THE IMPACT OF THE WTO AGRICULTURAL NEGOTIATING MODALITIES ON SOUTHERN AFRICAN DEVELOPMENT COMMUNITY COUNTRIES

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Abstract

This paper assesses the likely impact on the agricultural sector of the Southern African Development Community (SADC) countries of the Harbinson modalities, along with the EU and US proposals as alternative scenarios in the context of the ongoing negotiations of the WTO Agreement on Agriculture. Impacts are assessed on a number of indicators, notably government revenue, producer, consumer and total welfare measures and trade flow. Reflecting country- and commodity-specific factors, the three modalities have different impacts on the indicators. The SADC as a whole is found to lose in terms of total welfare under all three proposals. But while this loss under the Harbinson and EU proposals is due to declines in consumer surpluses and government revenues, reduced producer surplus and government revenue explain the loss in total welfare under the US proposal. Thus, the ranking of the modalities differs according to the impact indicator used, revealing important trade-offs in the choice of the modalities. An issue raised is the value of consumer gains relative to producer gains for low-income economies highly dependent on agriculture because for them effective demand for consumption itself depends on incomes generated from increased agricultural activities, which in turn requires sustained gains in producer surpluses. The paper presents a range of results and discusses the trade-offs, with the hope that SADC trade negotiators and policy makers find these to be useful as they negotiate for the final form of the modalities.

1. INTRODUCTION

The first half of 2003 was a crucial period for the ongoing agricultural negotiations in the WTO. The Chairman of the WTO Committee on Agriculture (CoA) released a draft negotiating modalities in February 2003 and a revised version in March 2003. No agreement was reached on the modalities by then and in the subsequent months, as well as at the Cancun

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WTO Ministerial in September 2003. Some negotiators complained that the modalities on the table were too "ambitious" while others said that the reform proposals were not ambitious enough. In view of this, there is a heightened interest among all those involved in the negotiations, directly or indirectly, on likely impacts of the modalities. Of particular concern is the impact on developing countries, as the Doha Round is also called a "development" round. One way to make progress in the negotiations is to understand the implications of the proposals, in both quantitative and qualitative terms.

To this end, the main objective of this paper is to quantify the likely impact of the negotiating modalities on the agricultural sector of SADC countries, focusing on the Harbinson revised draft modalities of March 2003, on the EU and US proposals as alternative scenarios. This work is also a contribution to the new and growing literature on model-based assessments of the impact of the Doha Development Round of reform proposals. These other works include Freeman *et al* (2000), Diao *et al* (2001), FAO (2002), FAPRI (2002), OECD (2002), Vanzetti and Sharma (2002), Vanzetti and Peters (2003) and Poonyth and Sharma (2003).

The paper consists of six sections. Following this introduction, Section II presents, very briefly, an overview of the SADC countries followed by their main trade concerns. Section III introduces the ATPSM model, including sources of data and parameters, and coverage of countries and commodities. Next, Section IV summarizes negotiating modalities and presents the three scenarios simulated. Section V presents simulation results while section VI concludes.

2. OVERVIEW OF THE SADC ECONOMY AND CONCERNS ON AGRICULTURAL TRADE NEGOTIATIONS

2.1 Overview of the economy

SADC was formed in 1992 and currently consists of 14 member countries, which together comprise a total population of approximately 200 million people. The total SADC GDP was around US$182 billion in 2000, with average GDP *per capita* of US$1,761 (World Bank, 2002). There is a considerable heterogeneity among the SADC members. Thus, for example, seven of them are least-developed countries or LDC (Angola, the Democratic Republic of Congo, Lesotho, Malawi, Mozambique, Tanzania and Zambia). The rest are

developing countries, with South Africa considered to be a borderline case.[3] South Africa is also the largest economy and has large manufacturing sectors along with Zambia and Zimbabwe. Most SADC countries are also food deficit. Three countries (the Democratic Republic of Congo, South Africa and Tanzania) account for almost two thirds of the total population (64%) while the six smallest members (Seychelles, Swaziland, Mauritius, Botswana, Namibia and Lesotho) make only 4%.

Agriculture is the most important sector for many SADC countries from various standpoints. Although the sector's contribution to the GDP varies widely (from 3% for South Africa to 58% for Tanzania), some other contributions are significant, e.g. as a source of foreign exchange, government revenue, employment (highest, with the exception for South Africa and Botswana). Thus, in the context of discussions on the impact of trade liberalization, it is important to keep in mind these features of the agricultural sector. In particular, the sector is the main source of livelihood for the majority of the population, especially in rural areas. Also important to note is the predominance of small farmers who are relatively vulnerable to external shocks. Agriculture in the region is also highly dualistic with large-scale commercial farms operating side by side with small, family farms, a structure that matters in discussing the impact of trade liberalization.

2.2 Issues at stake in trade negotiations

There are some general issues or concerns that apply to all SADC members, as with all developing countries, while others are specific to particular countries or country groups. One general concern is that while these countries themselves grant little or none of the trade-distorting domestic subsidies, they feel that they are affected negatively by subsidies granted by developed countries.[4] Thus, on the whole, the position is that there are significant gains to be made from reductions in trade-distorting domestic subsidies in the developed countries. This also follows from the fact that the SADC countries are considered to be natural low-cost producers of farm products. Similarly, a much stronger arguments are made against export subsidies.

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[3] *Note that there is no "official" definition of a developing country in the UN or other system. In the ongoing WTO negotiations, South Africa is seen as a developed country. FAOSTAT classifies South Africa as a developed country, while for the World Bank it is a lower middle-income country.*

[4] *Some WTO Members, in their expressed positions, feel differently, i.e. they feel that reduced subsidies by OECD countries raise world food prices and increase import bills. This is covered later.*

Market access, the third pillar of the Uruguay Round Agreement on Agriculture (UR AoA), perhaps attracts the most attention of the developing countries, and indeed rightly so, as improved market access provides direct, tangible benefits. In this area, the three main difficulties discussed are tariff peaks and escalation in developed country markets (OECD, 1997; OECD, 2001; Lindland, 1997), and high tariffs in many other developing country markets. The key negotiating positions call for sharply reducing the tariff peaks and tariff escalation, a legacy of the tariff cutting formula of the UR.[5] Although tariffs on most tropical products are relatively low, it is often forgotten that the developing countries also produce and export temperate-zone products in significant amounts.

In addition to these common interests, there are also some significant divergences of concerns and positions among the SADC members, which have led them to join different groupings and alliances in the WTO negotiations. Thus, for example, South Africa has supported the freer-trade position of the Cairns Group in several areas, while Mauritius is an active party to the so-called grouping of "friends of multifunctionality", at the same time speaking on the cause of Small Island Developing States or SIDS. Some others belong to the group of Net Food-importing Developing Countries or NFIDC (Mauritius, Botswana, Namibia and Seychelles) that are concerned with the possibility of negative effects in terms of higher food import bill following trade liberalization. Most SADC members also receive preferential access for their exports, (e.g. under the Cotonou Agreement) and are worried that further reduction of the Most Favoured Nation (m.f.n.) tariffs would reduce this advantage. Finally, many countries, notably the LDC, are worried about lower tariff revenues once their own tariffs are reduced.[6]

In summary, these are some of concerns that are widely shared by all or most SADC members, and others that apply to particular groupings and alliances. The AoA package consists of many trade policy instruments, which at times tend to work in different directions. For example, reduced tariffs should expand exports on the positive side, but these also could raise food import bills on the one hand and reduce export earnings, as preferential tariff margins shrink, on the other. Though models are often criticized for not being

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[5] See Table III.2 in WTO (1999) for reduction rates. Some of the reduction rates could be misleading. For example, tariffs on tropical products were reduced the most but from a very low base (e.g. 5–10%). Its effect on trade would be much less than, say, 26% reduction of a tariff from a very high base.

[6] Yet another important country grouping is the Southern Africa Custom Union or SACU formed by Botswana, Namibia, Lesotho, Swaziland and South Africa, and has common external tariffs.

realistic, there is no other way to quantify the effects of some the many different reform proposals within a common framework.

3. THE ATPSM MODEL

Developed jointly by UNCTAD and FAO, the Agricultural Trade Policy Simulation Model (ATPSM) is a global trade model designed primarily for simulating agricultural trade policies in the context of the WTO AoA. The advantage of this model over most other models is that it covers virtually all countries, including LDC. It is also flexible in that a user can define his/her own groups of countries (e.g. SADC) and commodities (e.g. cereals).

3.1 Model characteristics

The ATPSM is a comparative-static, synthetic, multi-commodity, multi-region, partial-equilibrium world trade model for agricultural products. It accounts for the distribution of quota rents, solves for equilibrium world market prices and their impact on domestic production and trade flows. It covers 161 countries (160 individual countries and one EU-15) which can be grouped as desired for the purpose of measuring impacts. For example, in an earlier work (Poonyth & Sharma 2003), countries were grouped into three categories: 42 LDC represented in the model; rest of the 99 developing countries; and 20 developed countries. In this paper, results are shown separately for all SADC countries as well as for SADC total. The model is also fairly comprehensive in its commodity coverage, a total of 36 commodities.[7] All policy instruments are defined in *ad-valorem* equivalent terms. Thus, specific tariffs are converted to *ad valorem* rates and both domestic and export subsidies are similarly expressed in their respective *ad-valorem* equivalents.

Production (domestic supply) and demand depend linearly on domestic prices. Imports clear the market. The world prices are linked to domestic prices by price transmission equations; transmissions are assumed to be complete. Both demand and supply specifications account for cross-effects. Demand function for country *r* and commodity *i* is expressed as:

$$\hat{D}_{i,r} = \eta_{i,j,r}\left[\hat{P}_{wt} + \left(1+\hat{t}_{ci,r}\right)\right] + \sum_{\substack{j=1 \\ j\neq i}}^{J} \eta_{i,j,r}\left[\hat{P}_{wj} + \left(1+\hat{t}_{cj,r}\right)\right] \quad (1)$$

[7] *Despite the fact that the model covers 36 commodities, it is possible that some important commodities for some countries are excluded, for example wines for South Africa. See Table 1 for the commodities covered.*

Domestic supply for country r and commodity i is similarly expressed as

$$\hat{S}_{i,r} = \varepsilon_{i,j,r}\left[\hat{P}_{wt} + \left(1+\hat{t}_{pi,r}\right)\right] + \sum_{\substack{j=1 \\ j\neq i}}^{J} \varepsilon_{i,j,r}\left[\hat{P}_{wj} + \left(1+\hat{t}_{pj,r}\right)\right] \quad (2)$$

The import and export functions are expressed as

$$\Delta M_{i,r} = D_{i,r}\hat{D}_{i,r} - S_{i,r}\hat{S}_{i,r} + \Delta X_i \quad (3)$$

$$\Delta X_{i,r} = \gamma_{i,r}\Delta S_{i,r} \quad (4)$$

Where:

D, S, X, and *M* denote demand, supply, exports and imports, respectively: ^ denotes a relative change and Δ absolute changes, P_w is world price, t_c is domestic consumption tariff and t_p is domestic production tariff, ε is supply elasticity, η is demand elasticity, γ is the ratio of export to production and *i, j* are commodities indexes while *r* is a country index. Domestic price is a function of the world market price and policy variables, e.g., support measures, tariffs, subsidies and quotas.

Trade revenue and welfare effects are computed based on volume responses (i.e. ΔX, ΔM, ΔS and ΔP) and price changes. The trade revenue effect of a policy change is derived for each country and commodity as follows:

$$\Delta R = \left(P_w + \Delta P_w\right)\left[\left(X + \Delta X\right) - \left(M + \Delta M\right)\right] - P_w\left(\left(X - M\right)\right) \quad (5)$$

Total welfare TS is the sum of producer surplus (PS), consumer surplus (CS) and net government revenue (NGR), i.e. $\Delta TS = \Delta PS + \Delta CS + \Delta NGR$. The change in CS also takes into account the change in the quota-rent received. Quota rents, *U*, are computed for each country and commodity as the product of import volume and world price, times the difference in in-quota and out-quota tariffs, i.e.,

$$U = QP_w(t_{m2} - t_{m1}) \quad (6)$$

Where:

Q denotes the import quota, P_w the world price, t_{m1} and t_{m2} are in-quota and out-quota tariffs (or applied rates if lower). Rent accrues only if the importing country is applying the out-quota tariff. The capture rate, *c*, is the proportion of the rent captured by exporting producers as opposed to the proportion, 1-*c*, going to the importing country. The change in the quota rent received, $c\Delta U$, is

added to the PS. For each country and commodity, changes in the PS and CS are defined as:

$$\Delta PS = \Delta P_p \left[S + 0.5(\Delta S_d)\right] + c\Delta U \quad (7)$$

$$\Delta CS = -\Delta P_c \left[D + 0.5(\Delta D_d)\right] \quad (8)$$

Change in net government revenue (ΔNGR) includes a change in tariff revenue, change in export subsidy expenditure, change in domestic support expenditure and change in quota rent not received by exporters. Formally, $\Delta NGR = \Delta TR - \Delta ES - \Delta DS + (1\text{-}c)\Delta U$, where TR is tariff revenue, ES is export subsidy expenditure, DS is domestic support expenditure and (1-c)ΔU is change in quota rent forgone.

The model generates outputs in terms of changes in both quantities and percentage changes from the base period for the following variables:

- Quantities - production, consumption, imports and exports
- Trade values - export, import, and net trade balance
- Welfare measures – Producer surplus, Consumer Surplus, Net government revenue and Total welfare
- Prices - world market prices, and wholesale (consumer) and farm prices

3.2 Data source

The model is based on data from various sources. Production, consumption, exports and imports (in metric tons) are from FAOSTAT[8]. All prices are expressed in US dollars. The base period for the model is 1998-2000 for production, imports, exports etc. while tariffs and other policy parameters are based on the final year of implementation of the UR AoA (2000 for developed and 2004 for developing countries). In-quota tariffs, out-quota tariffs and global quotas are from the AMAD[9] database and were aggregated to the ATPSM commodity levels. UNCTAD COMTRADE[10] is the main source for bilateral trade flows while applied tariffs are from the TRAINS[11] database. Model parameters are assembled from several sources, but mainly from the FAO World Food Model.

[8] *FAOSTAT: FAO Data Base.*
[9] *AMAD: Agricultural Market Access, http://www.amad.org/.*
[10] *COMTRADE: http://unstats.un.org/.*
[11] *TRAINS: http://r0.unctad.org/.*

3.3 Model limitations

All commodities are assumed to be tradable, i.e., there is no independent behaviour for domestic prices, and homogeneous, i.e. there is perfect substitution among goods produced in different countries. There are no other domestic policies besides Amber Box subsidies. The model does not account for the possibility of countries exerting market power, though it is well known that international trade of several agricultural products is often concentrated in a small number of companies. Being a comparative static model, other non-price factors in both supply and demand sides are not captured. Finally, there is no income variable in the model.

An important assumption is that within-quota tariffs are not relevant even where quotas are unfilled.[12] This means that the out-quota tariff or the applied rate, whichever is operative in a particular situation, is the key determinant of domestic prices. Where in-quota rates are the relevant determinants of domestic prices, this assumption would overstate the benefits of liberalization. The ATPSM does account for preferential market access (e.g. EU-ACP and EBA) with the exception of the AGOA. The model however does not account for trade diversion in the context of regional or preferential trade arrangements. Bilateral quotas are allocated by a complex procedure based on each country's import and export shares in the base period. Quota rents are distributed in proportion to trade flows.

4. NEGOTIATING MODALITIES AND SIMULATION SCENARIOS

March 2003 will remain an important date in the history of the ongoing agricultural negotiations. In that month, the Chairman of the WTO CoA, Mr Stuart Harbinson, released a draft negotiating modalities based on some modalities as well as many proposals by WTO members. But no agreement could be reached on the modalities by then, as well as in subsequent months, nor at the WTO Cancun Ministerial conference where revised versions were presented. The negotiations continue.

As said at the beginning, although the main interest is with the Harbinson modalities, this paper also discusses simulated results of the EU and US modalities as alternative scenarios in view of the following reasons: i) these being among the few complete modalities; ii) the weights these two WTO Members carry in these negotiations; and iii) the fact that these represent to a

[12] *The main reason for this assumption is that based on the recent implementation experience of the TRQs, many TRQs were found to be under-filled even when in-quota rates were lowered, suggesting that it was not in-quota rates but other factors that kept the TQRs under-filled.*

large extent "modest" and "deeper" reforms, relative to the Harbinson text. The final modalities that would be agreed to one day could change, but most probably by not much.

For space reason, the modalities are not described here in detail; this is also not necessary because these are available in public domain in the WTO and other web sites. Rather, in what follows, the three scenarios are presented briefly. An important point to note here is that not all parameters or proposals in the respective modalities can be quantitatively analysed with any model, including the ATPSM. The three scenarios simulated are summarized in Box 1. The parameters listed in the box, therefore, represent only those elements that are amenable for quantitative analysis with the ATPSM. Several other elements of the reform package could be important but can not be modelled, e.g. rules on TRQ administration, state trading enterprises, non-direct forms of export subsidies, Green Box Measures, "non-trade" concerns, and so on. Nevertheless, the scenarios simulated cover in general most of the important elements of the three proposals regarding the three pillars of trade liberalisation.

Box 1: Modalities parameters used in simulations

Harbinson Modalities	
Tariff:	**Developed countries - 3 band reduction formula**
	tariff > 90 reduction of 60% with a minimum 45%
	15 < tariff ≤ 90 reduction of 50% with a minimum 35%
	tariff <15 reduction of 40% with a minimum 25%
	Developing countries - 4 band reduction formula
	tariff >120 reduction of 40% with a minimum 30%
	60 < tariff ≤ 120 reduction of 35% with a minimum 25%
	20 < tariff ≤ 60 reduction of 30% with a minimum 20%
	tariff <20 reduction of 25% with a minimum 15%
TRQ:	No change in in-quota rates; expand TRQ up to 10% of current domestic consumption for developed countries and 6.6% for developing countries; LDC are exempted.
Domestic support:	60% cut in Amber Box for developed countries; 40% for developing countries; no reduction for LDC.
Export subsidies:	Eliminate
US Proposal	
Tariff:	Swiss formula with parameter 25 on applied tariffs
TRQ:	No cuts in in-quota rates, 20% expansion of TRQ volumes
Domestic support:	Reduce to 5% of the value of agricultural production
Export subsidies:	Eliminate
EU Proposal	
Tariff:	15% minimum cut, 36% reduction on average
TRQ:	No cuts in in-quota rates; no expansion of TRQ volumes
LDC:	Duty and quota free access for LDC
Domestic support:	55% cut in Amber Box (2/3rd of this level for developing countries; no cut for LDC)
Export subsidies:	45% reduction (2/3rd for developing countries and LDC)

4.1 Market access

The key US proposal on tariff was the use of a harmonization formula that would reduce higher tariffs more deeply than lower tariffs. For this, the Swiss formula was proposed, with a parameter of 25[13]. This means that all tariffs are reduced to below 25%. The other key proposal was to apply the formula to applied tariffs. The EU proposal was for the continuation of the UR approach, i.e. 36% average reduction of bound rates with a minimum 15% cut for each tariff line. The Harbinson draft proposed different reduction rates for developed and developing countries depending on the level of the initial tariff (see Box 1). This proposal also leads to harmonization of tariffs to some extent because higher rates are reduced proportionately more than lower rates. It also has the average-minimum feature of the EU proposal. The US proposal does not say anything about special and differential treatment for developing countries. It is important to note that the EU scenario includes its duty-free and quota-free preferential access package for LDC, called "Everything but Arms".

As regards TRQs, the Harbinson proposal called for expanding volumes up to 10% of current domestic consumption (6.6% for developing countries). Some proposals have been made for in-quota tariff also. The US proposed elimination of the in-quota rate and a 20% expansion of the TRQ volumes. The EU modalities did not propose any increase in the TRQ volume.

4.2 Domestic support

The US proposal is for the reduction of total non-exempt domestic support (which includes in the US definition both Amber and Blue Boxes) to at most 5% of the average value of agricultural production in the base period 1996-98, to be implemented over a five year period. It further proposed for maintaining the current *de minimis* threshold (5% of the value of agricultural production). The EU proposed maintaining all the three Boxes (amber, blue and green) and called for reducing the Amber Box or Total AMS by 55%, and eliminating the *de minimis* provision for developed countries. Harbinson's proposal is for reducing the AMS by 60% over 5 years for developed countries and by 40% over ten years for developing countries. It also proposed reducing *de minimis* by 50% over 5 years for developed countries but maintaining it for developing countries.

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[13] *The Swiss formula with parameter 25 is:* $T_{new} = (25*T_{old})/(25+T_{old})$, *where T is tariff rate.*

4.3 Export subsidies

The US proposal is for complete elimination of export subsidies over a five year period. Export taxes are to be phased out in developed countries and if export tax is used in a developing country, it should be applied uniformly across all agricultural commodities. The EU proposed a "substantial" but unspecified cut in the volume of subsidized exports and 45% reduction in subsidy outlays. Harbinson's proposal is to reduce export subsidies using the following formulae:

$$\text{Budgetary outlay, } B_j = B_{j-1} - C^*B_{j-1}$$

$$\text{Volumes subsidized, } Q_j = Q_{j-1} - C^*Q_{j-1,}$$

where j is the implementation year. The value of the C is 0.3 for developed countries (to be reduced over a five year period and then eliminated) and 0.25 for developing countries (reduced over 10 years and eliminated in 11^{th}).

The ATPSM is designed for simulating the effects of the Swiss formula, and so this is not an issue. There are, however, some areas where incorporating the scenario parameters is not as simple. For example, simulating tariff reductions in the Harbinson proposal requires first the grouping of commodities into the three and four tariff bands. Even then, it is not possible to implement the "minimum-average" reduction rule, because it cannot be known in advance how individual countries will select tariff lines for the minimum reduction. This limitation also applies to the EU proposal. In the case of export subsidies, the EU proposal merely says a "substantial" reduction in export volumes without specifying the exact number. In the simulation, the same 45% as for budgetary outlay is assumed for quantities also. Finally, additional work was needed to incorporate the duty-free and quota-free market access for LDC in the EU scenario.

5. SIMULATION RESULTS

This section reports assessments of the likely impacts of the three scenarios. Most of the main results are expressed as volume and percentage changes from the base levels. Before reviewing the results, it would be useful to note the commonly stated sceptism about model-based results. The sceptics argue that global trade models often give different assessments, and messages, at times widely different for even seemingly similar reform. This is true to some extent, but not entirely so. For example, most studies of this type point to the same direction for changes in world market prices, at times even to similar magnitudes, e.g. the impact on temperate-zone food products versus those on

tropical products. But differences do also occur. There are several reasons for this, which are worth noting in reviewing the results (Sharma *et al*, 1996). For example, models differ with respect to structure, specification and parameters. Models also differ greatly in terms of aggregation, both of countries and commodities, which tend to cancel out some effects that would be evident in more disaggregated models. The elements of a reform package simulated could also be different, and even weights attached to particular instruments could vary. Nevertheless, there is no alternative to model-based assessments.

5.1 Impact on world market prices

In global trade models, it is the change in world market prices that drives other results, and so this would have to be the starting point. Table 1 shows the impact on world market prices. There are three main messages here. First, on the whole, the impact is large on most temperate-zone commodities such as beef, sheep meat, dairy products, sugar, wheat and vegetable oils, in all three scenarios. This was expected, as these are the commodities receiving high levels of protection and support. Other studies do also point to similar impacts. For example, the USDA study (Diao *et al*, 2001) showed large increases in world prices under full policy reform (18% for wheat, 15% for other grains, 22% for butter and 12% for beef). The impact was small (e.g. 3.4 and 1.4% for wheat and other grains) under slight reductions in domestic support and tariffs. The results of Diao *et al*'s full policy reform scenario are closer to those under the US scenario in this paper. Similar effects were found in a recent FAPRI study analysing the impact of the Doha Round reforms (FAPRI 2002). By contrast, the impact on tropical product prices was modest, also expected.

Second, looking at the results across the three scenarios, the impact is most pronounced under the US scenario, also expected in view of the sharp reductions in (applied) tariffs in particular but also heavy reduction of domestic support and elimination of exports subsidies. These price rises are on average twice the levels under the EU proposal, while those under the Harbinson proposal lie in between the two scenarios. There are some cases where this pattern does not hold strictly.

Third, it is already possible to guess, based on the price changes, the direction of the impact on some of the national level indicators, like trade and welfare. Thus, the change in the terms of trade would be unfavourable for many developing countries that import basic foods and export tropical products.

Evaluating the impact of the three main elements – tariff reductions and domestic and export subsidy cuts – separately, it was found that though all

the elements of the reform package contribute to the price change, but tariffs play a dominant role, especially the sharp reduction for developing countries under the US scenario.

5.2 Impact on total welfare

As explained in Section 3, total welfare or surplus (TS) in the ATPSM is the sum of producer and consumer surpluses (PS and CS respectively) and change net government revenue (NGR). This sub-section summarizes the overall impact of trade liberalization on SADC countries in terms of the TS; the impact on the three components of the TS is discussed separately in some detail below. Table 2 shows the results for TS.

Table 1: Impact on world market prices (%change from base levels)

Commodities	Harbinson Proposal	US Proposal	EU Proposal
Bovine meat	6	7.8	3.2
Sheep meat	6	9.6	4.2
Pig meat	2.6	3.4	1.8
Poultry	2.5	5.8	1.9
Milk, fresh	6	10.3	4.4
Milk, conc.	13.7	18.1	7
Butter	20.2	24.3	10.6
Cheese	13	16	7.3
Wheat	10.8	11.9	5.4
Rice	1.6	2.5	1
Barley	1.5	2.8	0.8
Maize	2.7	4.4	1.6
Sorghum	0.6	0.8	0.3
Pulses	2.7	3.2	0.7
Tomatoes	2.1	3.1	1.6
Roots & tubers	0.9	3.5	1
Apples	2.3	3.6	1.9
Citrus fruits	1.1	1.5	0.8
Bananas	0.9	1.2	0.7
Other tropical fruits	2.3	2.5	1.1
Sugar	4.7	9.2	3.3
Coffee green	0.8	1.2	0.5
Coffee roasted	0.3	0.5	0.2
Coffee extracts	3.7	6.8	0.3
Cocoa beans	0.2	0.3	0.1
Cocoa powder	1	1.3	0.7
Cocoa butter	0.7	0.5	0.7
Chocolate	4.7	6.1	3.4
Oilseeds	1	1.2	0.8
Cotton lint	1.4	1.5	0.8
Vegetable oils	3.4	7.2	1.3

Source: Simulation results

The outcomes under the Harbinson, EU and US scenarios are similar in terms of the direction of change (positive or negative) but the magnitudes differ significantly. For the former two scenarios, all SADC countries are seen losing in TS term with the exception of Malawi, Swaziland, and Zambia. The loss in TS is the result of the sum of the losses in CS and government revenues exceeding the PS gain.

SADC as a group incurred TS losses under all three scenarios, the most ($180 million) under the Harbinson proposal. About 50% of the total loss was accounted for by just two countries, South Africa and Mauritius. All three NFIDC (Mauritius, Botswana and Namibia) also incurred welfare losses under all three scenarios. Finally, SACU as a group incurred TS losses under the Harbinson proposal while recording small positive TS gains under the other two scenarios.

One interesting result is that all LDC (Lesotho, Malawi, Mozambique and Zambia) show TS gains under the US proposal. This was so because even the LDC is required to cut tariffs under this proposal, which results into significant CS gains. As lower tariffs offset more than the higher world prices. By contrast, the CS was negative under Harbinson proposal, as tariff cuts did not offset the effect of higher world prices.

Table 2: Impact on total welfare for SADC countries (millions US$)[1]

Countries	Harbinson Proposal	US Proposal	EU Proposal
Botswana	-18	-32	-14
Lesotho	-10	10	-7
Malawi	2	14	19
Mauritius	-66	-94	-50
Mozambique	-11	3	-6
Namibia	-11	-21	-10
South Africa	-39	19	-25
Swaziland	5	15	5
Tanzania	-10	-1	8
Zambia	#	4	2
Zimbabwe	-22	-20	-18
SADC	**-180**	**-103**	**-96**

Note: [1]Results are not shown for Congo DR, Seychelles and Angola.
Source: Simulation results. A # means less than one million.

Overall, six countries had welfare gains under the US proposal, but only four and three under the EU and Harbinson proposals respectively. In other words, the Harbinson proposal resulted into the highest number of losers (8 countries out of 11), although the magnitude of the loss itself is small as PS and CS changes typically cancel out.

5.3 Consumer and producer surpluses

These are useful welfare indicators on their own; they are also interesting from the standpoint of the political economy. Governments often attach different importance to these gains. In general, PS gains seem to be preferred in practice by trade negotiators and agricultural officials alike. Although agriculture is at times found to be taxed, many developing country policy makers would like to support the sector in view of its importance for economic growth and poverty reduction.

Table 3 shows estimated PS and CS values for the three scenarios. As a group, SADC loses in CS term in the case of Harbinson and EU proposals, with the loss much larger than the PS gains. The losses in CS and PS differ across countries and scenarios. Under the Harbinson proposal, only Botswana and Swaziland had CS gains – as their high tariffs get reduced significantly which offset the effect of higher world prices. By contrast, the LDC loses on account of the CS for the same reason as said earlier, i.e., as they did not reduce tariffs, domestic prices rose with world prices. Also, countries that benefited significantly in the base period from preferential market access experienced PS losses as support and protection in developed country markets fell. This effect is much pronounced under the US proposal that called for sharp cuts in domestic subsidies. The results for Botswana and Mauritius show this effect more clearly.

Table 3: Changes in consumer and producer surpluses (million US$)

Countries	Harbinson Proposal		US Proposal		EU Proposal	
	Consumer surplus	Producer surplus	Consumer surplus	Producer surplus	Consumer surplus	Producer surplus
Botswana	13	-18	42	-34	12	-15
Lesotho	-19	12	40	-19	-14	8
Malawi	-24	26	-47	62	-19	38
Mauritius	-17	-49	8	-89	-6	-49
Mozambique	-36	27	121	-119	-31	26
Namibia	-3	-6	-1	-12	-2	-7
South Africa	-202	137	16	3	-224	209
Swaziland	8	4	32	5	7	3
Tanzania	-99	91	-11	21	-72	82
Zambia	-20	20	12	-8	-15	17
Zimbabwe	-40	23	-15	29	-31	16
SADC	-439	267	197	-161	-395	328

Source: Simulation results.

There is an outlier to this pattern – many more countries seem to lose in PS term in the US scenario, and significantly so. This is due to the elimination of

preferential trade agreement. But countries which do not have a higher volume of trade under preferential agreement showed a gain in PS, such as Tanzania and Malawi as producers received higher prices for their products. The reason for the PS loss for others, as noted before, is that in the US scenario the LDC also reduce tariffs and so farm prices in the domestic market decline. By contrast, in the other two scenarios, although tariffs decline, these were not deep enough to lower domestic prices, given the increased world prices. Thus, overall, if SADC countries as a group were to place greater importance on the PS gain, the US proposal appears less attractive followed by the Harbinson package.

In summary, two points may be noted. First, the results show different gains and loses from the three proposals, at times markedly so, and mostly in the opposite direction. This is useful information for trade negotiators and policy makers, as they often attach different weights to the two sources of welfare gains. Second, the results raise the issue of compensation, which is well known in welfare economics but not as intuitive in practice. There are two dimensions to it. One is compensating winners and losers within a country (e.g. between the PS and CS gainers and losers). Given the results, it is clear that governments need to take into account the issue of social costs to particular population groups during the reform process. The other is international dimension, i.e., those countries that gain will have to compensate those who lose. This could be an area worth pursuing within the WTO framework.

5.4 Government revenue

In the ATPSM, changes in government revenues result from changes in tariff revenues, outlays on domestic and export subsidies and the part of the quota rent not received by exporters. In the SADC, only South Africa has subsidy reduction commitments and so changes in tariff revenues account for most changes in government revenues. Reduced tariffs typically lower border revenues but could also raise them if imports expand. The simulation results show reduced government revenues in most cases under all three scenarios (Table 4). The reduction is most marked under the US scenario as tariff rates fall to very low levels. At the same time, imports decline due to higher world market prices. Under the Harrbinson and EU proposals, by contrast, tariffs do not decline as much.

These results show the possibility of significant negative effects that many SADC countries have been expressing as a matter of concern for them in the context of trade liberalization.

Table 4: The impact on government revenue (million US$)

Country	Harbinson Proposal	US Proposal	EU Proposal
Botswana	-13	-40	-11
Lesotho	-3	-11	-1
Malawi	-#	-1	0
Mauritius	-#	-13	2
Mozambique	-1	1	-1
Namibia	-2	-7	-1
South Africa	26	#	-10
Swaziland	-7	-22	-5
Tanzania	-2	-11	-1
Zambia	#	1	0
Zimbabwe	-5	-34	-3
SADC	-7	-137	-31

Source: Simulation results. A # means less one million.

Faced with these prospects, they are often advised to diversify into other forms of taxation. But this is often more simple said than done if administrative and others costs involved in raising these taxes are taken into account. The simulation results show that this aspect needs to be considered while assessing the overall impact of trade liberalization.

5.5 Impact on export earnings, import cost and trade balance

In the model, the two key factors that determine changes in export earnings and import bills, following a policy reform, are changes in world market prices and tariffs, which influence trade flows. Although all countries face the same world prices, the impact on a particular country depends on changes on own tariffs and to the composition of exports and imports. First, in all three scenarios, world food prices rise relatively strongly than tropical product prices, which impact negatively on net trade balance of countries that import food and export tropical products. Second, domestic prices that consumers face will decline, or not increase by as much, where a country reduces its own tariffs, which pushes up import bills. This was the case under the US scenario where the simulated net trade balance (export minus import) for SADC as a whole was smallest (Table 5). Under the other two proposals, by contrast, import bills rise only modestly as consumption, and hence import, did not increase much as tariffs were reduced only modestly.[14]

[14] *This is also reflected in terms of significant consumer surplus losses under the Harbinson and EU proposals in Table 3.*

Table 5: Impact on export revenues, import costs and trade balance (billion US$)

Countries	Change in export revenue (a)	Change in import bill (b)	Change in trade balance (a–b)
Harbinson Proposal			
Botswana	9	8	1
Lesotho	#	-2	2
Malawi	24	1	23
Mauritius	9	5	4
Mozambique	12	-6	17
Namibia	18	3	14
South Africa	132	117	15
Swaziland	16	5	10
Tanzania	57	-13	70
Zambia	13	-2	16
Zimbabwe	50	6	44
SADC	**340**	**122**	**218**
US proposal			
Botswana	12	18	-6
Lesotho	1	65	-64
Malawi	55	1	53
Mauritius	16	18	-2
Mozambique	8	88	-80
Namibia	26	5	20
South Africa	241	109	135
Swaziland	34	13	22
Tanzania	61	57	4
Zambia	9	17	-8
Zimbabwe	91	11	79
SADC	**554**	**402**	**153**
EU Proposal			
Botswana	5	6	-1
Lesotho	#	-1	1
Malawi	20	-1	21
Mauritius	6	4	1
Mozambique	9	-4	13
Namibia	10	2	9
South Africa	105	-67	173
Swaziland	13	4	9
Tanzania	39	-7	46
Zambia	8	-2	10
Zimbabwe	37	-9	45
SADC	**252**	**-75**	**327**

Source: Simulation results. A # means less one million.

6. CONCLUDING REMARKS

The paper analysed the likely impact on the SADC economies of the draft Harbinson modalities under the Doha agricultural negotiations, along with the US and EU modalities as alternative scenarios. The impact was assessed

for a number of indicators. Several results are standard and relatively straightforward to explain. Thus, further trade liberalization raises world prices of farm products, much more so for temperate-zone products that received high support and protection in the base period than for tropical products. World price increases are more pronounced under the US scenario than the other two, reflecting deeper reforms.

Many of the outcomes are determined by how domestic market prices change following policy reforms. These prices are determined by two factors: the extent of the change in world prices, which applies to all countries similarly; and the depths of tariff cuts, which are specific to modalities, countries and commodities. For this reason, different scenarios could lead to different outcomes. For example, where import tariffs are not reduced (as for LDC in the EU and Harbinson proposals), or reduced relatively modestly (as in these two proposals, relative to the US proposal), domestic prices rise, or do not decline much, following the same changes in world prices. These lead to loses for consumers and gains for produces. By contrast, where tariffs are lowered markedly, as in the US scenario, there are widespread consumer gains while producers lose. Government revenues and trade flows are also affected by these changes.

Thus there are important trade-offs involved, and modalities may be "ranked" differently based on the indicator used. Table 6 summarizes these rankings based on net gains for SADC as a whole. For example, the EU scenario results into highest gains in terms of total welfare, producer gains and trade balance. Very often, published impact studies report only one or other indicator, the typical ones being total welfare and trade flow. While economists tend to like the former indicator, trade negotiators seem to be more interested in trade flow. This study demonstrates the value of considering a range of impact indicators and the trade-offs involved. Hopefully, this will be appreciated by both economists and trade negotiators.

Table 6: Ranking of the three modalities according to indicators (ranking based on net gains to SADC as a group)

Indicators	First rank	Second rank	Third rank
Total welfare	EU	US	Harbinson
Consumer surplus	US	EU	Harbinson
Producer surplus	EU	Harbinson	US
Govt. revenue	Harbinson	EU	US
Trade balance (X-M)	EU	Harbinson	US

Source: Based on assessed gains and losses as reported in various tables in Section 5.

Finally, this paper raises an issue for further debate. The question is what does it really mean in practice, for lower-income economies with large populations dependent on agriculture, to gain in CS and at the same time to lose in PS. One consideration is that in models where incomes are not generated endogenously (as in ATPSM), or not injected exogenously, it is not clear if the estimated CS gains are realized effectively (i.e. "effectively demanded") because in such economies farm production itself is a major source of income and so PS loss could also imply income loss for consumers (the simulations show that the CS gains invariably show up with PS losses). Moreover, since agricultural development would require PS gains on a sustained basis, it would seem that PS gains are much more valuable than CS gains in those economies. If this is so, assessments based on total welfare could also be misleading because this indicator attaches equal importance to both the surpluses (i.e. one dollar of PS gain is valued the same as one dollar of CS gain). Thus, it makes sense for policy makers in such economies in particular to review the impact of policy reforms on both surpluses, and of course other indicators too.

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REFERENCES

AMAD (2004). AMAD database at http://www.amad.org.

DIAO X, ELBEHRI A, GEHLHAR M, GIBSON P, LEETMAA S, MITCHEL L, NELSON FJ, NIMON RW, NORMILE M A, ROE R, SHAPOURI S, SKULLY D, SIMTH M, SOMWARU A, TRUEBLOOD M, TISGAS M, WAINO J, WHITLEY D & YOUNG CE (2001). *The road ahead: Agricultural policy reform in the WTO-Summary Report.* ERS/USDA, Washington, DC. Available online: http//:www.ers.usda.gov/publications/aer797.

FAO (2002). *Commodity-specific trade issues and implications of possible modalities for commitments in the context of WTO negotiations on agriculture.* Paper No 4, 8th Geneva Roundtable on trade-related issues, FAO Rome. Available online: http//:www.fao.org/trade.

FAPRI (2002). *The Doha Round of the World Trade Organization: Appraising further liberalization of agricultural markets*. FAPRI Working Paper 02-WP-317, November 2002, Iowa State University. Available on FAPRI website: Available online: http//:www.fapri.missouri.edu/publication.

FREEMAN F, MÉLANIE J, ROBERTS I, VANZETTI D, TIETUE A, & BEUTRE B (2000). *The impact of agricultural trade liberalization on developing countries.* Australian Bureau of Agricultural and Resource Economics, Canberra.

LINDLAND J (1997). *The impact of the Uruguay Round on tariff escalation in agricultural products*. ESCP Working Paper No 3, FAO, Rome.

OECD (1997). *The Uruguay Round Agreement on Agriculture and Processed Agricultural Products*. OECD, Paris.

OECD (2001). *The Uruguay Round Agreement on Agriculture: An evaluation of its implementation in OECD countries.* OECD, Paris.

OECD (2002). *Alternative liberalization scenarios and their impacts on quota rents and tariff revenue in selected OECD agricultural markets*. OECD, Paris.

POONYTH D & SHARMA R (2003). *The impact of the WTO negotiating modalities in the areas of domestic support, market access and export competition on developing countries: Results from ATPSM*. A Paper present at IATRC Conference, June 2003, Capri, Italy.

SHARMA R, KONANDREAS P & GREENFIELD J (1996). An overview of assessments of the impact UR on agricultural prices and incomes. *Food Policy* 21(4/5):351-363.

VANZETTI D & PETERS R (2003). *An analysis of the WTO, US and EU proposals on Agricultural reform*. Unpublished paper, UNCTAD, Geneva.

VANZETTI D & SHARMA R (2002). *Impact of agricultural trade liberalization on developing countries: Results of ATPSM partial equilibrium model.* Paper presented at IATRC Summer Symposium, 16-17 June 2002, Whistler Valley, Canada.

WORLD BANK (2002). *World Development Indicators, 2002*, Washington DC.

WTO (1999). *Guide to the Uruguay Round Agreements*. Kluwer Law International and WTO Secretariat. Available online: http//:www.wto.org.

WTO (2002). *Negotiations on agriculture*. Document TN/AG/6 18th December 2002, Geneva. Available online: http//:www.wto.org.

WTO (2003). *Negotiations on agriculture: First draft of modalities for the further commitments*. TN/AG/W/1/Rev.1, 18 March 2003, WTO, Geneva. Available online: http//:www.wto.org.