sectors were subjected to tariffs as well as all tradable manufacturing and mining, and private services. We therefore expect these sectors to be directly affected by the fall in the price of imports.

Table 9: Various initial sectoral shares

Sectors	Sectoral value added/ total value added	Sectoral imports/ total imports	Sectoral exports/ total exports	sectoral imports/ sectoral output	Sectoral exports/ sectoral production
Agrain	2.4	0.4	2.2	6.7	25.9
Ahorticu	0.6	0.1	0.2	2.7	7.0
Ateacoffe	0.5	0.0	1.8	0.0	78.2
Acottobc	7.3	0.2	27.9	6.0	90.9
Aothcrop	1.7	0.0	3.9	0.0	49.4
Alivestock	2.6	0.0	6.0	0.0	48.9
Afishery	0.1	0.0	0.0	0.0	0.0
Aforestry	0.3	0.0	0.0	0.0	0.0
Amining	4.5	1.3	12.5	9.0	50.3
Afodproc	7.8	6.7	2.5	17.1	7.4
Atextile	2.1	3.5	1.7	20.5	12.9
Allothmauf	17.2	82.3	18.7	53.3	22.2
Aconstrn	3.1	0.0	0.0	0.0	0.0
Aewtdts	19.4	0.0	0.0	0.0	0.0
Apubsv	14	0.0	0.0	0.0	0.0
Aprivsv	16.5	5.6	22.5	10.6	31.6
ALL*	100	100	100	34.6	34.2

* Average variation for volumes - Laspeyres index variation for prices

Figure 1: Initial tariff rates and the resulting fall in import prices (after the shock)



Source: Chitiga et al, 2000

The effect of the experiment is to reduce all import prices in local currency by an overall 5.5 percent. Figure 1 shows that the sectoral import price effect is related to the initial tariff as expected: The higher the initial tariff, the higher the price fall. Table 10 gives a summary of the main sectoral price effects of the simulation. The fall in import prices encourages consumption of imported substitutes at the expense of domestic goods. The main beneficiaries in increased imports are the sectors that

had previously high protection (such as horticulture) which now increased imports by 16.6 percent. Grain too also increases imports substantially by 9.6 percent as seen in Table 11. This induces a fall in most sectoral prices in the domestic sector. Output falls in most sectors.

To compensate for the increase in imports, exports have to increase and agriculture sectors benefit from this. At the same time, the result of reduced domestic prices against fixed export prices is that the export market becomes more competitive than the local market. All previously major exporters, such as tobacco and cotton, some manufacturing, mining and private services, increase their exports. As a result, value added increases primarily in the export-oriented sectors, not in the other non-benefiting sectors. However, grain agriculture, which is not mainly an export crop, does not benefit and its price increases slightly as resources move to the export agriculture sectors. This effect is likely to work against rural poor households who mainly consume this commodity.

The factors used intensively in the export oriented sectors benefit while those in the other sectors do not. In agriculture, unskilled labour benefits and its wage goes up by 4.6 percent. Land used in the agriculture sectors also sees an increase in its return. On the other hand, capital and skilled labour mainly used in the manufacturing sectors see a fall in their remuneration. As factors are allowed to be mobile, the capital and skilled labour remuneration also fall in the agricultural sectors by 3 percent and 5.4 percent, respectively.

Table 10: Simulation results (percent change from base in the variable)

Sectors	Domestic price	Producer price	Value added	Skilled wage rate	Unskilled wage rate	Rate of return on capital	Rate of return on land
Agrain	0.0	0.1	-1.6	-5.4	4.6	-3.0	1.3
AHorticu	-0.4	-0.4	-1.3	-5.4	4.6	-3.0	1.3
ateacoffe	-4.1	-1.2	2.8	-5.4	4.6	-3.0	1.3
Acottobc	-6.2	-1.6	5.5	-5.4	4.6	-3.0	1.3
aothcrop	-1.2	-0.6	0.0	-5.4	4.6	-3.0	1.3
alivestock	0.2	0.3	-1.9	-5.4	4.6	-3.0	0.0
aFishery	-2.1	-2.1	-0.9	-5.4	4.6	-3.0	0.0
aForestry	0.4	0.4	-0.8	-5.4	4.6	-3.0	0.0
Amining	-3.4	-2.0	0.8	-5.4	4.6	-3.0	0.0
afodproc	-1.7	-1.6	-1.5	-5.4	4.6	-3.0	0.0
Atextile	-1.0	-0.9	-2.7	-	4.6	-3.0	0.0
allothmauf	-2.9	-2.3	-1.3	-5.4	4.6	-3.0	0.0
aconstrn	-2.0	-2.0	-1.2	-5.4	4.6	-3.0	0.0
Aewtdts	-1.6	-1.6	-0.3	-5.4	4.6	-3.0	0.0
Apubsv	-3.2	-3.2	0.1	-5.4	4.6	-3.0	0.0
Aprivsv	-2.2	-1.6	0.7	-5.4	4.6	-3.0	0.0

Among the main income earning factors for the poor, labour is one of the most important. Thus it plays a crucial role in determining the fate of the poor after a simulation. The sectors that show an increase due to this experiment are mainly agriculture-based and services providers. These sectors use more unskilled workers than the sectors which have shrunk. The increase in demand in these sectors benefits the unskilled labourers and the households that rely on this labour type for income. For those households that receive the bulk of their income from skilled labour and from capital, the results suggest losses. Because of the assumed mobility of capital, the agriculture capital remuneration also falls as a result of the fall in the industrial sector. Therefore, the benefits of capital owners in the agriculture sector are dampened. In general, the policy leads to a reallocation of resources from other sectors to the export sectors, mainly agriculture and mining.

Table 11: Simulation results (percent changes relative to the base values)

Changes in factor demands, exports and domestic production							
Sectors	Skilled labour demand	Unskilled labour demand	Capital demand	Land demand	Imports	Exports	Domestic production
Agrain	-4.8	-3.3	1.7	-2.3	9.6	-1.4	-1.6
Ahorticu	-4.2	-2.7	1.1	-2.8	16.6	-0.6	-1.3
Ateacoffe	3.4	5.0	3.4	-0.6	-	3.8	2.8
Acottobc	6.0	7.7	6.0	1.9	0.8	6.3	5.5
Aothcrop	-1.8	-0.3	1.7	-2.2	-	0.7	0.0
Alivestock	-5.4	-3.8	1.5	-	-	-1.8	-1.9
Afishery	-2.0	-0.4	-0.6	-	-	-	-0.9
Aforestry	-4.3	-2.8	2.5	-	-	-	-0.8
Amining	1.5	3.2	0.5	-	3.2	3.1	0.8
Afodproc	-0.7	0.9	-1.7	-	4.8	0.7	-1.5
Atextile	-	-7.8	-1.3	-	5.7	-1.1	-2.7
Allothmauf	-1.3	0.3	-1.5	-	2.0	1.8	-1.3
Aconstrn	-1.3	0.2	-1.6	-	-	-	-1.2
Aewtdts	-0.7	0.9	-0.2	-	-	-	-0.3
Apubsv	0.4	2.1	-1.0	-	-	-	0.1
Aprivsv	0.0	1.6	1.0	-	1.1	2.6	0.7

The effects of the policy on household income distribution are varied and dependent on their sources of income and composition of expenditures. The richer households, those that derive most of their income from skilled labour and capital income, are the worst off after the policy. On the other hand, the poorer households, those reliant on unskilled incomes, benefit in increased income. As the prices have fallen for most commodities, all groups benefit in terms of expenditure. However, the fall in prices is different in sectors as seen in Table 10. The main beneficiaries are urban dwellers whose consumption basket contains mainly manufactured commodities, including manufactured food.

The methodology used of including all households from a survey has an advantage in that it allows us to perform detailed poverty analysis. The introduction of all survey households introduces heterogeneity and dispenses with the assumption of the representative household. Poverty indicators are computed as shown in Table 12 using the Foster, Greer and Thorbecke (FGT) measures to decompose poverty into the poverty headcount (population below the poverty line) poverty gap and the severity of poverty. The measures are computed using the software DAD by Duclos, Araar and Fortin (2004).

For the continuous case, the FGT index is defined as $P_\alpha = \int_0^z \frac{(z-y)^\alpha}{z} f(y)dy$, where z is the poverty line and α is the degree of aversion to poverty.

The degree of aversion to poverty is given as α= 0, measuring the poverty headcount index. This index shows us the number of households below the poverty line divided by the total households in the group. From this index we get a good picture of the prevalence of poverty, but not an indication of the degree of poverty. To learn about the depth of poverty, we use α=1. In this case we are able to tell the mean shortfall of the poor's income below the poverty line. To calculate an index for the severity of poverty, which considers the inequality among households that are poor, we use α= 2 in the formula. This index assigns a weight to each household that is equal to its shortfall from the poverty line, (see also Ravallion, 1994). Using the household size and the consumption results from the CGE model, these indices are then computed and reported in Table 12.

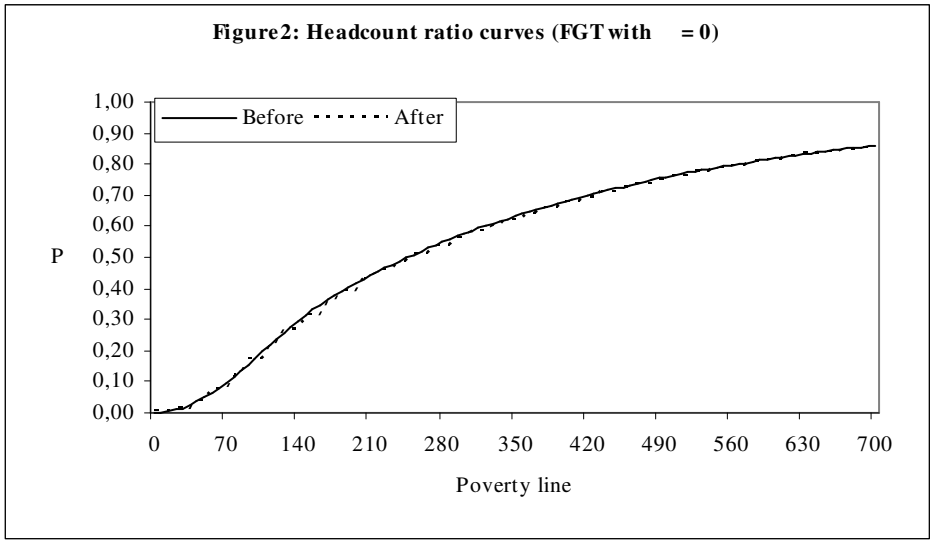
Table 12 Poverty results using Normalized FGT measures

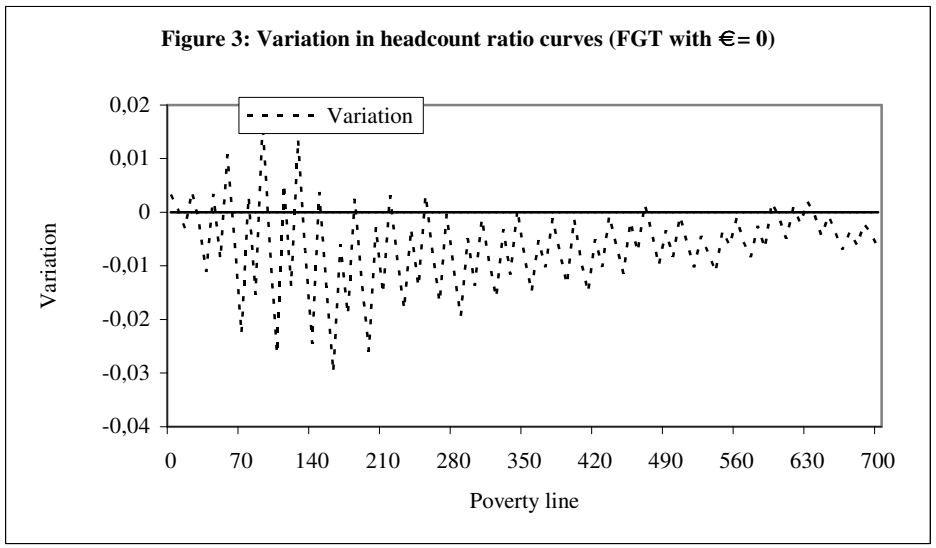
	Poverty head count (α=0)			Poverty gap (α=1)			Poverty severity (α=2)		
	ALL	Rural	Urban	ALL	Rural	Urban	ALL	Rural	Urban
Base	0.622	0.721	0.273	0.332	0.398	0.077	0.212	0.263	0.035
After simulation	0.612	0.716	0.268	0.327	0.393	0.075	0.207	0.258	0.034
% change	-1.665	-0.705	-1.925	-1.565	-1.155	-2.025	-2.500	-2.000	-3.030

The results in Table 12 show that the halving of tariffs leads to a fall in poverty, seen though the reduction in head count, poverty gap, and the severity of poverty between the base and after simulation FGT values. The reason for the reduction in poverty is the gain that is made in income by unskilled labour-dependent households who are generally the poorer of the households. In addition, the fall in

prices allows the poor to afford more commodities than before the simulation. When we compare the changes between rural and urban areas, the greater reduction in poverty occurs in the urban areas as opposed to rural areas. This is mainly because the fall in food prices is more for processed food than for grain. The urban dwellers rely exclusively on processed food while the rural poor also rely on grain as main food items. Further, most of the unskilled labour is in urban areas. Thus, the urban poor benefit more than the rural poor.

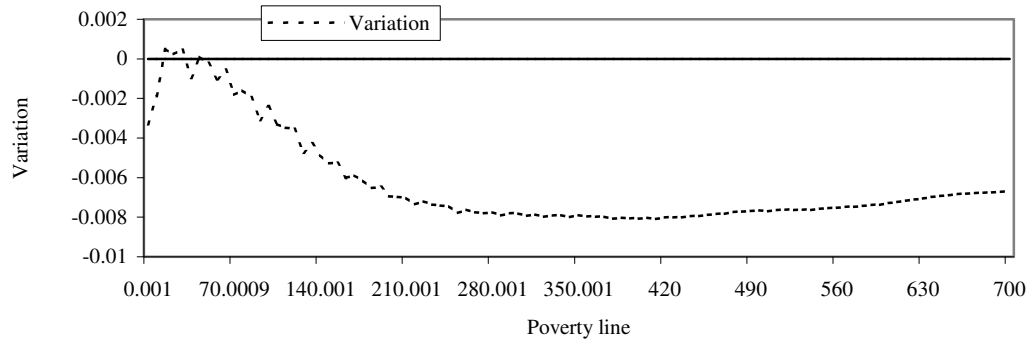
It is important to check the robustness of the FGT measures, as they are quite sensitive to the choice of the poverty line. In order to check if the results are maintained for a reasonable range of poverty lines, we plot the difference in the before-and-after simulation FGT measures for a wide range of poverty lines. Figure 2 shows that for the full range, for all the population, poverty is reduced after the simulation. These results are also confirmed for the case of α=1 and α=2.





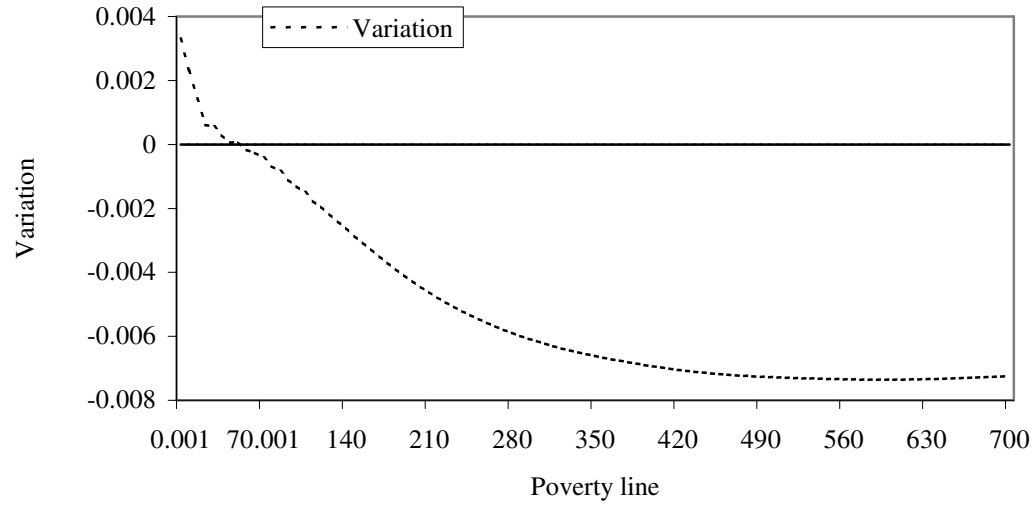
In Figure 3 we investigate whether the choice of the poverty line matters. The figure shows that although the choice of the poverty line makes a difference, the results already found are confirmed. The graph shows that although there is some slight increase in the number of those who are very poor, there is a definite reduction in the number of those that are poor to moderately poor, who are the majority of the two groups. The poverty gap variations reinforce these results as seen in Figure 4. There is only a slight increase in the poverty gap among the very poorest, but there is a fall in poverty among the rest of the poor groups.

Figure 4: Variation in poverty gap curves (FGT with α = 1)



In Figure 5 we see the variation in terms of poverty severity. The same results as above are supported. Apart from the small very poor group, poverty severity falls in the economy with trade liberalization.

Figure5 : Variation in poverty severity curves (FGT with α=2)



6. Summary and conclusion

A CGE microsimulation model has been used to analyse the effects of a 50 percent reduction in tariffs on all imports. The model used is based on the Exter+ model developed by the Laval University team. It contains sixteen sectors, four factors of production and fourteen thousand and six households from a 1995 household survey.

The simulation results show that the tariff cut favours export-oriented sectors, which are mainly agriculture and mining. These sectors use unskilled labour and are intensive in production, thus benefiting this factor in increased remuneration. The losers are non-export sectors, mainly manufacturing sectors. These sectors use skilled labour and capital, and rely intensively on production. As a result, these factors also see a reduction in their remuneration. The free mobility of factors allowed for means that capital in agriculture also falls. The return to land increases as export agriculture expands. General consumer prices fall and consumption expenditure also falls in the economy.

The increase in incomes of the unskilled people translates to an increase in incomes for the poor. The fall in prices also benefits all consumers. These factors lead to a fall in poverty in the whole economy. Urban dwellers benefit more as the price of processed foods falls as compared to grain prices in the rural areas. These are the main consumption items of the poor in urban and rural areas respectively. The results inform policy in that the popular condemnation of trade liberalisation may not always be true. The differences in results between the rural and urban households can assist the government to prepare for policies to cushion those that are less favoured by the policy.

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