IIIS Discussion Paper

No. 74/ June 2005

Global and EU Agricultural Trade Reform: What is in it for Tanzania, Uganda and Sub-Saharan Africia?

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1. Introduction

Both the Doha Development Round of trade talks, and recent rulings at the WTO, have placed the EU under increasing pressure to agree to more far-reaching proposals for reform of the European Union's Common Agricultural Policy. The purpose of this paper is to examine to what extent Sub-Saharan African (SSA) economies could gain or lose from EU trade reform, whether undertaken in a unilateral or multilateral context. EU trade reform impacts on SSA countries are also set in the context of potential gains that they may obtain from trade reform by other geographic regions including the SSA countries themselves.

The primary economic argument for trade reform is that free trade can be a source of important efficiency gains if a country liberalises its own trade. Free trade is a means for a country to go beyond the constraints of its autarkic production possibilities. However, most SSA economies are classified as Least Developed Countries (LDCs), and it is not likely that they will be obliged to reduce their agricultural trade barriers in the Doha trade round. The principal likely sources of welfare changes from the Doha trade round as it impacts on agricultural trade, for SSA countries, are greater access to rich country markets and the resulting rise in world food prices. Net food exporters will benefit from positive terms of trade effects. However, some SSA exporters will face preference erosion if EU agricultural trade liberalisation causes the EU internal market price to fall and thus reduces the value of their preferential access to the EU market. Also, many SSA economies are net food importers and will face terms of trade losses if world prices rise. Non-LDC developing SSA countries[1] will be obliged to cut their own agricultural tariffs if such cuts for developing countries are part of a Doha round agreement. These factors point to the need for a careful country by country analysis of impacts of trade reform that moves beyond the analysis of relatively heterogeneous large groups such as all LDCs or all SSA countries.

[1] Congo, Gabon, Ivory Coast, Kenya, Nigeria, Namibia, Seychelles, South Africa, Swaziland. Zimbabwe.

This paper aims to determine the sign and strength of the effects of agricultural trade liberalisation on welfare, production and trade of Sub-Saharan African countries. In addition, it poses some more speculative questions about the potential effects on poverty of different trade liberalisation scenarios. The paper has a particular focus on Tanzania and Uganda because of their status as priority countries for Ireland's development assistance programme.[2]

Included are a series of partial equilibrium simulations using the UNCTAD Agricultural Trade Policy Simulation Model (ATPSM). These focus on the producer, consumer, and total welfare effects from trade liberalisation.[3] A number of scenarios are developed. These include benchmark scenarios reflecting the potential impacts on SSA countries of unilateral agricultural trade liberalisation by the EU, by the SSA countries themselves, and by other major country groupings. In addition, results are presented of some simulated policy scenarios based on negotiating positions put forward in the Doha round negotiations to date.

The recurring pattern in these simulations is that the significant benefits for SSA producers from the higher world prices of agricultural commodities are offset, and typically more than offset, by the losses to consumers, so that total welfare changes are very small or negative. Not all countries follow this pattern however; some experience significant changes in total welfare and these 'exceptions' drive the aggregate total welfare results for the SSA region as a whole.

2. Literature Review

Most of the estimates published to date of the effects of agricultural trade liberalisation in Sub-Saharan Africa have been at the aggregate regional level. There is also a small number of papers that give estimates for some individual Sub-Saharan African countries. Three strands of literature are considered in turn.

2.1 Global General Equilibrium Studies by Aggregate Country Groupings

Applied general equilibrium (AGE) models are stylised representations of the true economy. They employ specific and restrictive mathematical formulations of market structure and the behaviour of agents. Their strength, despite the restrictions imposed, is that they include a more accurate structural representation of the interaction of many agents in the economy, such as producers, consumers, public entities, investors, workers, owners of capital, land owners, importers and exporters. This more comprehensive

[2] The research on which this paper is based is part of the *Policy Coherence in Trade and Agriculture Project* undertaken by the Institute of International Integration Studies at Trinity College Dublin and supported by a grant from the Advisory Board to Development Cooperation Ireland. Partners in this project include the Bank of Uganda and Sokoine University of Agriculture (Morogoro, Tanzania) in furthering the analysis of the possible impacts of agriculture trade reform on poverty in both countries.
[3] We are grateful to Sam Laird, Ralf Peters and David Vanzetti of UNCTAD for their assistance and for sharing their insights and knowledge about the operation of the ATPSM model.

structural representation leads to the description 'general equilibrium'.[4] In addition, the model can either be implemented nationally or alternatively on a global basis taking into account the trade flows and trade restrictions that occur internationally.

Amongst the global models that have estimated the effects of trade liberalisation on Sub-Saharan Africa there are contrasting results. This is principally due to differences in the trade liberalisation scenarios simulated, in model structures and assumptions and differences in the data set used. The treatment of preferential trade access is a key influence on the results for SSA countries. Later generations of models treat preferences more comprehensively both in terms of data used and model structure.

At the optimistic end of the spectrum, the World Bank estimates the effects of a radical liberalisation of all world trade - including agriculture, manufactures and services (World Bank, 2004). They assume that all trade restrictions, including tariffs, domestic support and export subsidies (in agriculture), are reduced by one sixth in each of the years from 2005 to 2010. They also estimate the longer run effects up to 2015. An applied general equilibrium model called LINKAGE is used to generate their results.

The static, exogenous productivity, version of the LINKAGE model suggests the above scenario would result in an increase in real incomes in the least well off group of nations of $121 billion (in 1997 US dollars) and that 94% of these gains would be due to agricultural trade liberalisation. In addition, they find that real unskilled labour wages would increase by over 8% (when deflated by the price of food and clothing) in Sub-Saharan Africa. Assuming an elasticity of poverty with respect to a change in the real unskilled wage of 2 (i.e. for every 1% increase in the unskilled wage the headcount poverty rate decreases by 2%), they estimate that the numbers of those living on less than $2 per day in Sub-Saharan Africa would decline by approximately 130 million.

In contrast to this optimistic prediction, an alternative estimate of the regional impact of multilateral trade reform has been undertaken by Bouet, Bureau, Decreux and Jean (2004), using the applied general equilibrium MIRAGE model. They estimate a more modest, and arguably more politically realistic, trade liberalisation scenario akin to the Harbinson proposal in the Doha round negotiations.[5] They also make a major contribution to the data by integrating preferential trading agreements more fully. Both these factors tend to reduce the impact of trade liberalisation on Sub-Saharan Africa for three reasons:

1) Least Developed Countries in Sub-Saharan Africa (LDC SSAs) are not required to cut their tariffs under the Harbinson proposal but are assumed to make these cuts in the World Bank simulation.
2) LDC SSA's agricultural exports face lower rich country tariffs to begin with when preferential agreements such as the 2001 EU *Everything But Arms Initiative*[6] (EBA), and the 2001 US *African Growth and Opportunity Act* (AGOA), are taken

[4] We describe the contrasting partial equilibrium type of model below.
[5] We describe this trade liberalisation scenario in more detail below, as it is implemented in ATPSM. This differs in some details from the scenario implemented by Bouet et al. but is substantially the same.
[6] Described in more detail below.

into account, therefore cutting these tariffs has less of an effect and indeed reduces the value of their preferential margin in these markets.

3) Both least developed and developing Sub-Saharan African countries are exposed to preference erosion if prices for agriculture and food products in the rich countries, to which they have privileged access, fall as a consequence of trade liberalisation.

The projected positive effects on SSA are correspondingly modest.[7] SSA agro-food exports are projected to increase by 6.2%, real returns to agricultural labour are projected to increase by 1.7%, and overall welfare in SSA is predicted to fall marginally. Clearly, changes of this magnitude will have nothing like the poverty reducing effect that is predicted by the World Bank model.

A recent paper by Anderson and Martin (2005) indicates convergence between the results of the MIRAGE and LINKAGE models on the basis of using the same preference-included data and simulating a likely Doha round scenario. They note that "some least developed countries in Sub-Saharan Africa and elsewhere appear to be slight losers in (the) Doha simulation when developed countries cut their tariffs and those LDCs choose not to reform at all themselves".[8] This is due to the fact that 'a non-trivial number of low-income countries'[9] are net-food-importers or face preference erosion.

2.2 Partial Equilibrium Studies by Aggregate Country Groupings

Another set of papers use a partial equilibrium approach. Partial equilibrium international agricultural trade models typically only include demand and supply relationships (whether domestic or traded) and ignore factor markets. Gohin and Moschini (2004) note that when agriculture is important as a share of GDP, as in many developing countries, these factor market effects may be significant. Their suggestion is that PE models are more congruent with GE models when used for analysis of developed economies. However in LDCs, capital can be highly sector specific and land and labour may be under-utilised and in elastic supply. These characteristics may dampen the factor price effects of a trade induced agricultural expansion even though factor employment changes may still be significant - for example moving from subsistence into commercial agricultural production. Another distinct advantage of GE models over PE models is that GE models treat explicitly the linkages between agriculture and non-agriculture sectors in the economy. Since the Doha round will affect more than agriculture a GE framework would appear more appropriate. However, for LDCs with little industry or traded services and no obligation to change domestic tariffs under the Doha round these inter-sectoral effects are also perhaps not very strong.

Vanzetti and Peters (2003), Peters and Vanzetti (2003), and Laird, Peters and Vanzetti, 2004 report results for different country groupings using the partial equilibrium model ATPSM model that has been developed jointly by UNCTAD and the FAO. It is a partial

[7] These are the results published in the sensitivity analysis tables for double Armington elasticities.
[8] Anderson and Martin, 2005, p.11.
[9] Ibid. p. 14.

equilibrium model because it focuses only on imports and exports, production and consumption, of agricultural goods. The model is described and evaluated in more detail later. In these papers, the authors do not report results for Sub-Saharan Africa, but rather for Least Developed Countries. They implement four trade liberalisation scenarios: a scenario which is derived from the initial US proposal in the Doha trade round which they dub 'ambitious'[10], a 'conservative' proposal they derive from the initial EU proposal, and a 'compromise' proposal that is derived from the Harbinson proposal and their interpretation of the Cancún formula.

The broad thrust of their conclusions for LDCs correlates with the Bouet et al. results for Sub-Saharan Africa. Under the Harbinson compromise proposal, LDCs would suffer a modest total welfare loss of -$200m that is generated by gains for producers of $2.2bn that are outweighed by losses for consumers of $2.4bn. The principal reasons for this are that LDC producers face erosion of existing preferences under trade liberalisation and their consumers lose through higher world prices. This picture is replicated, albeit with differences in the magnitude of the effects, under both the simulation of the authors' interpretation of the Cancún formula and their implementation of the main features of the initial EU proposal. It is only the ambitious US proposal that generates welfare gains in the LDCs. However, even this does not hold true for many countries in Sub-Saharan Africa.

2.3 General Equilibrium Individual Country Level Studies

A final strand in the literature is direct CGE modelling of the effects of trade liberalisation on individual SSA countries. Some of these studies also investigate poverty impacts on different types of households. One such study has looked at the implementation of the Uruguay Round trade reforms in Uganda (Blake, Mc Kay & Morrissey, 2002). Their paper focuses on an earlier phase of trade reform than the focus of this paper, and it uses data from 1997. However, even the modest price increases that they estimate for Ugandan agricultural products, 0.4% for coffee, 1.8% for other cash crops, and 0.9% for food, do have pro-poor effects. These predominate in the main food and coffee growing central and western regions of Uganda. The impacts are modest, however, both because trade liberalisation does not increase the price of the agricultural goods that Uganda produces by much, and also because of constraints in supply response by Ugandan producers. These constraints relate to the difficulty in sourcing affordable inputs, poor infrastructure and high trading costs, and lack of adequate water infrastructure (on this see also, Fan, Zhang & Rao 2004). Blake et al. also find that unilateral trade liberalisation by Uganda would bring benefits because it would permit more efficient resource allocation and would allow world prices to be transmitted to domestic producers.

As regards Tanzania, Wobst & Mhamba (2002) focus on seven changes in government investment that could help agricultural development. They trace the impact of these stylised changes on household poverty. To do this they use a computable general

[10] While it may have been ambitious in the depth of its proposed cuts in tariffs, the US proposal involved no cuts in US domestic support and in this respect could also be dubbed conservative.

equilibrium (CGE) model akin to that first proposed by Dervis, De Melo & Robinson (1982). They do not model changes in international trade policy. However, of interest here is their estimate of the effects of a 50% decrease in domestic and export marketing margins. They take this to be the outcome of increased investment in rural roads. They predict that the level of production and exports of cash crops such as coffee, sisal, tea, cashew nuts, and sisal increases between 11% and 50%. In consequence, the demand for labour would increase in cash crop producing areas. The outcome in terms of poverty impacts is a significant increase in rural incomes for both agricultural and non-agricultural workers who are below the food poverty line. In contrast, urban incomes, both agricultural and non-agricultural, of those below the food poverty line are estimated to fall, but not by as much as the increase in rural incomes. The realism of such a strong production response can be questioned, as it would rely significantly on complementary policies, such as fertiliser subsidies, improved labour and capital productivity, improved seeds, and better pest and disease control. However, the paper does highlight that domestic policy initiatives may have more significant developmental and pro-poor impacts than changes in a country's international trading environment.

Finally, Wobst, using the same class of CGE model, looks at the impact of domestic and global trade liberalisation in five Southern African economies, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe (Wobst, 2003). Once again, a series of stylised policy changes are simulated, including a 5% currency devaluation, a 50% cut in import tariff rates, and a 25% cut in export, import and domestic marketing margins. The last of these, as in the previous paper, produces significant increases in exports – over 10% in the case of Tanzania.

These papers raise two issues. First, there is a distinction between modelling trade tariff and subsidy changes which are directly related to a policy decision, and changes in marketing margins, whose relationship with the policy change (investment in infrastructure) is uncertain. So, estimating a 50% or 25% fall in marketing margins, as Wobst does, is estimating a possible result of an unknown set of policy changes, and not a policy change itself. Second, however, ignoring marketing margins, as in ATPSM, also leads to over-prediction of price change impacts. Since the ATPSM model does not take domestic marketing margins into account, and only includes trade policy aspects of import and export barriers (and not international infrastructure, for example), the estimated price stimulus to the domestic economy from international trade reform is likely to be significantly higher than would probably occur in practice. This is partly for the reason that high marketing margins and transactions costs make supply response to new trading opportunities more difficult. A second reason is that neglecting the role of marketing margins exaggerates the degree of price transmission between border and farm-gate or retail prices. Both problems can be addressed in an ad hoc way in the ATPSM model by choosing relatively low supply elasticities when undertaking model simulations. Price elasticities of supply are quite low in the current edition of ATPSM (see Table A3.1).

3. Description of Model and Policy Simulation Scenarios

3.1 The Model

The Agricultural Trade Policy Simulation Model (ATPSM) has been developed by UNCTAD in conjunction with the FAO.[11] It estimates the effects of reductions in trade barriers on prices and terms of trade, on changes in supply, demand and trade flows, and on welfare effects for producers and consumers. It allows the simulation of reasonably detailed specifications of agricultural trade policy changes that have computable effects. It produces results by 161 countries, where the EU is a single region; these can be aggregated into country groups that correspond to particular regions. The EU region covers only 15 members, prior to the enlargement to 25 countries on May 1st 2004. All intra-EU trade has been eliminated. It also reports results for 35 agricultural commodities. We outline the model in detail in Appendix One.

Volume data on trade and production are taken from FAO supply utilisation accounts.[12] Consumption data is apparent consumption derived from the sum of production plus imports less exports. Three year averages of volumes from 1999-2001 are used to smooth out annual variations in yield. The year 2001 is the base year in ATPSM version 3.0 August 2004. World market price data have been developed from several sources including *International Financial Statistics*, *FAO Trade Yearbook* and UNCTAD price statistics. They extend from the period 1999-2001.

The supply and demand elasticities used in ATPSM are those provided by the FAO. The supply elasticity is derived as the sum of the area and yield elasticities. Where no demand and supply elasticities are available for a country, its elasticities are assumed to be the same as those that pertain in a geographically close proxy region. The elasticities in the model are rather conservative (i.e. low).

Tariffs and tariff quotas are derived from the Agricultural Market Access Database (AMAD), the data for which mostly comes from WTO schedules and notifications with the applied rates being obtained from the UNCTAD TRAINS database.[13]

In order to allocate tariff quotas amongst exporters, information on bilateral trade flows is required. These trade flows are derived from the database of the UNCTAD trade deflator system. Data on export subsidies is based on government notifications to the WTO.

[11] The significance of the ATPSM model is that it has been fully documented and is available in the public domain, see http://192.91.247.38/tab/atpsm.asp. Apart from the model structure and code, ATPSM makes available a significant global database of trade flows and protection data for 35 agricultural products and 161 countries.
[12] See FAOSTAT at http://www.fao.org
[13] AMAD database http://www.amad.org

3.2 Benchmark Simulation Scenarios

What follows is analysis of a series of simulations using the ATPSM model both for Tanzania and Uganda and the 'Rest of SSA'.[14]

The first set of simulations establishes some comparative benchmarks. They give some indication of the potential welfare implications of different trade liberalisation scenarios for the two countries and the 'Rest of SSA' region. These simulations are based on the concept of total unilateral agricultural trade liberalisation (TAL) vis-à-vis all countries in the world. This acronym captures the idea that the liberalisation is undertaken (i) by an individual country (ii) removing all form of agricultural support and protection (iii) vis-à-vis all other countries. These simulations allow examination of the welfare impacts on Tanzania and Uganda of TAL by:

1) The European Union
2) All of Sub Saharan Africa and the East African Community (EAC, i.e. Kenya, Uganda, Tanzania)
3) Different regions including: the EU, the US + Non-EU Developed Countries, South America, China + India, All of SSA, and the World.

These benchmark scenarios are not currently credible policy scenarios. However, comparing the effects under each benchmark simulation allows useful conclusions to be drawn as to the extent of potential welfare benefits from agricultural trade liberalisation by different geographic blocs, and also as to the differential welfare impacts on consumers, producers, and government revenue in SSA countries.

TAL scenarios and free trade blocs

These benchmark estimates do not, and are not intended to, estimate the effect of a regional customs union such as the EAC. In a customs union, all the countries within the zone abolish tariffs on trade with each other, but maintain a common tariff with respect to countries outside the area. In contrast, what is estimated here is total unilateral agricultural trade liberalisation by countries in the region, whereby all tariffs are abolished both within the region and between the region and the rest of the world. The ATPSM model cannot, in its present form, simultaneously model customs unions and the individual countries within the customs union.

Thus the TAL scenarios are not especially useful in assessing the potential welfare gains or losses from future agreements such as an Economic Partnership Agreement (EPA) implementing free trade between the East African Community and the EU. An EPA combines the free trade effect purely within the EAC with a preferential free trade effect between the EAC and the EU. For estimates of the welfare impact of an EU-EAC EPA, see Milner, Morrissey & McKay (2005).

[14] Except where otherwise indicated the 'Rest of SSA' category covers all of Sub-Saharan Africa minus South Africa and the two countries that we focus on more specifically, Tanzania and Uganda.

Preferential trade arrangements in ATPSM

One of the main advantages of ATPSM is that, to the extent that it does take preferential trading quotas substantially into account. However, the fact that more recent non-quota-based preferential agreements are not taken into account is an important limitation and affects the interpretation of our results. For example, the model does not take into account the *Everything But Arms* (EBA) Agreement which was adopted in March 2001 and removes duties and quotas on LDC exports to the EU for, amongst others, most agricultural tariff lines with the exception of three key products where liberalisation is to be phased in gradually: 2002-2006 for bananas, and 2006-2009 for sugar and rice. Moreover, it is not just the EU that gives non-quota-based preferential access but also other OECD countries, for example, access given to the US market under the *African Growth and Opportunity Act*.[15]

This omission has implications for the interpretation of our estimate of the effect of several of the simulations scenarios on Sub-Saharan African LDCs and so needs some further consideration. [16]

The effects of EU TAL, without EBA, on Tanzania, Uganda and the rest of SSA, contrast with the effects of EU TAL in the presence of EBA. EBA opens up the EU market to Tanzania and Uganda and other LDCs, but it does not open it up to other developing and middle-income countries. For example, under EBA there is the potential for both Tanzania, and perhaps Uganda, to export some sugar to the EU, but in an EU TAL simulation, while they have free trade access as under EBA, so also do countries like Brazil with whom they must compete in the European market. Therefore, EU TAL, in the presence of EBA, exposes LDCs to more vigorous competition in supplying the EU market and also decreases EU market prices to world price levels. Thus, welfare gains for SSA countries, from EU TAL, will be significantly lower now that EBA has been implemented.

The latest version of ATPSM is based on figures for 2001 and could be interpreted as a 'before-EBA' result. Viewed in this context, the EU TAL simulation shows gains for producers and losses to consumers in most SSA LDCS and total welfare effects that would be largely neutral.[17] However, interpreting the result for EU TAL in the current post-EBA context suggests that it could be a significant overestimate of the positive welfare effects on SSA countries of total liberalisation by the EU. EU TAL would erode the preferential access that EBA provides. Indeed, SSA LDC suppliers may cease to supply the EU market entirely because of increased competition from lower-cost producers. ATPSM takes neither this non-quota based preference-erosion effect, nor the loss-of-EU-market-share supply effect, into account to offset the estimated producer surplus gains from higher world prices under EU TAL.

[15] See Cline (2004) p. 91-94, for a description of the US *African Growth and Opportunity Act*.
[16] In Appendix Three: Table A3.5 we show the quota rent losses for all SSA countries under all simulation scenarios.
[17] See Appendix Three: Tables A3.2-A3.4, column *EU FT*.

Similar considerations apply to the Doha scenarios which are considered next. Producer surplus welfare gains from the simulated scenarios do not take into account the fact that all SSA LDCs already have duty free access to the EU market for most goods. Any market access increasing component in Doha changes by the EU will impact on SSA through its positive impact on world prices and its negative impact on SSA countries through erosion of the value both of quota and EBA preferential access to the EU market.[18]

To summarise, the EBA gives SSA country producers access to the high price EU market without raising the international price of agricultural goods, thus without hurting consumers. Any trade reform by the EU, in the presence of EBA, whether unilateral or multilateral, will hurt consumers in SSA countries by increasing world prices of agricultural commodities. It will also hurt producers in SSA countries by reducing internal EU agricultural prices and thus eroding the value of preferential EBA access to the EU. However, these losses will be offset by gains to producers from sales at the higher post-liberalisation world price.

3.3 Policy Simulation Scenarios

A second set of simulations estimates the impacts on Tanzania, Uganda, and other SSA countries of the implementation of three different trade liberalisation formulae that have been proposed during the Doha development round. These are

1) The Harbinson Proposal
2) The US Proposal
3) The Cancún 'Proposal'

The US Proposal and the Harbinson Proposal have both been rejected in the negotiations while the Cancún 'proposal' lacks any numbers and best estimates of these have been filled in by UNCTAD. As such, these scenarios are not a prediction of the likely outcome of the Doha round, except as rough orders of magnitude. They do, however, implement quite different tariff cutting approaches and these have quite different implications for SSA countries, in particular, Tanzania and Uganda. The trend of the negotiations is towards tariff cutting formulae that re-approach the Harbinson proposal. Hence the Harbinson simulation results are presented in the main text while, apart from two brief comments, the discussion of the US proposal results and the Cancún Proposal results are in the Appendix Two.

The US proposal, because it involves large tariff cuts by the LDCs, can be regarded as a simulation that, roughly speaking, is equivalent to partial SSA country agricultural trade liberalisation combined with Harbinson (or 'Cancún') type cuts by other non-LDC countries. Both the US and 'Cancún' approach are outlined in detail in Appendix Two. Appendix Three gives the welfare effects and quota rent changes for all SSA countries under all benchmark and policy simulation scenarios.

[18] Quota access is still valuable to LDC SSA countries insofar as EBA free access will not be fully implemented till 2006 for bananas and till 2009 for sugar and rice.

In general, Laird, Vanzetti and Peters (2004) find that the Cancún proposal is somewhat less ambitious on tariff cutting than the Harbinson proposal, principally because the EU could designate sensitive products in the Cancún scenario. However, there are some differences in the predicted impact on world prices of tropical agricultural products under the Cancún 'proposal' that could be more favourable for producers in Tanzania and Uganda and some other SSA countries than those predicted under the Harbinson proposal. The total welfare effects are broadly similar both in Tanzania and Uganda, for the region as a whole, and for many SSA countries.[19]

The following outline of the Harbinson policy proposal at Doha (and the description of the US and Cancún proposals in Appendix Two), as well as the description of its implementation in ATPSM, draws heavily on Vanzetti & Peters (2004), Peters and Vanzetti (2004), and Laird, Peters and Vanzetti (2004).

The Harbinson Proposal – Scenario Description

The Harbinson proposal suggested that out-of-quota bound tariffs should be reduced by a simple average for all agriculture products, subject to a minimum reduction per tariff line. LDCs would not be required to cut their tariffs. The Harbinson tariff reduction formula includes bands, according to which higher initial tariffs are subject to higher average and minimum reductions than lower initial tariffs. The bands for cuts in Out of Quota bound tariffs are (where the initial bound tariff is denoted by x):

For Developed Countries

$x>90\%$	average reduction = 60%, (minimum reduction 45%)
$15\%<x\leq 90\%$	average reduction = 50%, (minimum reduction 35%)
$x<15\%$	average reduction = 40%, (minimum reduction 25%)

For Developing Countries

$x>120\%$	average reduction = 40%, (minimum reduction 30%)
$60\%<x\leq 120\%$	average reduction = 35%, (minimum reduction 25%)
$20\%<x\leq 60\%$	average reduction = 30%, (minimum reduction 20%)
$x\leq 20\%$	average reduction = 25%, (minimum reduction 15%)

In addition, Harbinson proposed that Green Box[20] domestic supports should be maintained while Blue Box[21] domestic supports should be cut by 50% in developed, and 33% in developing, countries. Amber Box[22] supports should be reduced by 60% in developed, and 40% in developing, countries. The *de minimis* exemptions, which exempt from reduction all domestic support below the *de minimis* percentage value of the product, would be reduced from 5 % to 2.5%.

[19] In Appendix Three, the total welfare impacts for other SSA countries are not without contrast as between Harbinson and 'Cancún'; for example for Botswana (C>H), Kenya (C>H), Namibia (C>H), Seychelles (C>H), Zimbabwe (C>H) and for Mozambique (C<H), Malawi(C<H), Mauritius (C<H), and Swaziland (C<H). Compare columns *Harb* and *Cancún* in Table A3.3.

[20] Green Box domestic support is ostensibly non trade distorting

[21] Blue Box domestic support is received in exchange for implementation of production limiting measures.

[22] Amber Box domestic support is trade distorting and is subject to reduction in WTO trade rounds

Finally, Harbinson proposed that export subsidies should be reduced to zero over 6 years in the developed countries and only reduced over a much longer time period in developing countries. Export credits would also be subject to disciplines.

Only some of these features can be integrated in ATPSM (Vanzetti & Peters, 2003).

1) Implementation of the tariff reduction bands is integrated in the simulation. However, these reductions are implemented through a uniform application of the average reduction across all the tariff lines in each band. There is no flexibility within bands, which would allow some tariff lines to be reduced by more than the average reduction while others are only reduced by the minimal amount.
2) The Harbinson proposal includes provision for some products in developing countries to be designated as special products which would be subject to an even lower minimum rate of tariff reduction. Special products cannot be catered for in the simulation until they have been chosen.
3) The simulation also includes a 20 per cent reduction of domestic support and a 20 per cent expansion of import quotas in developed and developing countries. It does not include the flexibility that Harbinson allowed in choosing an average expansion of quotas within certain limits. The possibility of assuring preferential schemes and some other special and differential issues are also included in the Harbinson proposal.

These factors will lead to an upward bias in the extent of the impact of the Harbinson changes in ATPSM.

No changes are simulated for the least developed countries as Harbinson proposed. However, Harbinson also included some provision for retaining preferential schemes and considered other special and differential issues. These cannot readily be included in ATPSM.

4. Levels of Protection in ATPSM

The impact of any trade policy change will depend both on the degree of policy change, the level of initial trade barriers, and the volume of trade. If trade barriers are low, then even large percentage cuts in trade barriers will be unlikely to have very significant impacts. So, the initial levels of protection that ATPSM reports will influence the results of the scenarios. However, it is also important to bear in mind that even large cuts in high tariffs will not have large welfare impacts if trade flows are, and remain, small.

The major advance in the data set used in the ATPSM model is that it includes both the bound and applied tariff levels. Moreover, it estimates the effect of cuts in the bound

(legally permissible maximum) tariffs, due to trade policy changes, on the applied tariffs (at the border). It avoids thereby one of the major sources of overestimation of the impact of trade policy change on developing countries. The WTO trade negotiations concern reductions in bound tariffs. However, many countries, especially developing countries, have applied tariffs that are considerably lower than the bound tariff rates. Thus, a given tariff cut may have no impact at all on actual tariffs. If this is ignored then the effects of tariff cuts are overestimated

Tanzania has out-of-quota bound tariff rates of 120% for most agricultural products. Exceptions are: livestock, processed coffee and tobacco and rubber, where the bound tariff is zero; raw sugar, both temperate and tropical oilseeds, where it is 25%; and Hides & Skins, where it is 5%.

Uganda, likewise, has out of quota bound agricultural tariff rates of 80% for most of the products. Exceptions are: Poultry (68%), Cocoa (60%), Apples (40%), Oilseeds trop.-temp. (6-7%), and Hides and Skins 6%.

The applied tariff data are given in Table 1 for a selection of SSA countries.[23] The applied out-of-quota agricultural tariff rate is 25% for most of the groups of products with the exception of wheat, maize, sorghum, pulses and vegetable oils where it is between 13 and 16%, and Hides & Skins, Tobacco leaves, and Cotton where it is 5%.

Most applied out of quota agricultural tariffs, however, are 15%. Exceptions are, Barley, Maize, Sorghum. Raw Sugar, Green Coffee, Tea, Oilseeds temp., Cotton, Vegetable Oil, which all have an applied tariff rate of 7%; Hides & Skins, Oilseeds trop., with an applied rate of 6%, and Wheat, with a rate of 4%.

It is highly unlikely that any trade reform in the Doha round will change the applied tariffs on agricultural goods in Uganda and Tanzania. Least Developed Countries like Tanzania and Uganda will, most likely, be exempted from any tariff cutting obligations that developing countries face in the Doha round. Even if cuts were required, the tariff overhang, or difference between the bound and applied rates, is so considerable in both cases that the bound rates for most products could be cut by 80% or more and it would leave the applied rates unchanged. Such large differences between bound and applied tariff rates do have an option value. They give scope for the country to raise applied tariff rates, if it wanted to in the future, in order to protect its agricultural sector.

Uganda has significantly lower applied tariff rates on agricultural trade than Tanzania. Tanzanian tariff levels are closer to, but lower than, Kenyan levels. As a result, in the simulation both of Sub-Saharan African trade liberalisation and EAC liberalisation, the welfare effects on Uganda of liberalising are likely to be somewhat less significant than those on Tanzania. The effects on Kenya will be stronger again because it has relatively high applied tariffs. Of course, the lower tariff in Uganda may not translate into a lower effective rate of protection for import-competing agricultural goods (mainly foodstuffs), since the country is landlocked, while Tanzania is not.

[23] Development Cooperation Ireland partner countries in SSA for which there are tariff data in ATPSM.

Table 1: Applied Out of Quota Tariff Rates for EU and Selected SSA Countries

ATPSM Applied Tariffs	*EU*	*Tanzania*	*Uganda*	*Kenya*	*Ethiopia*	*Zambia*	*Mozambique*
Livestock	74	0	0	10	10	0	14
Bovinemeat	138	25	15	35	20	25	30
Sheepmeat	89	25	15	35	20	25	30
Pigmeat	30	25	15	35	20	25	30
Poultry	33	25	15	35	20	25	30
Milk conc.	105	24	15	35	20	17	25
Butter	93	25	15	35	30	25	16
Cheese	60	25	15	35	30	25	29
Wheat	73	14	4	35	5	15	22
Rice	72	25	15	35	5	5	6
Barley	83	13	7	35	5	5	3
Maize	50	16	7	35	5	5	3
Sorghum	53	13	7	15	5	5	16
Pulses	1	13	15	35	20	10	30
Tomatoes	51	25	15	35	20	25	30
Roots & Tubers	53	25	15	35	20	25	30
Apples	30	25	15	35	20	25	30
Citrus fruits	19	25	15	35	20	25	30
Bananas	64	25	15	35	20	25	30
Oth. trop. fruits	5	25	15	35	20	25	30
Sugar raw	135	25	7	15	0	15	2
Sugar refined	135	25	15	63	5	25	8
Coffee green	6	25	7	15	40	25	21
Coffee proc.	8	0	0	0	0	0	0
Cocoa beans	0	25	15	15	30	15	3
Cocoa proc.	8	25	15	0	40	15	30
Tea	1	25	7	15	40	25	30
Tobacco Leaves	14	5	15	20	20	15	3
Tobacco proc.	0	0	0	0	0	0	0
Hides & Skins	0	5	6	5	10	16	1
Oilseeds temp.	0	25	7	10	5	6	1
Oilseeds trop.	0	25	6	11	5	15	16
Rubber	0	0	0	0	0	0	0
Cotton	0	5	7	3	10	5	3
Vegetable oils	12	16	7	3	30	15	21

Source: ATPSM database

One caveat to this picture is that, since March 2005, the East African Community has a common external tariff that has changed the tariff structure that Uganda and Tanzania have with respect to non-EAC countries. In general, these appear to have increased external tariffs for Uganda towards Tanzanian levels, while on more sensitive products like sugar, rice, maize, wheat and milk they are more like Kenyan levels. Higher external tariffs in Uganda, and to a lesser extent, Tanzania, suggest that consumer gains and producer losses may be larger than those predicted using the ATPSM applied tariff data.

The ATPSM database also contains data on the volume of agricultural trade flows in Uganda and Tanzania, for each of the products in Table 1, and some conclusions can be drawn about the logic behind the agricultural tariff applied to that product.

Uganda has relatively higher tariffs (15%) on products in which, in the presence of the tariff, it trades little, but instead provides for consumption from domestic supply. Examples of this are: meat products, dairy products (with the exception of concentrated milk that is largely imported) and fruits. These sectors would face import competition if the tariff were lower. It also has the same high tariff where domestic production provides for the majority of domestic consumption but faces import competition. Here the tariff is not as exclusionary as for the previous group of products. Examples are: rice, pulses, and refined sugar. Applied tariffs are significantly lower for products where the major part of consumption is supplied through imports and there is limited actual or potential domestic production. Examples are: wheat, barley, and vegetable oils. Lower tariffs apply also for food products where significant imports are necessary to make up shortfalls in domestic supply, such as maize and sorghum. Low tariffs also apply to a range of goods where domestic supply meets domestic demand but import competition is not so intense, such as tropical and temperate oilseeds, tea, processed coffee, as well as for some export crops, such as green coffee, cotton, tobacco leaves, hides and skins.

The pattern of tariffs in Tanzania is roughly similar to that in Uganda. High tariffs (25%) strongly reduce import competition in sectors where the bulk of consumption is supplied domestically such as meat and dairy (with the exception of concentrated milk that is imported), fruit and vegetables, oilseeds both temperate and tropical, and tea. Tariffs are lower on food crops such as wheat, maize, pulses and sorghum; however, they are nearly double the levels in Uganda. Rice and refined sugar are heavily protected in Tanzania, as in Uganda. Just three quarters of domestic rice consumption and 60% of refined sugar is supplied domestically so import competition is real. Crops which Tanzania exports but of which they import little, such as cotton, tobacco leaves, and hides and skins, have lower tariffs, as do goods where imports predominate and there is little domestic production, such as rubber, processed cocoa, processed tobacco. Finally, some agricultural products that Tanzania exports, such as green coffee and cocoa beans, have surprisingly high tariffs.

The agricultural applied tariff structure for some other sub-Saharan African countries is also shown in order to give some comparative perspective.[24] The tariff structures correlate quite closely. Typically, there are high tariffs on meat, fruit and vegetable crops, and lower tariffs on food-grain crops, export crops, and import-only crops. As regards average tariff levels, Uganda would appear to be among the lowest, and Kenya and Ethiopia among the highest.

[24] Ethiopia, Kenya, Zambia and Mozambique are all SSA LDCs that receive development assistance through Development Cooperation Ireland and are of interest to our overall project, even if they are not the main focus of this paper.

The EU applied tariff levels are considerably higher than the applied tariff levels in the sub-Saharan African countries considered. Low tariffs only apply to products that the EU does not itself produce.

It is important to realise that the tariff levels in Table 1 are not the tariff levels that the EU applies bilaterally with SSA countries. They are the applied out of quota tariff levels within ATPSM. The ATPSM model does include bilateral tariff information on in-quota tariffs but does not include bilateral detail on out-of-quota tariffs.

However, because of the *Everything But Arms* Initiative, the effective applied EU tariff rates since 2001 on all non-arms LDCs exports to the EU are zero for all products except for rice, sugar and bananas, and, as noted above, these three products will face zero EU tariffs by 2009. ATPSM includes Tanzania's sugar quota of 22,120 metric tonnes, and also preferential zero in-quota tariff rates on refined sugar and Tobacco Leaf. It also registers the preferential in-quota rate of 6% on Ugandan roots and tubers, as well as a 0% in-quota rate on bananas. However, to the extent that preferential SSA exports to the EU are expected to increase over time under the EBA, future trade liberalisation will involve greater erosion of the value of preferences than is currently estimated in ATPSM.

The assumption in ATPSM, which can be easily changed, is that, apart from sugar and beef, quota rents accrue to taxpayers in the importing countries. This may underestimate the value of preference erosion to the extent that developing country preferential exporters benefit from the difference between the protected market price and the world price in developed country market. No adjustment to the quota rent allocation in ATPSM was made in running the simulations in this paper.

5. Results

In interpreting the results, four points emerge from the literature review, description of the model, and examination of the applied tariffs it uses.

1) The model includes no trading costs or marketing margins. Any change to the world price is assumed to be fully passed on to both producers and consumers. This assumption overestimates the welfare changes for producers and consumers by overestimating the impacts of trade liberalisation on the domestic price level paid by consumers and received by producers. Internal trading and marketing margins are so high in many SSA countries that significant areas of agricultural production are non-traded.[25] Thus any world or border price change has no effect on the share of producer and consumer surplus in these locations. To the extent that this is the case the effect of a rise in world prices on consumer losses and producer surplus gains will be lower than the model predicts. Any overestimation of total welfare changes, from a world price rise, will be smaller because the overestimation of producer gains will cancel out the overestimation of consumer

[25] Delgado, Minot & Tiongco (2004) find that food-staples are non-traded in about one quarter of Tanzania.

losses. In addition, there can be asymmetry in price transmission where cuts in world prices are passed through to domestic producers more fully than increases in world prices, while cuts in world prices are passed through less fully to consumers than rises in world prices. This occurs due to lack of competition in distribution and marketing chains. A rise in world prices would lead to a commensurate fall in consumer surplus because of full pass through of the price rise; however, producer surplus gains would be lower due to the incomplete pass through of the same price rise. Any positive total welfare impacts would be overestimated.

2) Although quota-based preferences are substantially taken into account, the EU agricultural tariffs on SSA exports in the model are higher than the actual EU tariffs on SSA agricultural exports, when the EBA is taken into account. This leads to overestimation of the impact of trade reform, both TAL by the EU, and the EU component of the different trade policy scenarios - US, Harbinson and Cancún. Where such arrangements are in place between developed country markets and developing country markets, all the simulations overestimate the gains for producers through trade liberalisation, because they ignore preference erosion both in terms of the price received for exports to the developed country market and the volumes exported there.

3) Regional customs union trade agreements are not simulated in the benchmark TAL scenarios because the ATPSM model does not include bilateral out-of-quota tariff information. As a result, only the abolition of all tariffs by the EAC countries both internally and vis-à-vis the rest of the world can be simulated and not the effect of establishing the EAC with a common tariff vis-à-vis the rest of the world.

4) The static partial equilibrium measures of welfare in ATPSM do not capture fully the possible dynamic gains from specialization according to comparative advantage that may flow from trade liberalisation (Anderson & Tyers, 1993; Anderson, 2004). Unlike points 1-3, point 4 suggests that ATPSM might underestimate the positive welfare impact of trade liberalisation.

5.1 Benchmark simulations

5.1.1 EU agricultural trade liberalisation

Unilateral EU agricultural trade liberalisation would evidently have significant impacts on agricultural production and farm incomes in the EU, even if the disruption to the livelihoods of farmers across the EU can be minimised by the payment of compensation. The simulation of unilateral EU agricultural trade liberalisation is purely to obtain

benchmark estimates for the welfare impacts of EU agricultural trade protection on Tanzania and Uganda and other SSA countries.[26]

As seen in Table 2, the largest price changes occur in agricultural products that are produced in temperate climates, such as most of those in the left hand column, along with apples, tomatoes and sugar in the middle column. In contrast, the price changes in tropical products, with the exception of bananas, sugar and roots and tubers, are relatively minor. The reason for this is that the EU has high levels of protection for products that it produces itself, which face competition from the rest of the world, as well as for those products (principally bananas and sugar) where supply on a preferential quota basis has been sourced from ACP countries under the Lomé Convention, now the Cotonou Agreement.

The gains for producers in SSA countries are likely to be concentrated in those few sectors where the world price increases and they can, and do, export the particular products. In addition, the costs to consumers from higher world prices will depend principally on the level of imports of non-tropical agricultural products and the impact of higher world prices on domestic prices of food.

Table 2: **EU Agricultural Trade Liberalisation, Implied Percentage World Price Changes By Commodity**

Commodity	% change	Commodity	% change	Commodity	% change
Livestock	-1	Sorghum	1	Cocoa beans	0
Bovinemeat	4	Pulses	0	Cocoa processed	1
Sheepmeat	6	Tomatoes	2	Tea	0
Pigmeat	1	Roots & Tubers	4	Tobacco Leaves	1
Poultry	2	Apples	4	Tobacco processed	0
Milk conc.	19	Citrus fruits	1	Hides & Skins	1
Butter	13	Bananas	5	Oilseeds temperate	0
Cheese	8	Other tropical fruits	0	Oilseeds tropical	0
Wheat	8	Sugar raw	2	Rubber	0
Rice	1	Sugar refined	4	Cotton	0
Barley	6	Coffee green	0	Vegetable oils	1
Maize	2	Coffee processed	0		

Looking at the welfare impacts, EU agricultural trade policy liberalisation can be disaggregated into three components:

- total market access liberalisation with zero out-of-quota tariffs (which also imply no export subsidies since, with free trade, the EU domestic price will equal the world price)

[26] EU trade liberalisation is most likely to occur in the multilateral context of the World Trade Organisation negotiations in the Doha Round, examined in Section 5.2 Policy Simulations.

- an abolition of export subsidies alone with no change to tariffs or domestic support
- an abolition of domestic support alone with no change to tariffs or export subsidies.

Following the 2003 Luxembourg Agreement to reform the EU's Common Agricultural Policy, most direct payments have now been decoupled from production. It is likely that these payments will be Green Box-compatible and thus not subject to reduction in the Doha round. If it were assumed that decoupled payments have no impact on production, the simulation of zero EU domestic support might be interpreted as the impact of decoupling. That is, the change in EU direct payments from Blue Box to Green Box is equivalent, from a production point of view, to their elimination. However, not all commentators agree that decoupled payments are totally production-neutral in this way.[27]

There are several striking results in Table 3 below.

Firstly, there is a very large difference in the magnitude of the impact of EU unilateral trade liberalisation on Tanzania, Uganda and most SSA countries, on the one hand, and on the EU, on the other. The total welfare effect for the EU is a gain of $11bn while that for Uganda is roughly zero and Tanzania experiences a modest welfare fall of just under $10m. The gains from liberalisation are significant for the EU, though not very significant in relation to total EU GDP. The losses for Uganda and Tanzania are very small, though underestimated due to the non-inclusion of erosion of EBA based preferential access.

For the 'Rest of SSA'[28] (outside of Tanzania and Uganda, and ignoring South Africa) EU TAL has a negative overall welfare effect of over $500m – a considerable aggregate sum. However, two countries contribute significantly to this welfare loss.[29] Mauritius registers a total welfare loss of $154m due to the erosion of the value of its preferences in sugar supply to the EU (which are included in ATPSM). Nigeria accounts for a loss of $115m because it is a significant net agricultural importer. Excluding these two leaves a total welfare loss for the aggregate of the other SSA countries (excluding Tanzania, Uganda and South Africa) of just $255m. Uganda is typical of one half of this group of 'remaining' SSA countries, with a negligible total welfare loss, while Tanzania is estimated to experience a negative total welfare change similar in order of magnitude to that estimated for the other half of the countries.[30] This belies the frequently expressed

[27] As noted later, problems with the measurement of domestic support in ATPSM mean that the interpretation of the output from the elimination of domestic support must be interpreted with care.
[28] The 'Rest of SSA' is the aggregate of the individually simulated impacts for each country in the group.
[29] The Seychelles also shows very large effects in the ATPSM simulations; for example, the change in total welfare under "Zero Out of Quota (and zero subsidy)" EU reform would be a loss of $285m, which amounts to 64 % of Export revenue of $445m or 48% of Import Revenue of $591m in the Seychelles in 2001 (data from *International Financial Statistics*). There appears to be a problem in the ATPSM database which registers Import Revenue of $6.5bn for ATPSM products alone in the Seychelles in 2001. The huge welfare losses from trade-reform induced world price rises are not surprising given the benchmark data.
[30] See Appendix Three, Table A3.3, column *EU FT* for details.

opinion that EU agricultural protection is a major factor retarding economic progress in Sub-Saharan Africa.

Table 3: Welfare Impacts of EU Unilateral Trade Liberalisation

	EU Unilateral Free Trade	*Zero Out of Quota Tariff*[31]	*Zero Export Subsidy*	*Zero Domestic Support*
Producer Surplus				
Tanzania	+44.4m	+45m	+1.7m	-0.2m
Uganda	+42.6m	+43m	+1.9m	-0.1m
Rest of SSA[32]	+475m	+476m	+87m	-0.3m
EU	-73,366m	-43,841m	-15,282m	-29,721m
Consumers Surplus				
Tanzania	-55m	-55m	-3.6m	+0.1m
Uganda	-43m	-43m	-2.4m	+0.1m
Rest of SSA	-1,037m	-1,034m	-213m	-3m
EU	+57,015m	+57,098m	+14,732m	-112m
Government Revenue				
Tanzania	+0.7m	+0.7m	+0.3m	+0m
Uganda	+0.1m	+0.1m	+0m	+0m
Rest of SSA	+39m	+38m	+20m	+0.3m
EU	+27,785m	-3,920m	+2,320m	+31,431m
Total Welfare				
Tanzania	-9.6m	-9.5m	-1.6m	-0m
Uganda	-0.4m	-0.4m	-0.5m	-0m
Rest of SSA	-524m	-515m	-106m	-3m
EU	+11,434m	+9,338m	+1,770m	+1,598m

Note: the left hand column for EU Unilateral Free Trade is equal to the sum of the 'Zero-Out-of-Quota-Tariff' column (that includes Zero Export Subsidies) and the 'Zero-Domestic-Support' Column. Some slight discrepancies occur so that the totals do not sum exactly; this is due to the fact that these simulations are run separately in ATPSM.

As mentioned above, erosion of EBA preferential access is not fully taken into account. In the short term this will lead to greater welfare losses than those reported here. However, it is questionable whether distorting market based incentives provides a good long term basis for agricultural development in Sub-Saharan Africa. The vulnerability of Mauritius and some other island ACP economies to the erosion of the value of their

[31] When out of quota tariffs are zero, then, abstracting from differences in indirect taxation, world prices prevail within the zero out of quota tariff region/country. As a result, since all production occurs in response to world prices, no export subsidies should be needed to sell excess domestic supply outside of the region/country. So this simulation also includes zero export subsidies.

[32] 'Rest of SSA' refers to all of Sub-Saharan Africa less South Africa, the Seychelles, Tanzania and Uganda, Lesotho and Democratic Republic of Congo. Tanzania and Uganda are highlighted separately. South Africa is excluded because of its economy is at a different stage of development to other Sub-Saharan African economies. The 2001 database for ATPSM does not include data for the Democratic Republic of Congo or Lesotho.

preferential access points to the inherent problem with this foundation for development – it depends on the level of protectionism in the EU, which is under threat in the WTO negotiations.

Secondly, the total welfare effects are made up of very strongly contrasting changes in producer and consumer surplus. In the EU, farmers lose a massive $73 billion while consumers gain $57 billion and an additional $28 billion is saved in EU budgetary expenditure on subsidies and domestic support (this figure is net of some loss in tariff revenue on agricultural imports into the EU.) In Tanzania and Uganda, the opposite happens. Producer surplus rises by just over $44m while Consumer Surplus falls by $55m in Tanzania, while in Uganda the producer surplus gain of $43m equals the consumer surplus loss. Government revenue in the two countries is largely unaffected since they make no change to their tariffs, and the changes in imports are not significant.

In comparison to other SSA countries, the dollar denominated welfare gains to producers in Tanzania and Uganda are among the highest in absolute value. Only the Cameroon, Kenya and Nigeria have bigger producer surplus gains under EU TAL. Some SSA country producers lose, however, especially Mauritius in relation to sugar, but also Botswana, Swaziland and Namibia – all through preference erosion on sugar and/or beef.[33] Overall the losses to Sub-Saharan African from EU TAL through loss of preferential quota rent amount to $340m, the vast bulk of which is incurred by these four countries and Zimbabwe.[34] Tanzania loses $4m in preferential quota rents. Uganda has no quota based preferential access to the EU market in ATPSM so no losses in quota rents are registered. As noted above, however, it may lose through erosion of the value of non-quota based EBA preferential access to the EU market but this does not register in ATPSM.

All SSA countries lose consumer surplus due to higher world prices consequent upon EU TAL. Tanzania and Uganda lose consumer surplus amounts that are of the same order as the losses in consumer surplus in Malawi, Ethiopia, and Cameroon, but are significantly less than consumer surplus losses by the big net food importers. These can be distinguished as being big net importers due to the size of their market, Kenya and Nigeria, or due to their island status, Mauritius.[35]

So, EU free trade is almost a zero sum game for Tanzania and Uganda. What the producers gain consumers lose! This does not mean, however, that the poverty impact of such trade reform will be entirely neutral. The increase in producer surplus should go mainly to rural areas while the poor in rural areas will rely to a significant degree on their own production to supply their food needs, rather than imports. Rural poverty should decline. Urban poverty may increase because urban dwellers are net food importers and

[33] See Appendix Three, Table A3.4, column *EU FT* for details. In ATPSM, Botswana has preferential access to the EU market for beef, at a rate 4.91%, Swaziland has preferential access, at 4.4%, for beef and 0%, for sheepmeat; while Namibia has preferential access, at 3.85% for beef, 0% for Tobacco Leaf, and has a sugar quota of 150,914 metric tonnes at 0% tariff, and a preferential rate of 13% for Citrus fruits.
[34] See Appendix Three, Table A3.6, column *EU FT* for details.
[35] See Appendix Three, Table A3.5, column *EU FT* for details.

have a higher propensity to consume imported temperate zone agricultural products. Since 87% of the 'basic needs' poor live in rural areas in Tanzania and 95% of the poor live in rural areas in Uganda, one would expect that overall poverty would decrease, but not by much given the magnitude of the predicted changes.

The third key point to note in Table 4 is that changes in EU Domestic Support have virtually no aggregate welfare impact and no distribution of welfare impact on Tanzania, Uganda or the 'Rest of SSA' group. Indeed, the zero-out-of-quota tariff accounts for virtually all of the welfare changes resulting from EU trade liberalisation. This is important politically in the Doha Round Negotiations where several developing countries continue to lobby hard for the abolition of EU domestic support even when de-coupled. Green and blue-box Domestic Support are not included in ATPSM so the model does not trace the impact of cutting them.

In ATPSM, changes in domestic support have very strong implications for the distribution of welfare in the EU. Abolishing domestic support involves an estimated direct welfare transfer of about $30bn from EU agricultural producers to the EU Budget, or EU taxpayers, with only a small change to total welfare of $1.6bn. However, these impacts are over-estimated. In ATPSM, the *ad valorem* equivalent includes the market price support element of amber box domestic support (an administered price or intervention price system) as well as direct payments. As the administered price is removed when import tariffs are lowered[36], it is double-counting to also include it in the domestic support measure. For this reason, the figures in this version of the paper exaggerate the transfer effects in the EU of removing amber box direct payments.[37]

Finally, the model suggests that abolition of EU Export Subsidies would have a modest welfare impact on Tanzania, Uganda and the 'Rest of SSA'. In all three cases, agricultural producers would gain a small amount, while consumers, who benefit from lower world prices due to subsidised EU exports, would lose by a slightly larger amount. Of course, the effect on the poor may be more important, if they consume the goods whose price is depressed due to export subsidies.

The reverse is the case in the EU. Significant, rather than modest, welfare impacts occur if export subsidies are abolished. Consumers gain $14.7bn, while agricultural producers lose by a slightly larger amount. EU taxpayers also gain. These transfers from producers to consumers are much larger than the savings in terms of expenditure by the EU taxpayer in financing export subsidies. This indicates that the price effects of abolishing the subsidies are relatively important.

[36] If the import price were lower than the administered or intervention price there would be an incentive to import and sell into intervention. So, the administered or intervention price must be removed if the tariff inclusive import price falls below it.

[37] A workaround for this would be to estimate the value of amber box direct payments in the main users of direct payments and to represent the scenario of the total elimination of domestic support as the reduction in the *ad valorem* equivalent of domestic support by the corresponding amount.

5.1.2 Sub-Saharan Africa, East African total unilateral agricultural trade liberalisation

Sub-Saharan Africa may also realise gains from trade by reducing its own agricultural tariff barriers unilaterally. As Table 1 indicates, applied tariff levels are significant both in Tanzania and Uganda as well as other SSA countries. Reduction of tariffs by the Least Developed Countries is not on the table for discussion at Doha. It is, however, under discussion in the context of Economic Partnership Agreements (EPAs), where the EU wants to replace the Africa Caribbean and Pacific (ACP) country non-reciprocal preferential access regime with reciprocal trade agreements. This is required to make the ACP trade regime comply with WTO rules. Tanzania and Uganda may be difficult to persuade to negotiate such an agreement since they already have duty and quota free access to the EU market under the EBA and an EPA implies significant opening up of their markets to tariff free European exports. This could lead to some losses in employment and income in their manufacturing sectors, even if this would be offset by benefits to their consumers.

The benchmark estimates of unilateral agricultural trade liberalisation in Sub-Saharan Africa represent the welfare impacts that are under the control of Sub-Saharan African countries themselves. This simulation is markedly different to a simulation of the effect of a Sub-Saharan African or East African Community free trade area in agricultural products, where the area collectively maintains common external tariffs with respect to the rest of the world. Here SSA and EAC countries as well as Tanzania and Uganda are simulated as reducing their agricultural tariff barriers with respect to <u>all</u> countries in the world.

The world price changes caused by TAL in SSA are much lower than those caused by EU TAL; the SSA region is a much smaller market to join the world market through TAL. The price changes are also different in composition and affect mainly tropical products, as one would expect. The largest increases are for Roots & Tubers (2%) and Pulses (2%), with lower price increases, of 1%, for Bananas, Tropical Oilseeds, Vegetable Oils, Sorghum, and Sheepmeat. There are no negative price changes. The world price changes caused by EAC TAL are negligible: 1% higher for roots & tubers. The welfare gains and losses that result are therefore a consequence of the fall in domestic producer prices, when lower cost world imports are allowed in at a zero tariff, and also the resulting fall in government revenue. These different sets of price changes under different liberalisation scenarios in turn generate different welfare impacts.

The total welfare changes in Tanzania and Uganda due to SSA TAL are small relative to the very considerable positive and negative welfare impacts on producers and consumers respectively. The gain of $21m in total welfare for Tanzania under SSA TAL results virtually entirely from its own TAL which results in a total welfare gain of $22m. This is the only numerically positive total welfare effect for Tanzania in any of the trade liberalisation scenarios that are simulated here. Uganda gains just $6m due to its own TAL. This is also its largest gain in total welfare under any of the liberalisation scenarios. The poverty impacts of this increase in total welfare may well be negative, however, as rural incomes, where most of the poor in Tanzania and Uganda live, will be hit by the fall

in agricultural prices as tariffs are abolished. These distributional issues are arguably more important, from a poverty viewpoint, than the aggregate change in total welfare which remains very modest in both cases. The fall in own Producer Surplus under Ugandan TAL and Tanzanian TAL is quite large in both cases.

Table 4: Unilateral Trade Liberalisation in Africa, by individual country and region

	Sub-Saharan Africa[38]	*East African Community*	*Tanzania Alone*	*Uganda Alone*
Producer Surplus				
Tanzania	-239m	-250m	-253m	+1m
Uganda	-101m	-112m	+1m	-115m
Rest of SSA[39]	-3,557m	+60m	+22m	+12m
EU	+546m	+147m	+44m	+20m
Consumers Surplus				
Tanzania	+295m	+307m	+310m	-1m
Uganda	+112m	+124m	-1m	+127m
Rest of SSA	+5,116m	-64m	-24m	-12m
EU	-611m	-159m	-46m	-22m
Government Revenue				
Tanzania	-35m	-35m	-35m	0
Uganda	-6m	-6m	0	-6m
Rest of SSA	-1,039m	+0.1m	+0.2m	+0.1m
EU	+45m	-14m	-0.2m	-1m
Total Welfare				
Tanzania	+21m	+22m	+22m	0
Uganda	+5m	+6m	0	+6m
Rest of SSA	+520m	-3m	-2m	-1m
EU	-110m	-27m	-2m	-3m

For the 'Rest of SSA' group, the total welfare effect is a gain of over half a billion dollars. Once again this is distributed unevenly across the countries in the group. Over four fifths of these total welfare gains are accounted for by Nigeria ($185m), Kenya ($87m), Angola ($45m), the Gambia ($26m), Guinea ($22m), the Cameroon ($21m), Tanzania ($21m), and Botswana ($17m).

[38] All of SSA including South Africa.
[39] For the Sub-Saharan African, Tanzanian alone and Uganda alone TAL we take 'Rest of SSA' to be as in Table Three above, for the EAC community liberalisation simulation, we take 'Rest of SSA' as before but also excluding Kenya.

The welfare changes are opposite in composition to those that arise as a result of EU TAL. Producers lose very significantly as they face stiffer import competition, though this loss is slightly reduced under SSA TAL due to higher world prices. Consumers gain very significantly from cheaper prices, and government revenue is cut due to the abolition of import tariffs on agriculture.

Apart from these poverty impacts, the loss in government revenue is another disadvantage of this liberalisation strategy. Tanzania loses a significant $35m, while Uganda, due to its lower tariffs and lower agricultural imports, only loses $6m. Other SSA countries lose government revenue heavily when they liberalise agricultural trade. The countries that lose significant amounts of revenue, along with Tanzania, are the Gambia (-$193), Kenya (-$179m), Malawi (-$99), Nigeria (-$86m), Botswana (-$76), Swaziland (-$54m), Namibia (-$52m), Gabon (-$51m), Guinea (-$39m), Mozambique (-$37m), Senegal (-$33m) and Mauritius (-$27m).[40] These countries, together with Tanzania, account for 92% of the loss in government revenue in the 'Rest of SSA' group. Many of these countries have relatively narrow tax-bases and fragile tax administration systems. In this context, it is not easy to substitute a tax for the lost tariff revenue. This could result in longer-term continued under-provision of public goods.

The final two columns in Table 4 indicate the extent to which the welfare effects of TAL are offset for Tanzania and Uganda when they gain some reciprocal access to neighbouring markets – but not privileged access, because they compete in those markets against supply from all other countries in the world as well as that market's domestic supply. The improvement in producer surplus under EAC TAL, relative to liberalising alone, is just $7m for Tanzania, with a loss of $4m due to somewhat higher prices for consumers under EAC total liberalisation; the total welfare difference between the two scenarios is just $3m. In Uganda, the gain to producers from access to EAC markets is exactly offset by the somewhat higher prices under EAC liberalisation, so there is no difference in total welfare. The third country in the EAC group, Kenya, experiences larger but similar welfare impacts from EAC TAL. Producers in Kenya lose $589m; consumers gain $859m; government revenue falls by $179m, so that the total welfare gain is $91m.

Further reciprocal access in all of Sub-Saharan Africa, along with access for all other countries to SSA markets, produces a slightly larger reduction both in losses for producers and in gains for consumers. This is because SSA liberalisation causes world prices to increase somewhat, and this offsets the fall in domestic agricultural prices in Tanzania and Uganda due to the removal of all tariffs.

Table 4 also shows the distributional impact of TAL in all Sub-Saharan Africa including South Africa. As domestic prices fall, both Tanzania (-$239m) and Uganda (-$101m) lose amounts that are among the larger losses of producer surplus in SSA countries. The other large falls in producer surplus are in Nigeria (-$1,268m), Kenya (-$579m), Angola

[40] See Appendix Three, Table A3.6 column *SSA FT*. The result for the Seychelles appears anomalous, with government revenue falling by almost $US 1bn, or one and a half times the value of total GDP valued in 2000 US$!

(-$206m), Cameroon (-$154m), Ghana (-$125m), Guinea (-$111m) and Mozambique (-$109). While these losses are offset by consumer surplus gains, [41] it is still likely that rural poverty will increase. The Table includes figures for the estimates of TAL by EAC, Tanzania only, Uganda only and the 'Rest of SSA[42]' for completeness.

In summary, comparing the results of EU TAL and SSA TAL, the total welfare impact of EU TAL is negative for Tanzania, Uganda and 'Rest of SSA'; however, it is positive under SSA TAL. This would appear to suggest that the real gains from agricultural trade liberalisation lie in the hands of Sub-Saharan African economies themselves. However, there are three caveats to this conclusion. First, since SSA TAL involves substantial losses for producers in the region, of over $3 billion, there would very likely be an increase in poverty, because most poor people live in rural areas in Sub-Saharan Africa. Second, government revenue in the region would fall by $1 billion (excluding the Seychelles). Given that these countries have relatively weak tax collection infrastructure and a relatively narrow taxable base, this reduction in tariff revenue could have a substantial impact on the provision of public goods such as education, health (combating HIV AIDS) and infrastructure spending. So the gains to consumers, especially urban consumers, from cheaper food, would be likely to come at a price for the poor. Third, the model ignores the labour market. Therefore, it ignores the welfare costs of rural unemployment and rural-urban migration that would arise if agricultural incomes were to fall significantly.

5.1.3. Agricultural liberalisation by Regions of the World

Table 5 presents simulations of the welfare impacts on Tanzania, Uganda, and the EU of TAL in different regions of the world. The first point to note is that TAL in China and India has the biggest positive effect on producer surplus in Tanzania and Uganda and in the 'Rest of SSA' group. It gives access to large and fast growing markets without eroding preferential trading arrangements as EU TAL does. Trade liberalisation in the US & other Non EU Developed Countries, and in South America, both have effects on producer surplus in Tanzania and Uganda that are roughly similar; but liberalisation in South America has less impact on producer surplus in the 'Rest of SSA'. Table 5 illustrates the importance of middle-income country agricultural trade liberalisation for SSA countries, especially liberalisation in the large and growing Chinese and Indian markets that have a significant effect on world markets.

Secondly, as with EU trade liberalisation, the positive impact on producer surplus is offset by the negative impact on consumer surplus of higher world prices. As a result total welfare effects are very small.[43]

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[41] See Appendix Three, Table A3.5, column *SSA FT*.

[42] Note that if Kenya were included in the 'Rest of Africa' for the EAC TAL scenario then the effects in that country alone would swamp the effects in the rest of non-EAC Sub-Saharan Africa (minus South Africa). The impact of EAC TAL in Kenya is a loss of producer surplus equal to –$589m, a consumer surplus gain of $859m, a government revenue loss of –$179m, and a total welfare change of +$91m. For this reason, Kenya is excluded from the 'Rest of SSA' category in simulating the effects of EAC TAL.

[43] See Appendix Three, Table A3.3-5, column *SSA FT*.

Finally, comparing across the rows for Tanzania, Uganda and the 'Rest of SSA', the sign of the welfare impact effects of total world free trade in agriculture is determined principally by the abolition of the individual country/SSA agricultural trade barriers. The welfare losses for producers due to SSA liberalisation more than outweigh the welfare gains due to unilateral liberalisation by the EU, US + Non EU Developed, South America, China and India combined.

Table 5: Welfare effects of TAL by global regional groupings

	EU	*US + Non EU Developed*[44]	*South America*	*China India*	*SSA*	*World*
Producer Surplus						
Tanzania	+44.4m	+14m	+13m	+39m	-239m	-92m
Uganda	+42.6m	+12m	+10m	+28m	-101m	+23m
Rest of SSA[45]	+475m	+351m	+182m	+736m	-3,557m	-1,216m
EU	-73,366m	+5,911m	+942m	+3,409m	+546m	-63,501m
Consumers Surplus						
Tanzania	-55m	-15m	-14m	-40m	+295m	130m
Uganda	-43m	-13m	-10m	-27m	+112m	-14m
Rest of SSA	-1,037m	-432m	-203m	-784m	+5,116m	+1,942m
EU	+57,015m	-4,937m	-829m	-3,656m	-611m	+44,807m
Government Revenue						
Tanzania	+0.7m	+0.3m	+0.2m	+1m	-35m	-35m
Uganda	+0.1m	+0.1m	+0m	+0.4m	-6m	-6m
Rest of SSA	+39m	+15m	+3m	+14m	-1,039m	-1,039m
EU	+27,785m	-1,802m	-222m	-669m	-45m	+28,459m
Total Welfare						
Tanzania	-9.6m	-0.6m	-0m	+1m	+21m	+3m
Uganda	-0.4m	-1m	-0.2m	+1m	+5m	+3m
Rest of SSA	-524m	-66m	-18m	-35m	+520m	-313m
EU	+11,434m	-828m	-109m	-916m	-110m	+9091m

Note: The columns do not sum horizontally to equal the result in the column for full world liberalisation because not all countries in the world are covered in the five country groups that are shown.

The same is true for the welfare gains to consumers. These outweigh the welfare losses due to increases world prices when the other regions liberalise their agricultural trade. Overall, however, total welfare impacts of world liberalisation in agriculture are very small indeed for both countries.

[44] 'Non-EU-Developed' includes Canada, Japan, Korean Rep., Switzerland, Norway, Israel, Australia, New Zealand, Macau, and Hong Kong.
[45] As in Table Four above.

The simulations also reveal some contrasts between EU TAL and TAL in other groups of countries and regions, as regards impacts on the 'Rest of SSA' group of countries. EU TAL shows the second largest gain for producers. However, this is offset by the largest loss for consumers. By comparison, TAL by the US and other non-EU Developed countries delivers about 60% of the gain for producers that EU TAL does, but at the cost of a much lower loss, both for consumers, and in terms of overall welfare (less than one eighth: -$66m as opposed to -$524m). TAL in China and India also results in a lower loss of consumer surplus than that caused by EU TAL and generates a similar, relatively small, total welfare loss for 'Rest of SSA', to that caused by the US and other Non-EU Developed group liberalisation.

This set of benchmark estimates reveal several important conclusions.

a) EU trade liberalisation should focus on tariff reduction rather than on reforming domestic support in order to benefit SSA countries the most.
b) The magnitude of the total welfare impacts on Tanzania and Uganda of EU TAL are small. This reflects the fact that both countries have only modest net exports of agricultural products, so the welfare gains for producers of higher world prices are offset more or less equally by the welfare losses to consumers.[46] Erosion of the value of preferential access to the EU further diminishes producer surplus gains.
c) Middle-income developing country trade liberalisation, especially China and India, is almost as important for producers in SSA as agricultural trade liberalisation in all developed countries put together.
d) Developed or middle-income developing country trade liberalisation hurts consumers, but benefits producers in SSA.
e) SSA country or regional trade liberalisation hurts producers and benefits consumers.
f) The welfare effects of SSA country liberalisation on Tanzania and Uganda (producer losses, consumer gains) offset and outweigh the opposite effects of developed and middle-income country agricultural trade liberalisation (producer gains, consumer losses).
g) Two offsetting effects will determine the aggregate poverty impacts of these welfare changes: poverty impacts of gains/losses to rural producers minus poverty impacts of losses/gains to rural and urban consumers, due to higher or lower domestic prices respectively.

[46] If a country is neither a significant net-exporter, nor net-importer, of the good in question then the difference between the increase in producer surplus and fall in consumer surplus due to a fully transmitted world price increase will be quite small. If the country is a significant net-exporter then the producer surplus gain will be significantly larger than the consumer surplus loss. The converse is true if the country is a significant net-importer. See Appendix Four for a simple partial equilibrium diagrammatic explanation of this point.

5.2: Policy Simulations

The more practical policy oriented proposals that have been proposed in the Doha development round are analysed next. These simulations reflect the fact that EU trade reform, as with other areas in the world, occurs predominantly in a multilateral context that is facilitated and managed by the World Trade Organization.

5.2.2 *The Harbinson Proposal: Results*

As with EU TAL, the pattern of world price changes under the Harbinson proposal shows increases in the prices of temperate agricultural goods that are larger than the price increases for tropical goods. World prices increase by somewhat less across both temperate and tropical products under the Harbinson proposal than under EU TAL and by significantly less than under the US proposal (compare Table 6 with Table 3 and with Table A2.1). Least Developed Country producers will not benefit as much from Harbinson liberalisation as the US proposed liberalisation principally because of lack of liberalisation in the developing world. However, consumers will lose less because of the less dramatic price rise for food imports.

Table 6: The Harbinson Proposal, Implied World Price Change by commodity

Commodity	% change	Commodity	% change	Commodity	% change
Livestock	0	Sorghum	-1	Cocoa beans	0
Bovinemeat	5	Pulses	1	Cocoa processed	1
Sheepmeat	4	Tomatoes	2	Tea	1
Pigmeat	3	Roots & Tubers	2	Tobacco Leaves	2
Poultry	3	Apples	3	Tobacco processed	0
Milk conc.	18	Citrus fruits	1	Hides & Skins	1
Butter	12	Bananas	3	Oilseeds temperate	3
Cheese	9	Other tropical fruits	1	Oilseeds tropical	2
Wheat	5	Sugar raw	2	Rubber	0
Rice	2	Sugar refined	5	Cotton	1
Barley	5	Coffee green	0	Vegetable oils	1
Maize	1	Coffee processed	0		

The total welfare impacts show the familiar pattern for Tanzania and Uganda. The total welfare changes are very small, negative for Tanzania and positive for Uganda. However, Tanzanian and Ugandan producers gain under the Harbinson proposal. Therefore it is likely that the Harbinson proposal will have some (modest) poverty reduction effects in rural areas in both countries.

When it comes to the 'Rest of SSA' group, the results for consumer and producer surplus, producers gain while consumers lose. So, Harbinson is more likely to be modestly pro-poor in the 'Rest of SSA'. The Harbinson proposal implements tariff cuts on the bound tariff rates and not on the applied rates. Therefore, the loss in government revenue for the

Developing countries in the 'Rest of SSA' group – at $9m – is very small. Much larger losses are simulated when LDCs have to cut their tariffs and have to cut their applied rates as under the US proposal where simulated government revenue losses are $414m (see Appendix 2).

Preference erosion is about half of the level as under EU TAL both for individual countries and for the region as a whole. The losses for SSA amount to $170m and again are spread across the same countries, Botswana, Namibia, Mauritius, Swaziland and Zimbabwe.[47] Tanzania loses $2m under the Harbinson proposal in lost quota rents. Uganda is unaffected.

Table 7: Welfare Impacts of the Harbinson Proposal

Harbinson Proposal	*EU*	*US*	*Tanzania*	*Uganda*	*'Rest of SSA'*
Producer Surplus	-41,258m	-2,293m	+47m	+42m	+656m
Consumer Surplus	+27,834m	+106m	-53m	-42m	-992m
Government Revenue	+20,462m	+2,050m	0.8m	0.2m	-9m
Total Welfare	+7,038m	-136m	-6m	0m	-345m

The overall welfare loss in 'Rest of SSA' is estimated to be $345m under Harbinson. The bulk of these losses occur in the island economy, Mauritius (-$73m), while other countries that suffer preference erosion also lose, Swaziland (-$22m), Botswana (-$21m), Namibia (-$13m). Finally the larger net food importers lose; i.e. Nigeria (-$110m) and Kenya (-$19m).[48]

The impact on, potentially pro-poor, producer surplus across SSA countries is positive except for those countries that lose most from preference erosion. Some larger agricultural producers like Nigeria ($232m) and Kenya ($71m) gain most in terms of producer surplus, while another group of countries make double digit producer surplus gains that are, with the exception of the Cameroon ($50m), somewhat less than those predicted for Tanzania and Uganda.[49]

5.2.3. *Reflection on Results*

Overall, the producer, consumer and total welfare impacts in Tanzania and Uganda, under Harbinson are of the same order as those that would occur in these two countries under total unilateral EU liberalisation.

They are not of sufficient magnitude, however, to kick-start a major process of development or poverty reduction in either country. This is because the gains for producers are not especially large. Yet, this does not mean that they are insignificant.

[47] See Appendix Three, Table A3.6 for details.
[48] See Appendix Three, Table A3.3 column *Harb*, for details.
[49] See Appendix Three, Table A3.4 column *Harb*, for details.

With the offsetting effects for consumers, however, overall poverty impacts will be small. In general, SSA countries have a large subsistence agricultural sector. Households in the subsistence sector, if they remain in that sector, will experience no change in total welfare with changes in agricultural prices. Any increase or decrease in the market value of their output is offset exactly by changes in the opportunity cost of their subsistence consumption of that output. It is not surprising therefore, that in many SSA countries, including Tanzania and Uganda, producer surplus changes are substantially offset by consumer surplus changes.

5.3 Commodity Impact Analysis

To explore the importance of agricultural trade liberalisation by commodity, the results from the Harbinson simulation are reported in Tables 8 and 9. This scenario is the last official proposal to have been filled out in detail and discussed in the Doha process. Here the simulation is the standard version of the ATPSM model, in which the change in exports is calculated as a percentage of the increase in domestic production and not as the residual of the market clearing identity (See Appendix 1 for further details).

Looking at the change in export value by commodity in Tanzania, bananas account for almost 45% of the change, while seven other product groups where exports increase from more than a zero or very low base, account for another 30% - these are, in order of importance, Other Tropical Fruits, Sheepmeat, Raw Sugar, Poultry, Butter and Cheese.

Table 8: Simulated changes in Tanzanian Agricultural Export Value by commodity under the Harbinson proposal

Commodity Export	Change ,000$US	Commodity Export	Change ,000$US	Commodity Export	Change ,000$US
Bovinemeat	0	Sorghum	-5	Coffee processed	2
Sheepmeat	2,563*	Pulses	419	Cocoa beans	3
Pigmeat	374**	Tomatoes	3,514	Cocoa processed	0
Poultry	1,382*	Roots & Tubers	1,880	Tea	115
Milk conc.	24	Apples	0	Hides & Skins	60
Butter	640**	Citrus fruits	0	Oilseeds temp.	153
Cheese	284**	Bananas	15,515*	Oilseeds tropical	792
Wheat	49	Other trop. Fruits	3,161*	Rubber	0
Rice	51	Sugar raw	1,971*	Cotton	849
Barley	0	Sugar refined	424	Vegetable oils	8
Maize	3	Coffee green	177	Total	34,415

Those figures marked with ** indicate zero initial exports, those marked with * indicate a large increase relative to a low initial export volume.

By way of caution, the initial exports in several of the commodities where the largest export gains result are very low and the predicted increase in export volume is quite significant. The model predicts that Tanzania would begin to export livestock, pigmeat (298mt), butter (441mt) and cheese (132mt) not having any exports of these products in 2001. In addition, the predicted large export volume increases are as follows: from 21

metric tonnes to over 32,000 metric tonnes of banana exports, from 10 metric tonnes to over 4,000 metric tonnes of Other Tropical Fruit exports, and from 1 metric tonne to 998 metric tonnes of poultry exports.[50]

It should be noted that exports can arise in sectors where no exports have previously occurred. Consultation with our research partner in Tanzania suggests that the increase in exports of bananas and other tropical fruit could be possible at least at a regional level though it is not exactly clear where the export market would be. Exports of sheepmeat are possible if this includes goats which are exported to the Middle East. The model also predicts increases in livestock exports of about $5m although the data is unreliable so they are not included in Table 8. Tanzania does export livestock to the Middle East. Poultry is imported from South Africa rather than exported so the gains in poultry exports look unlikely. Butter and cheese production is very low so exporting looks improbable.

Table 9: Simulated changes in Ugandan Agricultural Export Value by commodity under the Harbinson proposal (standard model)

Commodity Export	Change ,000$US	Commodity Export	Change ,000$US	Commodity Export	Change ,000$US
Bovinemeat	0	Sorghum	0	Coffee processed	0
Sheepmeat	3,002**	Pulses	1,016*	Cocoa beans	0
Pigmeat	3,007**	Tomatoes	338**	Cocoa processed	0
Poultry	1,807*	Roots & Tubers	1,074*	Tea	24
Milk conc.	7	Apples	0	Hides & Skins	79
Butter	0	Citrus fruits	0	Oilseeds temp.	2,305
Cheese	0	Bananas	21,458*	Oilseeds tropical	225
Wheat	1	Other trop. fruits	2	Rubber	0
Rice	7	Sugar raw	3,245*	Cotton	408
Barley	0	Sugar refined	27	Vegetable oils	-1
Maize	4	Coffee green	536	Total	38,577

Those figures marked with ** indicate zero initial exports, those marked with * indicate large increase relative to a low initial export volume.

The export gains in sectors where Tanzania would either have to, or virtually have to, 'start exporting from scratch' amount to 75% of the total changes in export value predicted by the ATPSM simulation. Overall the growth in export value is modest as an aggregate sum, at $34.4m. However, it represents a 15% increase in the value of Tanzanian exports of agricultural goods (included in ATPSM) in 2001[51]. If those start-or-

[50] The reason for these large increases is that the ATPSM model, when initial imports (M) are low or even zero, sometimes predicts an increase in domestic production (P) relative to domestic Consumption (C) that implies negative imports when imports are calculated as the residual of the market clearing equation M=C+X-P. In this circumstance, the restriction in the standard version of the model on the growth of exports (X) in fixed proportion to output is relaxed and exports are increased to ensure non-negative (zero) imports. In short, the surplus additional production, over and above the estimated consumption response, is assumed to be exported.

[51] A 7.3% increase in total Tanzanian 2001 export value.

virtually-start-exporting-from-scratch sectors are excluded, the percentage increase, over 2001 levels, in export value of ATPSM products, would be just 4%.

For Uganda, the gains in export value show a similar pattern of concentration. Those products where initial exports in 2001 were zero account for 16% of the increase in export revenue – namely Sheepmeat, Pigmeat, and Tomatoes. Amongst the rest, in order of importance of contribution to increased export revenues are: bananas, raw sugar, temperate oilseeds, poultry, roots & tubers, pulses and tobacco leaves. These products, when taken together, account for 75% of the increase in export value predicted under the Harbinson proposals.

Most of these gains accrue to 'virtually start-exporting-from-scratch' sectors, and consequently one can question their realism. Exports are predicted to increase, for bananas, from 170 to 44,000 metric tonnes, for poultry, from 3 to 1,300 metric tonnes, for pulses, from 15 to 2,000 metric tonnes, for raw sugar, from 3 to 9,000 metric tonnes, and finally, for exports of roots & tubers show an increase from 3 to 12,500 metric tonnes.

In Uganda's case, the start-or-virtually-start-from-scratch export sectors account for almost 86% of the gains in export value. The total gain in export value represents a 8.5% increase over the value of total Ugandan exports in 2001.[52] It represents a 17% increase over the 2001 value of Ugandan exports of ATPSM product categories.

In summary, for both Tanzania and Uganda, the simulated Harbinson proposal promises increased export earnings but a significant share of these increases implies developing export markets that did not really exist in 2001. In both cases, increasing banana exports from very low initial year exports contributes the largest share to the increase in export revenue, 50% in the case of Uganda. However, this is another example where the inability to model preferences in ATPSM may bias the result, as under EBA both countries already have improved access and will have free access to the EU market for bananas after 2006.

Comparing these results with the welfare measures analysed in the previous section, it is clear that the primary impetus that the Harbinson proposal would give is through increased domestic prices.

6. Conclusions

This paper uses the ATPSM model to simulate the impact of different agricultural trade liberalisation scenarios on Sub-Saharan African economies with a particular focus on Tanzania and Uganda. The use of such models is necessary to quantify the impacts of trade policy changes as they are mediated through the world trading system in agricultural products. ATPSM has important advantages over previous attempts at such modeling and quantification. It has extensive and disaggregated country coverage, and

[52] 12.5% increase in total Ugandan 2001 agricultural export value.

also a higher level of commodity disaggregation than in many other models. It allows very flexible analysis of impacts both on individual countries and readily specifiable country groupings. It is capable of implementing a reasonably detailed approximation to real world trade policy scenarios. It can estimate cuts to the applied tariff rates thus avoiding the overestimation of tariff cuts if the bound tariffs are cut and tariff overhang is ignored. It generates a rich set of empirical results from each scenario covering information on prices, volume trade flows, changes in quota rents, changes in government revenue and a full range of welfare effects. Finally, ATPSM is publicly available and relatively easy to use.

ATPSM has some shortcomings for the purpose at hand. It is a quite simple partial equilibrium static model and thus ignores general equilibrium effects such as factor market constraints or dynamic effects. It does not include full bilateral tariff information on out-of quota tariffs. As a result, it is not possible to incorporate non-quota-based preferential trading agreements or regional trading agreements. Moreover, the lack of inclusion of these types of agreements has potentially important effects that would tend to over-estimate the benefits on Sub-Saharan Africa from further trade liberalisation by richer countries in the world. Finally, it assumes complete transmission of world prices through to the domestic market mediated only through the tariff and subsidy structures that are amenable to trade policy reform. In Sub-Saharan Africa however, the condition of trading infrastructure, both international and domestic, frequently dampens or prevents the transmission of world prices through to the domestic market, thus reducing the impact on producer surplus and consumer surplus.

This paper started with a review of the literature on the impacts of trade reform on SSA which highlighted the point that country by country impacts are likely to be very different. In the results, three categories of SSA countries can be identified in terms of the welfare impact of trade reform. The first two categories partially overlap. They are countries that are exposed to preference erosion and countries that are significant net-importers of agricultural products. These countries suffer welfare losses from trade reform by developed countries. The third group is of countries that remain largely unaffected by trade liberalisation because they have reasonably balanced trade in agricultural goods and are not exposed to preference erosion.

The overall impact of trade liberalisation on Tanzania and Uganda proves to be modest in terms of total welfare effects. However, the impact in terms of poverty might be beneficial in those scenarios that generate the most significant gains in producer surplus. Here agricultural trade liberalisation in China and India seems more promising than any other scenario. This is an interesting change in focus towards gains from liberalisation of agricultural trade by large middle-income developing countries.

The gains in producer surplus arising from liberalisation in other countries do appear to be significant in Tanzania and Uganda. However, there are two important caveats to this optimistic prediction. First, the bulk of these gains to producers are predicated on the transmission of world prices through to higher producer prices within the countries.

While this may well be the case near the major port or capital city, it is less likely that it will apply in the rural areas further distant where many of the poor live.

A large share of the expansionary stimulus to greater exports provided under the Harbinson liberalisation scenario occurs in products where neither Tanzania nor Uganda export large quantities at present. While favourable world markets are a necessary condition for increasing exports they may well be insufficient. There is no guarantee that other infrastructural, quality control and sanitary/phytosanitary issues will not present obstacles that are not readily surmountable in realizing that market potential. Yet, if these market opportunities could be realized, then the contribution to export earnings from the 'ATPSM' range of agricultural products would be significant.

Unilateral tariff cuts by SSA countries themselves produce the largest total welfare gains for Tanzania and Uganda. However, these are relatively small, and come at the price of large falls in producer surplus that are likely to increase poverty, and also losses in government revenues that are likely to undermine the provision of public goods.

The main gains from EU trade liberalisation come from tariff cuts and not as much from changes to domestic support or export subsidies; though export subsidies may have more direct impacts on the poor that are not captured here. The immense effort that has gone into EU decoupling would seem to be not that significant when it comes to welfare impacts in SSA. Some in the EU cite the recent decoupling reforms as evidence of the effort that the EU is making to build fairer agricultural trading arrangements. However, the effort seems largely irrelevant when it comes to SSA countries. This point finds a supportive echo in the recent book by William Cline. He points out that, in the Doha round, 'a disproportionate amount of' developing country 'attention seems to have been focused on reducing industrial-country subsidies for agriculture'. His suggestion is that 'their efforts should go more heavily towards reducing tariffs and tariff-rate quotas and towards increasing the volume thresholds at which the latter apply. (Cline, 2004, p.120)

The disaggregated picture presented lends support to the more aggregate regional analysis presented by Bouet et al. (2004) and the various papers by Laird, Peters and Vanzetti. It runs counter to the more optimistic analysis by the World Bank (2004).

Of course, the results generated here have the limitation of being derived from a partial equilibrium model. However, one should bear in mind that introducing other sectors, and especially resource constraints, in a general equilibrium model tends to mitigate the positive effects of an expansion in agriculture. Resources drawn into that sector have the effect of tightening constraints in other sectors so that total welfare impacts tend to be lower. General equilibrium models also allow for further positive effects through the increase in aggregate demand as one sector expands. It is not likely, however, that a general equilibrium approach will greatly magnify the partial equilibrium results unless it includes strong positive externalities, such as growth in productivity through openness to trade, as in the World Bank LINKAGE model. These remain rather speculative in their empirical foundation.

Global and EU agriculture reform appears to offer only modest opportunities to Tanzania and Uganda and cannot be expected to have a significant impact immediate impact on poverty in either country. Of course, dynamic gains are probably larger than the purely static impact analysis simulated in ATPSM.

The results are also ambiguous in terms of other SSA countries. None of them stand to gain hugely while some are exposed to significant potential losses. A small number of these lose significantly through quota-based preference erosion – a factor that impacts slightly on Tanzania. Others are large net-importers of food and lose significantly, in the aggregate if not in a per capita sense. It is striking that apart from Zimbabwe which, at least in 2001, was a significant net-food-exporter, no SSA countries show significant positive total welfare effects, and most show negative total welfare effects, from all the scenarios of trade reform apart simulated with the single exception of unilateral trade reform by the countries themselves.

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Appendix One: ATPSM Model Description

Model structure

In ATPSM, trade barriers are measured in tariff equivalent terms. Farm price (domestic) support is converted to tariff *ad valorem* equivalents by dividing the per unit level of support by the world price. The model includes information on export subsidies and on tariff rate (import) quotas. An important feature is that it applies tariff rate changes to both bound (permissible) and applied (actual) tariff levels.

It is a partial equilibrium model that does not model interactions between different sectors in the economy nor constraints in the supply of factors of production such as land, labour and capital. Neither does it allow for exchange rate changes. The model consists of a system of four equations representing supply, demand, exports and imports. These four equations are solved simultaneously.

The supply and demand functions can be described as being driven by domestic border prices, which are a function of world prices weighted by an average of tariffs, export subsidies and domestic support. The domestic price is akin to a border wholesale price. However, given that the model contains no separate data on domestic prices, demand for a particular agricultural commodity is really a function of the world price of that commodity, a weighted average of tariffs and the price elasticity of demand. Changes in supply are similarly a function of world prices, weighted tariffs and the price elasticity of supply (which 'represents' the price stimulated outcome of the implicit production structure and factor supplies). There is no information in the model on price transmission margins due to transport and marketing costs.

The country level model clears in one of two ways. In the standard version, exports change in fixed proportion to the changes in supply. The factor of proportionality is the share of exports in supply. The change in imports is derived from the market clearing condition - supply from domestic sources and imports must equal the demand from domestic sources and exports. This version of the model is used to calculate the effect on exports of trade reform in Section 5.3.

In the Armington version, the imported variety of agricultural goods is viewed as an imperfect substitute for the domestically supplied variety of the same good. The change in imports is determined by the change in relative (domestic and import) prices and the elasticities of substitution between foreign and domestic varieties, the so-called Armington elasticities. In this version, it is the change in exports which is derived from the market clearing condition. This version is used for all the other simulations. The results do not differ much between both models except in terms of predicting trade flows. Exports are calculated as a residual in the Armington version, which more accurately models import changes, so it is less suitable for analysis of export changes.

The model structure features both imports and exports. This is an important feature because negotiators are interested in trade flows in both direction and tariff revenues. These are not available in a net trade model.

Exports and imports are aggregated over all countries to form the world market. Equilibrium requires that the sum of all changes in exports minus the sum of all changes in imports equals zero. In other words, the world market clears. Trade policy change impacts are simulated by calculating the change in the world price that results from the policy change and then deriving the changes in quantities supplied/demanded and imported/exported, using the relevant elasticities of demand and supply.

Another useful feature is that when doing a country analysis one can easily adjust the price elasticities of supply and demand. Evidently supply response to a world price increase will influence the overall increase in producer surplus. Details of the own price elasticities of supply data used in ATPSM for Tanzania and Uganda are shown in Appendix Three. For most products (with the exception of tomatoes and citrus fruits) these are less than one, indicating a quite inelastic response. Even so, for some products, these may be overoptimistic when it comes to SSA agricultural supply response for reasons given above.

Representation of policy instruments

Four principal types of policy instruments are modelled in ATPSM. These are 'out of quota' tariffs, bilateral quotas and 'in quota tariffs', export subsidies and domestic support. All domestic prices are a function of world market prices and border protection or special domestic support measures. Specific tariff/support averages induce price wedges between the world price and the domestic wholesale border price and the producer 'border' prices respectively. Both these tariff/support averages are computed in two steps. The first step, common to both, is to calculate the average tax on domestic consumption due to import tariffs and export subsidies. Frequently agricultural goods are both imported and exported, hence the need to average the effects of tariffs on both. The tax on domestic consumption (t_d) is computed as a trade weighted average of the import tariffs and the export tariffs.[53]

The second step is to compute the average tariff that, when applied to the world price, generates the domestic border price. This is the average of the import tariff weighted by imports and the tax on domestic consumption weighted by domestic supply (S_d).[54] The second step when calculating producer wholesale price is to calculate the domestic market supply tariff. This generates the producer wholesale price when it is applied to the world price. It is the average of export tariffs weighted by exports and the tax on

[53] $t_d = (Xt_X + Mt_M) / M + X$ where M = Imports and X = Exports.

[54] $t_c = (Xt_X + S_d t_d) / D$, *where* D = *demand*

domestic consumption weighted by domestic supply, divided by supply plus the *ad valorem* domestic support tariff (t_p).[55]

Quotas on imports generate significant quota rents. ATPSM assumes that these rents are captured by exporting producers in the case of sugar and mainly captured by importing consumers in the case of all other products except beef.[56] Note that this means that preference erosion, as it affects Sub-Saharan Africa, can only occur for sugar and beef in the model, even though other bilateral quotas are also modelled. It is assumed that these rents are transferred without any dissipation through inefficiencies. These rents are eroded as out-of quota bound tariffs are reduced; however, producers are assumed not to respond to the changes in rents. This implies that the welfare effects of the erosion of quota rents as tariffs are reduced is underestimated to the extent that exporters or importers that benefit from quota rent may stop exporting or importing, respectively, when the value of the rent is eroded. However, where quotas are filled, and price changes are small, this should not be a serious problem.

The model assumes that import quotas are filled, so that the (applied) out-of-quota tariffs, rather than in-quota tariffs, drive the domestic prices. In-quota tariffs do not have any price and quantity effects because they are not binding; instead they change the distribution of the in-quota rents. For quotas where rent accrues to the exporters, it is the distribution between exporters and importers which is affected; for quotas where rent accrues to importers, it is the distribution between consumers and taxpayers in the importing country.

Calculating tariff equivalents of export subsidies is linked to export quotas in ATPSM. If exports are equal to the export quota (quotas are assumed to be filled) then the export subsidy in unit tariff form is the subsidy divided by the quota. If, on the other hand, exports exceed the quota, then it is assumed that the subsidy extends to total exports so that the unit tariff is calculated as the total value of the subsidy divided by the total export volume. If the country exports more than the quota it implies that surplus-to-quota exports are competitive at the world market price. Hence, the world market price must prevail domestically and domestic protection is eliminated. The export subsidy then becomes simply a transfer of income. The ratio of the unit tariff to the world market price in both these cases is its *ad valorem* equivalent.

Domestic support is expressed in *ad valorem* tariff equivalents that are added to the wholesale price in order to obtain the farm supply price. Domestic support in ATPSM excludes all green box and blue box domestic support and also, to avoid double counting, it also excludes amber box domestic support that is conflated with border support (i.e. the market price support element). Domestic support in the model thus refers to coupled direct payments not protected by the blue box.

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[55] $t_S = (Xt_X + S_d t_d) \big/ S + t_p$

[56] See Appendix Three, Table A2.2 for details of the initial import quota rent that exporters receive in the SSA-SA region as reported in the ATPSM database. Rent on sugar quotas ($254.24m) and on beef quotas ($67.4m) account for 99.5% of the total initial quota rent ($323.18m)) received in the region.

Appendix Two: The US and Cancún proposals – description and results

The US Initial Proposal- Scenario Description

The US initially proposed that applied tariffs be reduced in all countries (including LDCs) according to a harmonising Swiss formula whereby higher tariffs are reduced more than proportionately. The maximum final tariff proposed was 25%. This is also the coefficient for the Swiss formula so that final applied tariffs are calculated as $finaltariff = \frac{initialtariff * 25}{initialtariff + 25}$. The other elements of the US proposal were an elimination of in-quota tariffs and a 20% increase of import quotas. This proposal implied more than proportionate cuts in developing country bound tariffs. This is because developing countries typically have very high bound tariff levels on agricultural products. By applying the Swiss formula to the applied rates, the new bound rates for developing countries after the US proposal would be equal to the new reduced applied tariff. So, for LDCs and developing countries, the cut in bound (or permissible) tariff levels would be more than proportionate. EU applied agricultural tariffs would also be cut radically, as they are significantly higher than SSA country applied agricultural tariffs (see Table One, below).

The US proposal also suggested that domestic support should be drastically reduced and eventually eliminated. More specifically, the Aggregate Measurement of Support (AMS) (amber box) as well as production-limited (blue box) support should be reduced over 5 years to at most 5 per cent of the average value of agricultural production. All non-exempt domestic support would be eliminated by an unspecified later date. *De minimis* payments, i.e. exempted support not exceeding five per cent of the total value of production, would continue to be exempt from reduction and eventual elimination. Developing countries would be permitted to provide domestic support under special conditions in order to facilitate agricultural development and enhance food security.

In addition, the US proposal stipulated that all export subsidies should be eliminated, and that unspecified limits should be placed on officially supported export credits, food aid, and other forms of export support.

These provisions are simulated in ATPSM as the abolition of all export subsidies and domestic support in all countries across all agricultural commodities.

The US Proposal: Results

The earlier simulations showed that opening up agriculture markets, in both the developing and developed world, helped producers in the least developed countries like Tanzania and Uganda. Under the US proposals, all countries including LDCs would have to make cuts to their applied tariffs. This hurts LDC producers as they face more intense competition. However, LDC exporters also get better access to foreign markets that offset this. In Table 6, while the biggest price increases are for temperate goods, the prices of

tropical goods also increase considerably, with the exception of Sorghum. Correspondingly, producers benefit in countries that export tropical agricultural goods, as do those exporting temperate agricultural goods.

These price changes are more considerable than those caused by EU TAL shown in Table 2. Dairy products, in particular, show a large increase in world price; grains also increase in price substantially, as do temperate oilseeds and meat. Most SSA exports show lower price rises with the exception of refined sugar. From these price changes alone, it is apparent that a country that imports temperate agricultural products and grains like wheat or barley, and exports products like coffee, tea, and fruits, tobacco, hides and skins will experience a terms of trade deterioration in their agri-food trade.

Table A2.1: US Initial Proposal, Implied World Price Change by commodity

Commodity	% change	Commodity	% change	Commodity	% change
Livestock	0	Sorghum	-2	Cocoa beans	0
Bovinemeat	10	Pulses	4	Cocoa processed	2
Sheepmeat	6	Tomatoes	3	Tea	5
Pigmeat	6	Roots & Tubers	5	Tobacco Leaves	4
Poultry	7	Apples	4	Tobacco processed	0
Milk conc.	27	Citrus fruits	3	Hides & Skins	1
Butter	23	Bananas	5	Oilseeds temperate	8
Cheese	20	Other tropical fruits	3	Oilseeds tropical	4
Wheat	9	Sugar raw	5	Rubber	0
Rice	4	Sugar refined	10	Cotton	5
Barley	9	Coffee green	0	Vegetable oils	4
Maize	4	Coffee processed	1		

The story behind the total welfare impacts for Tanzania and Uganda of the US proposal is by now familiar from the benchmark simulations (Table 7). The gains/losses to producers are cancelled out through losses/gains to consumers from higher/lower prices. The net total welfare gains for Uganda are minuscule while Tanzania actually suffers a modest fall in total welfare. However, the poverty impacts are likely to be different in both countries. Ugandan producers gain, through increased market access, while Tanzanian producers lose. This is due to the fact that Tanzanian applied agricultural tariffs are higher (many are 25%) than Ugandan applied tariffs, so they would be cut by proportionately more (reduced to 12.5% - a 50% cut) under the Swiss formula with a coefficient of 25. As a result, domestic prices for producers are more negatively affected in Tanzania than in Uganda. In Uganda, on the other hand, since tariffs are already lower (the highest being 15%), they are not cut by as much (15% cut to 9.4%), so the tendency for domestic prices to fall, because of the tariff cut, is more than offset by the effect of the rise in world prices. Overall, Ugandan producers gain, while consumers there lose. On this basis, it is likely that, under the US proposal, urban poverty would reduce in Tanzania and rural poverty would increase, whereas the reverse is more probable in Uganda.

Table A2.2: Welfare impacts of the US Proposal

US Initial Proposal	*EU*	*US*	*Tanzania*	*Uganda*	*'Rest of SSA'*
Producer Surplus	-57,037m	-695m	-20m	+50m	-524m
Consumer Surplus	+34,069m	-3,751m	+27m	-47m	+677m
Government Revenue	+33,139m	+3,988m	-8m	-2m	-414m
Total Welfare[57]	+10,170m	-457m	-1m	+0.1m	-261m

By comparison, the 'Rest of SSA' suffers a total welfare decrease. This is mainly due to the large fall in Government revenue of -$261 million. The loss in government tariff revenue is just under half of that which would occur under 'Rest of SSA' TAL (see Table 6 above). This is not surprising given that average applied agricultural tariffs in the region are of the order of 25% and the Swiss formula implies a 50% reduction in tariffs at this level. The loss in government revenue dominates the total welfare effect. The net welfare gain resulting from the changes in consumer and producers surplus is estimated to be just $153m (PS –$524m, CS +$677m) but this is significantly less than the loss in government revenue.[58] Excluding the island economy of Mauritius (-$106m), and the large food importer Nigeria (-$61m), then the total welfare impact on the 'Rest of SSA' group, due to the US proposal, reduces to a loss of $96m, which is made up of more modest welfare losses that are offset by even smaller welfare gains in a few countries.[59]

Interestingly, about half of the countries in SSA are like Uganda where, having lower tariffs to start with, producer surplus increases, because the increase in domestic prices due to higher world prices outweighs the drop in domestic prices due to tariff cuts. The other half are like Tanzania, where higher tariff cuts outweigh the effect of higher world prices on domestic prices and producer surplus falls.[60] Government tariff revenue is cut by significant amounts in just a few countries, especially the Gambia and Kenya.

The simulation also demonstrates just why this proposal was so unpalatable for the EU. The losses to producers in Europe are greater than those that would occur if all EU agricultural tariffs and export subsidies were unilaterally cut to zero (see Table 3). There are significant welfare gains to the EU but these occur in a diffuse manner for EU consumers and taxpayers while the losses are highly concentrated among EU producers. In contrast, the losses to US producers are twenty times smaller than those for EU producers. This was politically palatable for the US since only modest net losses occur for the US in terms of total welfare.

[57] Vanzetti & Peters (2003) estimated that the total welfare effect of the US initial Doha proposal for agricultural trade liberalisation on the Dem Rep of Congo was relatively large at +$603m. If this figure were included here the total welfare impact on the 'Rest of SSA' group would be a gain of over $340m.
[58] The loss in government revenue in the Seychelles of -$500m, is equivalent to 77% of 2001 GDP.
[59] See Appendix Three, Table A3.3 column *US*, for details.
[60] See Appendix Three, Table A3.4 column *US*, for details.

The Cancún 'Proposal'- Scenario Description

In reality, the Cancún text, which has been so roundly criticized by developing countries, is not a proposal and cannot be treated as such. Instead, it is an attempt, to structure the negotiations in such a manner as to orient them in a more focused way towards achieving agreement on the precise formulae for reductions in tariffs, domestic support, and export subsidies.

In this light, the UNCTAD interpretation of a possible 'filled out' Cancún text on tariff reductions is presented here. This is useful because it allows us to compare the difference between the Harbinson proposal and the UNCTAD version of the Cancún proposal in their impact on individual countries including Tanzania and Uganda. The following is taken from Peters and Vanzetti (2004). It is the Cancún text with UNCTAD figures filled in italics.

> The formula applicable for tariff reduction by developed countries shall be a blended formula under which each element will contribute to substantial improvement in market access for all products. The formula shall be as follows:
>
> i. *40*% of tariff lines shall be subject to a *36*% average tariff cut and a minimum of *15*%; for these import-sensitive tariff lines market access increase will result from a combination of tariff cuts and TRQs.
> ii. *40*% of tariff lines shall be subject to a Swiss formula with coefficient *25*.
> iii. *20*% of tariff lines shall be duty-free.
>
> The formula applicable for tariff reductions by developing countries shall be as follows:
>
> i. *50*% of tariff lines shall be subject to a *24*% average tariff cut and a minimum of *10*%; for these tariff lines market access increase will result from a combination of tariff cuts and TRQs. Within this category, developing countries shall have additional flexibility, under conditions to be determined, to designate Special Products (SP), which would only be subject to a linear cut of a minimum of 5%, and no new commitments regarding TRQs; however, where tariff bindings are very low (below *30*%), there shall be no requirement to reduce tariffs.
> ii. *40*% of tariff lines shall be subject to a Swiss formula with a coefficient of *50*.
> iii. *10*% of tariff lines shall be bound between 0 and 5%, taking into account the importance of tariffs as a source of revenue for developing countries

UNCTAD have developed a routine within ATPSM that applies these reductions to the HS six digit level bound tariff rates. Individual bound tariff lines are assigned to one or other of the tariff cutting bands according to a criterion that minimizes the cuts in the applied rates. The welfare impacts are then calculated by estimating the impacts of the cuts in the applied rates. The full simulation criteria, for the Cancún formula, are as follows.

Developed countries:

i. 40% of tariff lines are subject to the Uruguay Round formula, where bound out-quota tariffs of the four most sensitive products are reduced by 15% and the next 10 most sensitive products by 44.4% (average 36%),
ii. 40% of tariff lines are subject to the Swiss formula with a coefficient of 25,
iii. 20% of tariff lines with the lowest initial bound values are reduced to zero;
iv. export subsidies are reduced by 80%
v. domestic support is reduced by 60%.

Developing countries:

i. 10% most sensitive tariff lines are reduced by 5% (Special Products),
ii. next 40% most sensitive products are subject to Uruguay Round formula, where bound out-of-quota tariffs of the 4 most sensitive products are reduced by 10% and the next 10 most sensitive products by 26.7% (average of last two categories 24%),
iii. 40% of tariff lines are subject to the Swiss formula with a coefficient of 50,
iv. the remaining 10% are reduced to 5%;
v. export subsidies are reduced by 70%,
vi. domestic support reduced by 20%.

Least-developed countries: no reductions.

Note that the Cancún simulation contains the same assumptions about the reductions in export subsidies and domestic support as the Harbinson simulation. Therefore, the difference between the two simulations is entirely due to the different changes to market access arrangements.

The Cancún 'Proposal': Results

The changes to world prices in the Cancún 'proposal' are somewhat lower again, on average, than those predicted under the Harbinson and US proposals. There are exceptions however, namely Sugar (especially refined), Hides &Skins, Oilseeds (especially temperate) and Vegetable Oils (see Table A1.1 below).

The Cancún 'Proposal' does predict greater gains for producers in Tanzania and Uganda than the Harbinson proposal. This is presumably due to the fact that some products such as tropical oilseed, vegetable oils, and sugar have a higher world price under Cancún than under Harbinson**.** For both countries, the difference in producer surplus, between the two scenarios, is of the order of just under $10m. As with all the scenarios, this gain is offset by consumer losses, so that total welfare impacts are small and once again slightly negative for Tanzania and positive for Uganda**.** The higher producer surplus gains do suggest that at least for Tanzania and Uganda the Cancún scenario may be marginally more pro-poor than Harbinson.

Table A2.3: The Cancún 'Proposal', Implied World Price Change by commodity

Commodity	% change	Commodity	% change	Commodity	% change
Livestock	2	Sorghum	0	Cocoa beans	0
Bovinemeat	4	Pulses	1	Cocoa processed	0
Sheepmeat	2	Tomatoes	1	Tea	0
Pigmeat	2	Roots & Tubers	2	Tobacco Leaves	1
Poultry	2	Apples	2	Tobacco processed	0
Milk conc.	15	Citrus fruits	1	Hides & Skins	2
Butter	10	Bananas	3	Oilseeds temperate	9
Cheese	8	Other tropical fruits	1	Oilseeds tropical	5
Wheat	4	Sugar raw	5	Rubber	0
Rice	1	Sugar refined	11	Cotton	1
Barley	5	Coffee green	0	Vegetable oils	2
Maize	1	Coffee processed	0		

Producers in 'Rest of Africa' group also gain by slightly more under Cancún than under Harbinson, while losses to consumers also increase. Due, in part, to the slightly higher losses in government revenue, the 'Rest of SSA' group benefits less from the Cancún scenario than the Harbinson scenario by about $80m.

Comparing across countries, broadly speaking, many SSA countries do better from the point of view of producer surplus gains under 'Cancún' than under Harbinson. There are exceptions however, notably Kenya and Mauritius, where producers lose under Cancún, whereas they had gained under Harbinson (See Table A2.4).

Table A2.4 Welfare Impacts of the Cancún 'Proposal'

Cancún 'Proposal'	*EU*	*US*	*Tanzania*	*Uganda*	*'Rest of SSA'*
Producer Surplus	-40,441m	-2,661m	+55m	+51m	+705m
Consumer Surplus	+26,807m	+1,419m	-65m	-51m	-1066m
Government Revenue	+19,512m	1,371m	+1m	+0.2m	-66m
Total Welfare	+5,879m	+130m	-9m	+0.2m	-428m

Comparing the welfare impact of the Cancún 'Proposal' and the Harbinson Proposal for the US and the EU, the outcomes are very similar in terms of total welfare and producer surplus. The main differences occur for the US in Government revenue and Consumer surplus. Cancún delivers more consumer surplus gains to the US, but lower savings in Government revenue, leaving the total welfare effect unchanged. The EU is less well off under the Cancún proposal by about $1bn, which is the difference in the increase in consumer surplus, since the reduced government revenue gain, relative to the Harbinson scenario, is cancelled out by the reduced producer surplus loss.

Appendix Three: ATPSM Data and Results for all SSA countries

Table A3.1: ATPSM Own Price Elasticities of Supply for Agricultural goods in Uganda and Tanzania

ATPSM Own Price Elasticity of Supply	*Tanzania*	*Uganda*
Livestock	0.4	0.6
Bovinemeat	0.25	0.21
Sheepmeat	0.18	0.17
Pigmeat	0.3	0.25
Poultry	0.3	0.25
Milk conc.	0	0.11
Butter	0.07	0.07
Cheese	0.55	0
Wheat	0.77	0.61
Rice	0.76	0.61
Barley	0.6	
Maize	0.6	0.47
Sorghum	0.68	0.51
Pulses	0.4	0.4
Tomatoes	1.2	1.2
Roots & Tubers	0.3	0.3
Apples	0	0
Citrus fruits	1.42	0
Bananas	0.48	0.48
Oth. trop. fruits	0.48	0.48
Sugar raw	0.62	0.62
Sugar refined	0.62	0.62
Coffee green	0.2	0.2
Coffee proc.	0.18	0.18
Cocoa beans	0.45	0.45
Cocoa proc.	0	0
Tea	0.14	0.14
Tobacco Leaves	0.25	0.25
Tobacco proc.	2	2
Hides & Skins	0.4	0
Oilseeds temp.	0.35	0.31
Oilseeds trop.	0.35	0.31
Rubber	0.2	0.2
Cotton	0.44	0.44
Vegetable oils	0.35	0.31

Source: ATPSM database

Table A3.2: Initial Quota Rents for SSA-SA country exporters

Commodity	$m	Commodity	$m	Commodity	$m
Livestock	0	Sorghum	0	Cocoa beans	0
Bovinemeat	67.4	Pulses	0	Cocoa processed	0
Sheepmeat	0	Tomatoes	0	Tea	0
Pigmeat	0.04	Roots & Tubers	0	Tobacco Leaves	0
Poultry	0.03	Apples	0	Tobacco processed	0
Milk conc.	0.14	Citrus fruits	0	Hides & Skins	0
Butter	0.09	Bananas	0.17	Oilseeds temperate	0
Cheese	0.81	Other tropical fruits	0	Oilseeds tropical	0
Wheat	0.11	Sugar raw	0	Rubber	0
Rice	0.07	Sugar refined	254.24	Cotton	0
Barley	0	Coffee green	0	Vegetable oils	0
Maize	0.07	Coffee processed	0	Total	323.18

Table A3.3: Total Welfare Impacts of Various Benchmark and Doha Trade Policy Liberalisations on individual Sub-Saharan African Economies[61]

$million	US	Harb	Cancún	EU FT	SSA FT	US+OD	Chin+Ind	Latin Am
Angola	30	0	-1	-1	45	0	-1	0
Benin	-2	-3	-2	-5	5	-1	4	-1
Botswana	-31	-21	-10	-44	17	-2	-2	0
Burkina Faso	5	1	1	0	2	0	5	0
Cameroon	12	-2	0	1	21	0	0	0
Cape Verde	-4	-1	-2	-2	0	-1	0	0
Central Africa Rep.	1	0	0	0	1	0	1	0
Chad	0	0	0	0	7	0	0	0
Comorros	4	0	0	0	0	0	0	0
Congo	0	0	-1	-1	2	0	0	0
Djibouti	0	0	0	0	0	0	0	0
Eritrea	0	0	0	0	0	0	0	0
Ethiopia	-7	-5	-2	-8	5	-1	0	0
Gabon	-20	-13	-9	-12	9	-5	-4	-1
Gambia	2	-10	-12	-10	26	-4	-4	-1
Ghana	5	2	0	0	12	0	0	0
Guinea	5	-5	-5	-5	22	-2	-3	0

[61] In Tables A2.3-A2.6, all amounts x where -$500,000 < x < $500,000 are denoted by 0.

Guinea Bissau	0	0	0	0	0	0	0	0
Ivory Coast	-3	-1	-1	-1	3	0	-3	0
Kenya	12	-19	-1	-24	87	-6	-14	-1
Liberia	0	0	0	0	0	0	0	0
Madagascar	-1	-2	-5	-3	3	-1	-1	0
Malawi	-37	-18	-36	-14	5	-4	-18	1
Maldives	-1	-2	-2	-2	0	-1	-1	0
Mali	-11	-6	-8	-6	4	-2	-1	0
Mauritius	-106	-73	-140	-154	8	2	9	0
Mozambique	-29	-18	-36	-16	10	-8	-7	0
Namibia	-19	-13	-5	-26	7	0	-1	0
Niger	-2	-3	-3	-3	6	-1	-1	0
Nigeria	-61	-110	-111	-115	185	-38	-39	-9
Rwanda	-2	-1	-1	-1	0	-1	0	0
Sao Tome	0	0	0	0	0	0	0	0
Senegal	-20	-11	-8	-11	4	-4	-3	-1
Seychelles	-520	-283	-253	-289	42	-112	-140	-25
Sierra Leone	6	0	0	0	9	0	-1	0
Somalia	-1	-1	-1	-1	0	0	0	0
Swaziland	-29	-22	-44	-41	7	0	-3	-3
Tanzania	-1	-6	-9	-10	21	-1	-2	0
Togo	-2	-2	-2	-3	1	-1	2	0
Uganda	0	0	0	0	5	-1	1	0
Zambia	0	-1	0	-2	2	0	0	0
Zimbabwe	45	14	21	-12	3	16	23	1
Total Welfare	-770	-628	-681	-817	584	-177	-202	-43

Table A3.4: Producer Surplus Impacts, of Various Benchmark and Doha Trade Policy Liberalisations on individual Sub-Saharan African Economies

$million	*US*	*Harb*	*Cancún*	*EU FT*	*SSA FT*	*US+OD*	*Chin+Ind*	*Latin Am*
Angola	-122	17	19	18	-206	4	13	5
Benin	16	13	12	8	-37	5	20	2
Botswana	-47	-26	-13	-28	-40	4	3	2
Burkina Faso	10	9	19	1	-31	7	13	5
Cameroon	10	50	42	61	-154	9	29	11
Cape Verde	1	1	0	1	0	0	1	0

Central Africa Rep.	0	2	2	2	-9	1	3	0
Chad	-40	7	19	-4	-100	6	16	4
Comorros	2	1	1	1	0	0	1	0
Congo	-4	-2	-1	5	-23	1	3	1
Djibouti	-2	1	1	1	-5	0	0	0
Eritrea	5	2	1	4	1	1	0	0
Ethiopia	70	41	64	40	-54	12	22	16
Gabon	-15	6	3	9	-45	1	2	1
Gambia	-18	2	2	1	-24	1	1	0
Ghana	-28	7	5	19	-125	8	11	6
Guinea	-50	11	11	7	-111	7	14	2
Guinea Bissau	1	2	2	2	-6	1	2	0
Ivory Coast	53	16	5	22	-84	11	37	12
Kenya	-196	71	-25	71	-579	20	60	19
Liberia	7	3	3	4	1	1	2	1
Madagascar	40	24	17	18	-31	11	29	5
Malawi	54	36	50	34	-56	15	16	4
Maldives	0	0	0	0	0	0	0	0
Mali	0	17	16	21	-79	7	4	3
Mauritius	13	-3	-8	-74	-62	38	57	0
Mozambique	-23	15	20	12	-109	7	13	4
Namibia	-25	-11	-1	-20	-21	2	4	3
Niger	-15	10	16	5	-86	7	9	5
Nigeria	-384	232	267	207	-1268	108	210	54
Rwanda	6	4	5	2	-12	2	4	2
Sao Tome	0	0	0	0	0	0	0	0
Senegal	12	20	30	12	-72	10	20	5
Seychelles	0	0	0	0	-1	0	0	0
Sierra Leone	-29	4	3	3	-56	2	4	1
Somalia	3	1	2	1	0	1	1	0
Swaziland	27	10	32	-11	-14	14	16	1
Tanzania	-20	47	55	44	-239	14	39	14
Togo	15	8	6	4	-17	2	15	1
Uganda	50	42	51	43	-101	12	28	10
Zambia	47	28	36	15	-52	8	44	2
Zimbabwe	80	29	41	-1	6	21	36	5
Total Producer S.	-495	655	705	539	-3818	370	799	202

Table A3.5: Consumer Surplus Impacts of Various Benchmark and Doha Trade Policy Liberalisations on individual Sub-Saharan African Economies

$million	US	Harb	Cancún	EU FT	SSA FT	US+OD	Chin+Ind	Latin Am
Angola	143	-18	-20	-19	263	-4	-13	-5
Benin	-13	-17	-15	-13	59	-7	-16	-2
Botswana	64	22	43	-20	133	-7	-5	-2
Burkina Faso	-5	-8	-17	-1	34	-7	-9	-5
Cameroon	-4	-50	-42	-60	177	-9	-29	-11
Cape Verde	-5	-3	-2	-3	0	-1	-1	0
Central Africa Rep.	1	-2	-2	-2	10	-1	-3	0
Chad	43	-7	-19	4	109	-4	-16	-4
Comorros	-3	-1	-1	-2	0	0	-1	0
Congo	4	2	1	-7	28	-1	-4	-1
Djibouti	4	-1	-1	-1	10	0	-1	0
Eritrea	-5	-2	-2	-4	-1	-1	0	0
Ethiopia	-73	-46	-66	-49	70	-13	-22	-16
Gabon	13	-20	-14	-24	104	-7	-6	-2
Gambia	167	-23	-27	-23	243	-9	-6	-1
Ghana	32	-7	-5	-20	142	-8	-11	-6
Guinea	70	-17	-17	-13	172	-9	-16	-2
Guinea Bissau	-1	-2	-2	-2	6	-1	-2	0
Ivory Coast	-55	-17	-6	-23	92	-11	-39	-12
Kenya	278	-94	66	-100	845	-27	-71	-21
Liberia	-7	-4	-3	-4	-1	-1	-2	-1
Madagascar	-40	-26	-21	-21	38	-12	-30	-5
Malawi	-58	-55	-89	-50	160	-20	-36	-3
Maldives	0	-2	-2	-2	4	-1	-1	0
Mali	-6	-24	-24	-27	101	-9	-5	-3
Mauritius	-105	-75	-129	-83	97	-37	-45	-1
Mozambique	-1	-34	-60	-28	156	-15	-20	-4
Namibia	40	10	4	-8	80	-3	-5	-3
Niger	13	-13	-19	-8	98	-8	-10	-5
Nigeria	301	-344	-383	-325	1539	-147	-244	-63
Rwanda	-7	-5	-6	-3	14	-3	-4	-2
Sao Tome	0	0	0	0	0	0	0	0
Senegal	-23	-31	-39	-23	109	-14	-23	-6
Seychelles	-20	-5	57	-309	1022	-123	-144	-28

Sierra Leone	32	-4	-3	-3	67	-2	-4	-1
Somalia	-5	-1	-2	-2	-1	-1	-1	0
Swaziland	-18	-19	-75	-33	74	-16	-18	-5
Tanzania	27	-53	-65	-55	295	-15	-40	-14
Togo	-15	-10	-9	-8	26	-3	-13	-1
Uganda	-47	-42	-51	-43	112	-13	-27	-10
Zambia	-45	-29	-36	-18	63	-8	-43	-3
Zimbabwe	-35	-15	-21	-10	-3	-6	-13	-4
Total Consumer S.	643	-996	-1,009	-1418	6444	-573	-990	-251

Table A3.6: Government Revenue Impacts of Various Benchmark and Doha Trade Policy Liberalisations on individual Sub-Saharan African Economies

$million	*US*	*Harb*	*Cancún*	*EU FT*	*SSA FT*	*US+OD*	*Chin+Ind*	*Latin Am*
Angola	10	0	1	0	-11	0	0	0
Benin	-5	0	0	0	-17	0	0	0
Botswana	-48	-17	-37	3	-76	1	1	0
Burkina Faso	0	0	0	0	-1	0	0	0
Cameroon	7	0	0	0	-2	0	0	0
Cape Verde	0	0	0	0	0	0	0	0
Central Africa Rep.	0	0	0	0	0	0	0	0
Chad	2	0	0	0	-1	0	0	0
Comorros	0	0	0	0	0	0	0	0
Congo	0	1	-1	0	-3	0	0	0
Djibouti	-3	0	0	0	-5	0	0	0
Eritrea	0	0	0	0	0	0	0	0
Ethiopia	-3	0	0	1	-11	0	1	0
Gabon	-19	2	0	2	-51	1	0	0
Gambia	-147	11	15	11	-193	4	2	1
Ghana	0	1	0	0	-5	0	0	0
Guinea	-14	1	1	1	-39	0	0	0
Guinea Bissau	0	0	0	0	0	0	0	0
Ivory Coast	-1	0	-1	0	-5	0	0	0
Kenya	-70	4	-42	4	-179	1	2	0
Liberia	0	0	0	0	0	0	0	0
Madagascar	-1	0	0	0	-4	0	0	0
Malawi	-33	2	3	1	-99	1	2	0
Maldives	-1	0	0	0	-3	0	0	0

Mali	-5	0	1	0	-18	0	0	0
Mauritius	-13	5	-3	3	-27	1	0	0
Mozambique	-6	1	2	1	-37	0	1	0
Namibia	-35	-13	-7	2	-52	1	1	0
Niger	0	0	0	0	-6	0	0	0
Nigeria	22	2	4	3	-86	2	1	0
Rwanda	-1	0	0	0	-3	0	0	0
Sao Tome	0	0	0	0	0	0	0	0
Senegal	-9	1	1	1	-33	0	0	0
Seychelles	-500	-278	-310	19	-979	11	14	2
Sierra Leone	2	0	0	0	-2	0	0	0
Somalia	0	0	0	0	0	0	0	0
Swaziland	-38	-13	0	3	-54	1	0	0
Tanzania	-8	1	1	1	-35	0	1	0
Togo	-2	0	0	0	-7	0	0	0
Uganda	-2	0	0	0	-6	0	0	0
Zambia	-3	0	0	0	-9	0	0	0
Zimbabwe	0	0	0	0	0	0	0	0
Total Welfare	-919	-287	-376	56	-2041	26	30	6

Table A3.6: Loss in Preferential Quota Rent by Exporting Country

$million	*Harb*	*EU FT*
Angola	0	0
Benin	0	0
Botswana	-17	-33
Burkina Faso	0	0
Cameroon	0	0
Cape Verde	0	0
Central Africa Rep.	0	0
Chad	0	0
Comorros	0	0
Congo	0	-1
Djibouti	0	0
Eritrea	0	0
Ethiopia	0	0
Gabon	0	0
Gambia	0	0
Ghana	0	0

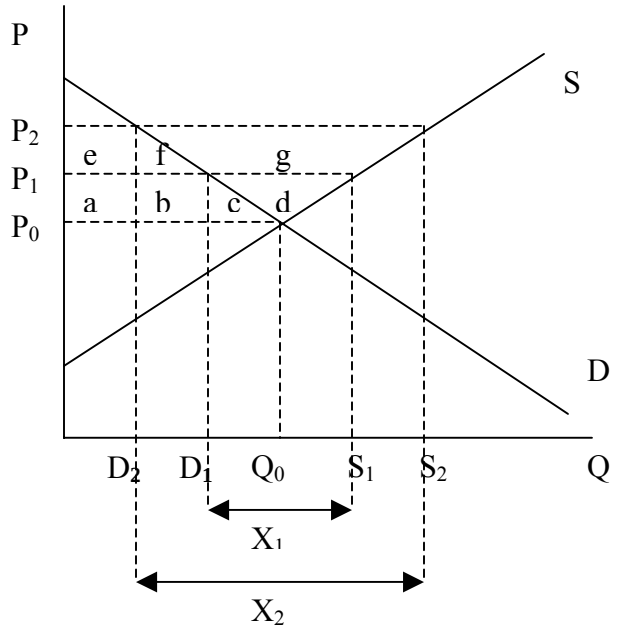
Guinea	0	0
Guinea Bissau	0	0
Ivory Coast	0	-1
Kenya	0	0
Liberia	0	0
Madagascar	-2	-4
Malawi	0	0
Maldives	0	0
Mali	0	0
Mauritius	-85	-161
Mozambique	0	0
Namibia	-12	-22
Niger	0	0
Nigeria	0	0
Rwanda	0	0
Sao Tome	0	0
Senegal	0	0
Seychelles	0	0
Sierra Leone	0	0
Somalia	0	0
Swaziland	-25	-45
Tanzania	-2	-4
Togo	0	0
Uganda	0	0
Zambia	-1	-4
Zimbabwe	-23	-42
Total Consumer S.	-170	-342

Appendix Four

The following two welfare diagrams illustrate the change in producer surplus and consumer surplus when the same percentage increase in world price of a good is fully transmitted to domestic prices. The first diagram illustrates the welfare impact of the price increase for a good of which the country is a net-exporter. The second illustrates the case of a net-imported good.

Producer surplus is defined as the area above the supply curve and beneath the supply line. It represents the gain that accrues to those producers who would be willing to supply the product more cheaply than they are required to do at the equilibrium selling price. Consumer surplus is defined as the area beneath the demand curve and above the supply line. It represents the gain that accrues to consumers who would be willing to spend more in purchasing the good than they are required to do at the equilibrium purchase price.

Net Exporting Good



When prices change from P_0 to P_1 the price change occurs in the context of zero net trade in the good in time 0. Here the change in producer surplus is equal to the area {abcd} while the fall in consumer surplus is equal to the area {abc}. Therefore the net welfare gain is {d}. The country becomes a net exporter in period 1, exporting the difference between domestic supply and domestic demand, i.e. X_1.

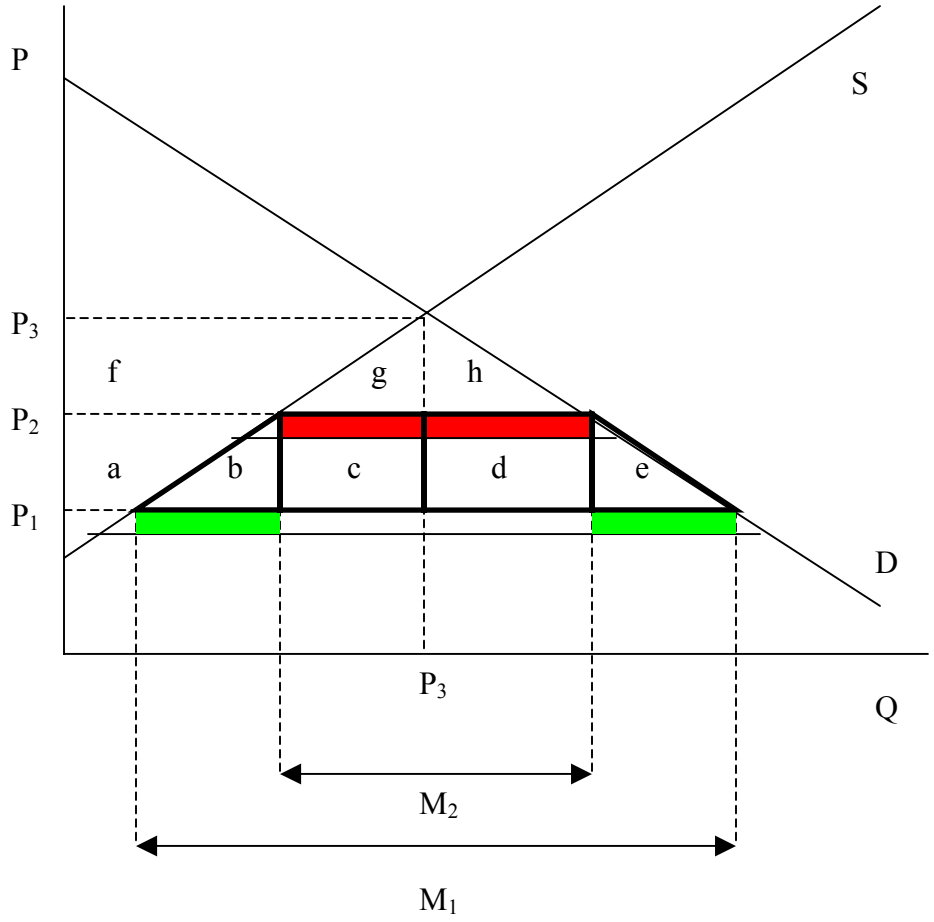
Take a further equivalent absolute increase in price from P_1 to P_2. The price change now occurs in a situation where the country is a net exporter of the good. The Producer surplus gain will be equal to the area {efg} while the consumer surplus loss will be equal

to area {ef}. The net gain in welfare is equal to {g}. However, area {g} is much larger than area {d}. The country will increase exports from X_1 to X_2.

For a net exported good, when the price rises, the positive net sum of producer surplus and consumer surplus loss rises by a greater amount, to the extent that the country is a net-exporter of the good, before the price increase occurs.

Net Importing Good

In this case, assuming that the country has an external tariff on the good in question, then tariff revenue changes must be taken into account in the welfare analysis. The tariff margin is shown by the solid lines drawn below the price line for the tariff inclusive prices, P1 and P2, where the distance between the two lines is the tariff level. It is not shown for P3 because there is no trade at this price – domestic demand is met by domestic supply.



As price increases from P_1 to P_2 the welfare change are as follows:

- producer Surplus rises by {a}
- consumer Surplus falls by {abcde}
- tariff revenue falls by the two green (light grey) boxes

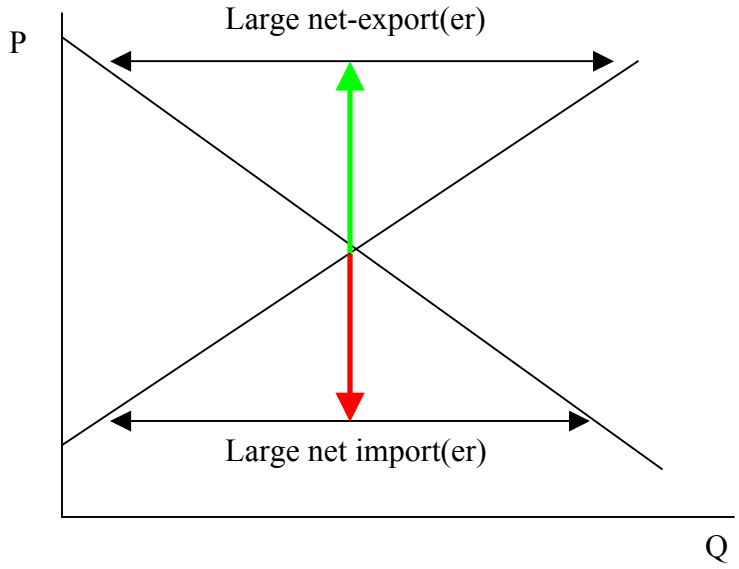
- total Welfare falls by {bcde} plus the two green (light grey) boxes.

As the price increases again, by an equivalent absolute amount, from P_2 to P_3 the welfare changes are as follows:

- producer Surplus rise by {f} which is larger than {a} under the previous price rise by the area {bg}
- consumer surplus falls by {fgh} which is smaller than {abcde} by the area {cd}
- tariff revenue falls by the two red (dark grey) boxes.
- total welfare falls by {gh} plus the red (dark grey) box, which is smaller than the total welfare effect due to the P_1-P_2 price change, by the area {cd}.

For a net exported good, under a price rise, the negative net sum of Consumer Surplus loss and Producer Surplus gain will be larger the higher the initial level of net exports.

In summary, when the price rises, the total welfare effect moves from strongly negative for goods that are largely imported, or countries that are large net importers, to strongly positive for countries that are large net exporters and goods that are largely exported



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