Simulating the impact on developing countries of market access reform

David Vanzetti

Eco Landuse Systems*

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Abstract

The interests of developing countries in multilateral trade negotiations will need to be given greater consideration than previously if progress is to be made in the current round of multilateral trade negotiations. Modelling the impacts of policy changes on individual developing countries requires a detailed coverage of tropical products, a high level of regional disaggregation, and information on bound and applied tariffs and the distribution of quota rents. Modelling with ATPSM suggests that many developing countries appear to gain relatively little from improved market access to developed country agricultural markets. More needs to be done to encourage such countries to play an active part in the negotiations.

Key words: agriculture, trade, modelling

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* PO Box 1121, Belconnen, ACT 2616 Australia, Tel. +61-2-62583561, Fax +61-2-62583812, email: david.vanzetti@elspl.com.au, http://www.elspl.com.au

1. Introduction

For there to be progress in the current WTO round of multilateral trade negotiations, it is necessary that the interests of developing countries are given greater consideration than previously. To help these countries develop a negotiating position, it is useful that the impact of various policy changes on specific sectors is identified. The focus of this paper is the agricultural sector, still of primary importance to many developing countries and a stumbling block in negotiations. Two types of market access are analysed. One is a linear across-the-board 50 per cent tariff cut, the other a proportional tariff cut that reduces the tariff peaks by a greater amount. Developed country liberalisation raises world prices of temperate country products – grains, oilseeds and livestock – but does little for the tropical products exported by many developing countries. Hence, although exports are enhanced, a large number of developing countries appear to suffer welfare losses from tariff reductions. However, these static losses are relatively small in global terms, and provide scope for compensation if the negotiations were broadened to sectors beyond agriculture.

Changes in policies introduced following the Uruguay Round Agreement on Agriculture have thrown up new challenges in modelling market access provisions. The Uruguay Round led to the establishment of a two-tier tariff system based on import quotas. Imports below the quota level attracted a relatively low tariff, while imports out of quota where impeded by relatively high, occasionally prohibitive, rates. Quota levels were set so as to provide access at around or above the levels observed during the 1986-1988 base period. Imports below 5 per cent of consumption are subject to minimum access obligations, implying that the quotas must be at least at this level. In addition, the outquota tariffs were to be reduced by 36 per cent (24 per cent for developing countries) over the implementation period. Not all countries have taken the approach of specifying tariff rate quotas, but 1371 such TRQs exist.

It soon become apparent that the specified reduction in support may have little impact on trade flows, for two reason:

- Where the tariff quota is filled and the outquota tariff prohibitive, changing the tariff may have no impact on imports at all.
- Where the applied rate is below the bound rate, reductions in bound rates may have no impact on domestic prices or trade flows.

This change in the tariff mechanism for numerous commodities has required a revision in the way border protection is modelled. Nominally, there are three possible determinants of imports:

1. Inquota tariffs, where imports are below the quota level.
2. Outquota tariffs, where exports are above the quota level.
3. The quota level itself, which determines imports if the outquota tariff rate is prohibitive.

To model border protection, it became necessary to collect data for these three variables. This task has been undertaken for many countries and the data are available from the AMAD database. The ATPSM model, developed at UNCTAD in the late 1980s to analyse trade policy impacts in the agricultural sectors in developing countries, has been modified to take account of the newly available data and the need for a revised approach to modelling border protection. A feature of the model is its ability to account for quota rents.

The paper is laid out as follows. In the next section the conceptual framework of the model is described. This includes discussion of the quota rents. Features of the data are then analysed. The tariff liberalisation scenarios are listed, the simulations detailed and the results presented and analysed. Policy implications from these simulations may suggest to negotiators from where the greatest gains from liberalisation may be obtained. Policy makers might also note the limitations to the analysis, outlined in the final section.

2. The ATPSM modelling framework

The Agricultural Trade Policy Simulation Model (ATPSM) is a deterministic, comparative static, partial equilibrium model. This means there are no stochastic shocks or other uncertainties, there is not a specific time dimension to the implementation of the policy measures or to the maturing of their economic effects. This doesn't imply that the policies take effect instantaneously. Rather, we are comparing two states at a similar point in time, one with the policy change, the other without. Finally, whereas the model aims at estimating far-reaching details of the agricultural economy, it does not deal with the repercussions of barrier reductions on other parts of the national economy. Thus, neither effects on the government budget (except for tariff revenues and subsidies to exports and domestic production) nor on the industrial and service parts of the economy or the labour

market are the subject to analysis. Simplifying the model in these respects allows for a detailed specifications of policies in a large number of countries for numerous commodities.

The main equations can be represented follows. Ignoring country and commodity subscripts, changes in demand and supply are log-linear functions of own and cross prices:

(1) $d = \eta(\beta p_w + t_c)$

(2) $s = \varepsilon(\alpha p_w + t_s)$

where d, s and p denote relative changes in demand, supply and price respectively, α and β are price transmission parameters, η denotes demand elasticity and ε supply elasticity. Consumer and producer prices are determined by the *ad valorem* tariff equivalent plus the tariff equivalent of import quotas ($t_c + t_s$) and are differentiated by domestic support, which is received by producers only. These equations can be readily extended to accommodate cross-effects with other commodities.

Values for α and β depend on the market structure. If price are determined by tariffs, β equals 1. If prices are determined by a variable levy, which rises and falls with world prices to keep domestic prices constant, β equals 0. The default in this version of the model is $\alpha = \beta = 1$ because most variable levies were phased out with the tariffication associated with the Uruguay Round.

For homogeneous products, trade is one–way, although switches may occur if prices change sufficiently. Equation (1) relates to total demand. However, trade data suggest it is possible for imports and exports to occur simultaneously. For heterogeneous products, equation (1) determines domestic demand and imports are based on an additional equation.

Domestic production is a function of the world price adjusted for the *ad valorem* equivalent of factors affecting producer prices plus domestic support that affects producers but not consumers directly. This might include support to intermediate inputs or factors of production.

If all goods in each sector could be assumed homogenous it would be sufficient to add a market clearing that global exports equal global imports and solve for a market clearing world price that would enable the determination of prices, production, consumption, imports and exports in each country for each commodity. The presence of two-trade calls

for additional equations to separately determine imports and exports separately from domestic production on consumption.

Imports are determined by applying an import demand elasticity to the price of imports:

(3) $m = \eta_M[\gamma p_w + t_m)]$

where η_M is the trade elasticity, γ a pass through factor and t_m reflects the landed price. The trade elasticities, relationship between trade flows and domestic quantities are derived from supply and demand elasticities and trade and self-sufficiency ratios.

The change in exports, x, is determined by an identity specifying the difference between production, S, and consumption, D, of the domestically produced commodity:

(4) $x = S/X\ s + D/X\ x$

where X and M refer to the level of exports and imports respectively. Finally, for the market to clear the change in global exports must equal the change in global imports:

(5) $\Sigma(M\ m - X\ x) = 0$

These five equations essentially describe the model. These apply for each commodity and country. Commodities are connected by cross-price effects and feed shares. These factors are not represented in these equations.

Prices are determined in different ways depending on the existence of two-way trade implying heterogeneous products. If the product is not imported than the export subsidy rate determines the domestic price. If the product is not exported than the outquota tariff or the applied tariff drives domestic prices. Where both imports and exports exist then the domestic price is a blend of prices for imports, exports and consumption supplied from domestic production. To the imports is assigned an import tariff and to the exports a tariff equivalent of an export subsidy. The tariff for the domestically supplied production is assumed to be the trade weighted average of the import tariff and the export support. The domestic price is then estimated as the average of the import tariff and the tariff for the domestically supplied production, weighting the former by the imports and the latter by the production mentioned. The producer (farm price) is computed as the average of the export support and the tariff for the domestically supplied production, weighting the former by the exports and the latter by the production mentioned, and adding the tariff equivalent of extra

farm support to this average.

(6) If X>0 and M=0, $p_c = p_w + t_x$

$p_s = p_c + t_d$

If X=0 and M>0, $p_c = p_w + t_m$

$p_s = p_c + t_d$

If X>0 and M>0, $t_p = (M.\ t_m + X.t_x)/(M+X)$

$t_c = (M.\ t_m + (D-M)t_p)/D$

$t_s = (X.\ t_x + (D-M).t_p)/D + t_d$

where applicable t_m is the lowest of the outquota tariff rate and the applied rate. Producer prices may differ from consumer prices because of the presence of domestic support (for example deficiency payments) over and above the market access support. A final observation on price determination is that where export subsidies apply only to a subset of exports (i.e. exports exceed the quota) the export subsidy rate is reduced in proportion and applied to all exports.

Welfare comprises consumer surplus, producer surplus, government revenue from tariffs less domestic and export subsidies and net rent receivable. Exporters gain quota rents where importers allow in some imports at low tariff rates while imposing higher tariffs on over quota imports.

Quota rents

Quotas and other quantitative restrictions generate rents, as importers can import at one price and sell at a higher price. These rents may be captured by the government by auctioning rights to import or export, but often they accrue to importers, exporters or producers, depending on the means by which quotas are allocated. The share of quota rents versus tariff revenue depends on the relative difference between the two tariffs and on the size of the import quota. There is, however, no one uniform tariff-quota policy administered by every country, which makes it difficult to determine whether an increase in import quotas or a decrease in tariffs will result in a greater trade liberalizing effect. Therefore, there is no general rule on how quota rents and tariff revenues will change with trade liberalization.

Quota rents are the quota times the difference between the domestic prices and

world price plus the inquota tariff. There are three possible situations[1]:

(1) If the inquota tariff is binding, the quota is unfilled, domestic prices equal world prices plus the inquota tariff and there is no quota rent;

(2) If the quota is binding, imports equal the quota and the rent is positive but indeterminate;

(3) If the over quota tariff is binding, imports exceed the quota and the rent is the quota times the difference between the inquota and outquota tariff rates.

The third case, with binding outquota tariffs, is illustrated in figure 1. It is claimed that this is the most relevant situation. Of interest is what happens to rents and tariff revenue as inquota tariffs, outquota tariffs and import quotas are altered. It is clear from figure 1 that:

- A reduction in inquota tariffs will increase quota rents and decrease tariff revenue;
- A reduction in outquota tariffs will decrease quota rents and outquota tariff revenue;
- A increase in import quota may merely increase quota rents and decrease tariff revenue. If the quota is increased sufficiently it, rather than the overquota tariff, will become binding and outquota tariff revenues will be eliminated.

It is assumed quota rents are of sufficient size to have economic effects. To measure the rents it is necessary to have observations of global quotas, bilateral quotas, inquota and outquota tariffs, world market prices, imports and the rent capture rate.

Global quotas, specifying the total level of imports at the lower tariff level, are notified to the WTO but most bilateral quotas are not and have to be estimated. The model uses bilateral trade flows to estimate the bilateral quota distribution. For each exporter for each commodity rent is calculated for each destination and then summed up to a total for the supplier. It is assumed that this all of this rent accrues to the supplier. This assumption can be varied globally in the model. Rent not captured by the supplier is dissipated. The model measures the rents forgone by importers, given the assumed 100 per cent rent capture by exporters. Global rents forgone equate with rents receivable. For countries with special preferences, such as the ACP countries that have preferential access to EU markets, rent is equal to the whole outquota tariff times the bilateral quota.

Ideally, the import quota fill rate should determine the domestic price. If the quota is unfilled domestic prices should be determined by the inquota tariffs, and prices should be

1 See Skully (2001) for more detail on tariff rate quotas and their administration.

high only if the quota is filled or overfilled. However, it is often observed that quotas are unfilled but domestic prices are high nonetheless. This may be because administrative constraints prevent the quotas being filled. More to the point, countries with high domestic prices are unlikely to be prepared to see them eroded by a shift in the supply of imports. As a result the assumption here is that the out-of-quota tariffs (or possibly the applied tariffs) determine the domestic market price. This implies that global quotas should not exceed imports. The calculation of tariff revenues and rents are based on this assumption.

Several trade policies can be analysed in the model. The include changes in:

- Outquota tariffs.
- Inquota tariffs.
- Import quotas.
- Export subsidies.
- Domestic support.
- Export quotas.

The focus of this paper is on market access so changes in domestic or export policies will not be examined here. In addition, the assumptions made imply that changes in inquota tariffs and import quotas will not have price and quantity effects, as these instruments are not binding. (They do, however, change the distribution of rents.)

APTSM estimates the economic effects of changes in inquota and outquota tariffs, import, export and production quotas; export subsidies and domestic support on production, consumption, prices, trade flows, trade revenues, quota rents, producer surplus and welfare.

Country coverage

The present version of the model covers 176 countries. Those not covered are mostly small island economies. A feature is that the economy for each country is represented, except for the European Union which includes 15 countries. Policy changes are assumed to occur in 48 countries, a limitation imposed by data quality.

Commodity coverage

Although many agricultural commodities are subject to trade and other protectionist barriers, those with particularly high barriers having substantially distorting economic impact are the temperate zone products. ATPSM commodity coverage also

includes tropical products of interest to many developing countries. There are 36 commodities in all, as shown in table 1.

Table 1. **Commodity coverage in ATPSM**

01100 Bovine meat	05440 Tomatoes
01210 Sheepmeat	05700 Non-tropical Fruits
01220 Pigmeat	05710 Citrus fruits
01230 Poultry	05730 Bananas
02212 Milk, fresh	05790 Other tropical fruits
02222 Milk, conc.	07110 Coffee green bags
02300 Butter	07120 Coffee roasted
02400 Cheese	07131 Coffee extracts
04100 Wheat	07210 Cocoa beans
04400 Maize	07240 Cocoa butter
04530 Sorghum	07220 Cocoa powder
04300 Barley	07300 Chocolate
04200 Rice	07410 Tea
06100 Sugar	12100 Tobacco leaves
22100 Oil seeds	12210 Cigars
42000 Vegetable oils	12220 Cigarettes
05420 Pulses	12230 Other tobacco - mfr.
05480 Roots, tubers	26300 Cotton linters

Data

Quantity data are an average of 1996-98 and are compiled from FAO supply utilisation accounts (see FAOSTAT). Price data are from FAO yearbooks. An average of 1996-98 is used here. Parameters on elasticities and feedshares are also provided by FAO. These are based on a trawling of the literature and are not econometrically estimated specifically for the model. Applied tariffs, inquota tariffs, outquota tariffs and global quotas, notified to the WTO, are obtained from the AMAD database and aggregated to the ATPSM commodity level. Export subsidy and setaside data is notified to the WTO. Bilateral trade flow data relate to 1995 and are provided by UNCTAD. These are used to allocate global quotas to individual countries. The UNCTAD TRAINS database is a source of additional tariff information.

3. Current protection levels and rents

Effective border protection levels used in the model are shown in table 2 for several developed countries. These data give the ratio of domestic prices to world prices. (Tariffs apply to the end of the Uruguay Round implementation period at 2001.) For example, domestic EU beef prices are 82 per cent above world prices. These values are determined by the relevant outquota or applied tariff and export subsidy, as noted above, and effectively

determine the potential gains from trade liberalisation. They are particularly high in Japan, Norway and Switzerland. However, it is the levels in the European Union that are particularly important because of the substantial trade flows to and from this region. Domestic prices in the European Union for all product categories listed here except oilseeds and vegetable oils are substantially above world prices.

Table 2: **Relative domestic to world prices for selected developed countries**

	EU 15	**Australia**	**Canada**	**Japan**	**U.S.A.**	**New Zealand**	**Norway**	**Switzer-land**
Bovine meat	1.82	1.00	1.14	1.76	1.02	1.00	3.93	1.26
Sheepmeat	1.58	1.00	1.13	1.00	1.00	1.00	3.42	1.67
Pigmeat	1.24	1.00	1.01	1.05	1.00	1.08	3.74	1.21
Poultry	1.09	1.00	1.96	1.08	1.00	1.09	3.54	1.12
Milk, fresh	1.62	1.00	2.38	2.55	1.25	1.03	5.24	2.58
Milk, conc.	1.26	1.00	1.12	3.82	1.08	1.06	2.33	3.83
Butter	2.09	1.05	1.54	5.53	1.53	1.02	1.60	9.40
Cheese	1.31	1.02	1.78	1.31	1.21	1.09	1.59	1.74
Wheat	1.63	1.00	1.07	2.89	1.08	1.00	2.55	1.71
Barley	1.52	1.00	1.34	3.01	1.14	1.03	4.18	1.94
Maize	1.33	1.01	1.04	1.13	1.01	1.00	2.71	2.77
Sorghum	1.32	1.01	1.00	1.01	1.00	1.00	2.63	1.50
Rice	1.60	1.01	1.00	5.14	1.01	1.00	1.15	1.06
Sugar	1.40	1.02	1.00	2.16	1.07	1.00	1.22	1.60
Oilseeds	1.01	1.00	1.01	2.40	1.06	1.00	1.67	1.66
Bananas	1.92	1.00	1.00	1.16	1.00	1.00	1.00	1.09
Coffee green	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.08
Tea	1.01	1.00	1.00	1.10	1.02	1.00	1.00	1.00
Tobacco leaf	1.90	1.17	1.03	1.00	1.95	1.02	1.00	1.09

Across commodities, it is apparent that most of the border protection applies to temperate goods, with the notable exception of rice, bananas and tobacco. (Most tropical products attract little protection in developed countries and are not shown here. However, many developing countries have substantial tariffs on tropical commodities.)

Perhaps a better indicator of where the likely benefits of liberalisation are likely to come from is tariff revenues and rents. These apply to the base period (quantities and prices are an average of 1996-98 and tariffs apply to 2001) and are shown in table 3.

Table 3: **Tariff revenue and rents by commodity**

	Outquota revenue	**Inquota revenue**	**Quota rent**
Temperate products	$m	$m	$m
Bovine meat	1854	326	392
Sheepmeat	70	3	342
Pigmeat	185	103	16
Poultry	926	86	149
Milk, fresh	26	10	1
Milk, conc.	11459	338	1334
Butter	190	74	203
Cheese	499	177	169
Wheat	1734	362	1868
Maize	1398	244	2046
Sorghum	57	6	13
Barley	271	45	360
Rice	406	19	1029
Sugar	1190	105	183
Oil seeds	1945	137	188
Vegetable oils	3068	97	1
Pulses	197	0	0
Roots, tubers	4	0	0
Sub-total	25479	2132	8294
Tropical products			
Tomatoes	235	0	1
Non-tropical fruits	1196	23	17
Citrus fruits	187	24	7
Bananas	346	102	280
Other tropical fruits	267	1	0
Coffee green bags	63	1	3
Coffee roasted	6	1	0
Coffee extracts	20	0	0
Cocoa beans	25	0	0
Cocoa butter	26	0	0
Cocoa powder	17	0	0
Chocolate	851	32	37
Tea	247	0	0
Tobacco leaves	2209	66	23
Cigars	14	0	0
Cigarettes	800	24	32
Other tobacco - mfr.	1603	0	0
Cotton linters	414	1	6
Sub-total	8526	275	406
Total	**34005**	**2407**	**8700**

Total tariff revenue and quota rent for these commodities amounts to around US$45 billion with rents accounting for 20 per cent of that. Inquota tariff revenue is also quite small, suggesting that there are few gains from reducing inquota tariffs. One should bear in mind that the assumption that outquota tariffs are binding biases upwards these estimates.

Across individual commodities, sheepmeat, butter, wheat, maize, barley and rice have high proportions of rent. While exporters gain from this, the importing country pays twice. Both consumers and taxpayers pay to support producers. With the exception of bananas, none of the tropical products accrue significant rents. Perhaps this is not surprising because it is European countries, Japan and the United States that utilise tariffs rate quotas the most (see table 4). In the European Union the most significant sectors forgoing rent are beef, sheepmeat, butter, sugar and bananas. Japan forgoes a significant amount of rent in the dairy, wheat and rice sectors. Australia and New Zealand forgo no rent in the agricultural sector. Of note here is the rent receivable by the United States. So long as they capture it, rent received accrues to exporters supplying goods under quota. In this case these are on US exports of wheat to Japan and maize to Korea.

Table 4: **Estimated quota rents for selected countries for temperate products**

Region	**Rent forgone**	**Rent receivable**
	$m	$m
EU 15	1132	873
Australia	0	633
Canada	169	719
Japan	4453	0
U.S.A.	62	3564
New Zealand	0	645
Norway	5	6
Switzerland	10	29
Sub total	5831	6469
Global total	**8294**	**8294**

Around 80 per cent of the market access distortions, i.e. tariffs and rents, apply to the temperate commodities listed here. This suggests that suppliers of temperate products are likely to gain from liberalisation. Developing countries are likely to gain most from improved access to sugar and oilseeds, products for which tropical products are quite

substitutable. Many developing countries produce rice, but only Australia, the United States and northern China produce the Japonica rice favoured in the potentially lucrative markets in Japan and Korea.

A variety of proposals for reform have been suggested in preparation for the current round of negotiations. These are centered around the three pillars of market access, domestic support and export subsidies. (See the WTO website for details http://www.wto.org/english/tratop_e/agric_e/negs_bkgrnd02_props_e.htm). Market access negotiations are traditionally based on bound tariffs, the outquota rate. However, because applied rates are well below bound rates in many instances, even substantial changes in bound rates may have little impact on trade flows. For this reason some countries, including the United States, have proposed cuts in applied rates. Other proposals emphasize the advantages of increasing import quotas so that more trade is subject to the lower tariff rates. Harmonising tariffs by reducing tariff peaks is a further suggestion that addresses the problem of tariff escalation. This appears to have widespread support, from the Cairns Group and several developing country groups, but understandably not from the European Union or Japan.

A further contentious issue concerns the administration of quotas (Podbury and Roberts 1999). Many import quotas are unfilled even though the tariffs are low because of delays in licensing or otherwise allocating quotas. However, there seems to be no systematic relationship between the type of administration and the fill rates. Auction systems do not seem to have higher fill rates than state trading enterprises, contrary to expectations. Some WTO members have called for the scrapping of quotas altogether or a review of administrative procedures.

Discussions on domestic support are centered on what should be exempt from reductions (green box) and what not. While the EU and Japan which to retain the blue box measures, exporting countries including the United States and the Cairns Group wish to remove them. Domestic support reduction commitments in the previous round have been easy to avoid because of the flexibility build into the agreements whereupon there was no requirement to reduce support to specific commodities so long as overall support was reduced. Some studies have found that reducing domestic support has relatively little impact on trade because the existing support measures are assumed to be decoupled and not

particularly production distorting (USDA 2001).

Most proposals favor a reduction or elimination of export subsidies. An exception is the European Union from where 85-90 per cent of the global export subsidies emanate. Under the Uruguay Round provisions export subsidy constraints did not prove to be binding in most instances, either because world prices moved favourably or countries had sufficient flexibility to avoid the constraints.

The three pillars of support are connected, in that a reduction in border protection without some cut in domestic support may lead to overproduction and the need for export subsidies to dispose of the surplus. If export subsidies are higher than tariffs, traders have an incentive to import and re-export. Alternatively, if export subsidies are too low a build-up of stocks occurs. In simulations with ATPSM, most of the domestic support that is output price enhancing is assumed to be reduced along with tariffs. Export subsidies are also reduced if they are greater than tariffs. As tariffs are reduced export subsidy constraints are likely to become non-binding.

Notwithstanding the three pillars, the focus in this paper is on market access reform. Two simulations are presented here to compare the distribution of gains and losses from a 50 per cent reduction in outquota tariffs.

4. Simulations

Two types of market access reform are simulated to assess the price, trade and welfare effects and to compare the distributional effects (table 5). Most discussion will centre on the first scenario - a 50 per cent reduction in outquota tariffs. Several variations are presented to help identify what is important to negotiators.

Table 5: **Alternative market access simulations**

Scenario 1.	A 50 per cent reduction in tariffs across-the-board.
Scenario 2.	Proportional cut in tariffs, such that higher tariffs are reduced by a greater amount, to a maximum of 200 per cent.

As previously noted of the 161 countries within ATPSM only 48 are deemed able to change policies. The remainder are price takers. This assumption reflects poor quality data

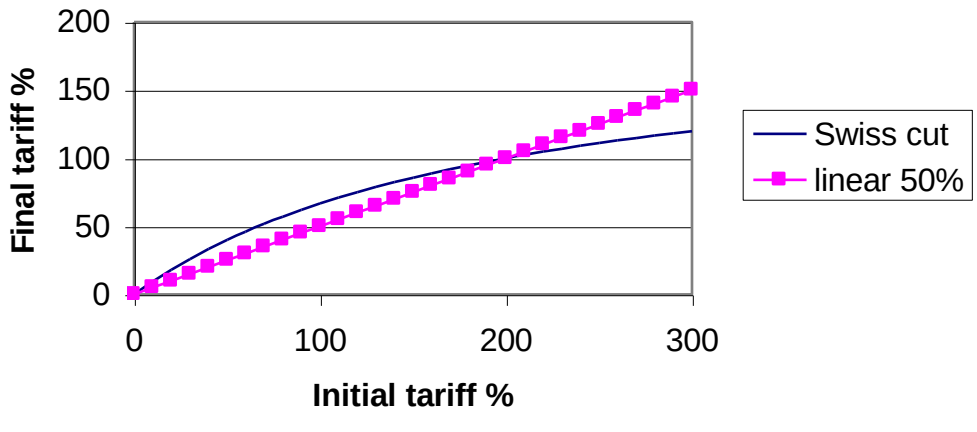
rather than reality.

Reductions in outquota tariffs for all agricultural commodities do not necessarily mean that the gap between domestic and world prices is reduced by 50 per cent. In some cases applied tariff are below the outquota rates, and the percentage actual cut is less than 50 per cent and may even be zero. In scenario 2 tariff peaks and tariff escalation are tackled with a proportional reduction in tariffs. This needs some explanation. The approach used here is the so-called Swiss formula, or Swiss cut. The formula is:

(7) $t1 = (max*t0)/(max + t0)$

where: *t0* is the initial tariff; *max* is the coefficient specifying the maximum tariff; and *t1* the final tariff. A maximum tariff of 200 is used here. This implies that if *t0* is 200 per cent, the calculated final tariff *t1* is (2*2)/(2+2) = 100 per cent. If the initial tariff is 50 per cent, the final tariff is (2*0.5)/(2+0.5) = 40 per cent, a reduction less than proportionate than the first example. This approach implies that relatively high tariffs are reduced by more than under a linear approach but low tariffs are reduced less. The attractiveness of this approach is that large tariffs lead to more than proportionally high losses, because the deadweight losses increase with the square of the tariff. Perhaps a more relevant point is that tariff escalation – higher tariffs on processed products – contributes to a lack of value added industries in developing countries.

Figure 1: Linear and proportional tariff reductions



5. Results

It can be difficult to summarise the impacts of partial liberalisation across 36 commodities in 161 countries. As with any policy change, there are winners and loser, with different indicators suggesting wins or losses to a particular country or sector. For example the European Union receives a welfare boost from trade reform, but its exports decrease in many sectors. An advantage of trade liberalisation is that it is not a zero-sum game, the net gains are positive. However, if the gains are distributed in a way such that few countries gain at the expense of many others, it can be a difficult policy to sell. Three indicators of impacts of liberalisation are prices, welfare and trade flows. Whereas economists are inclined to look at welfare measures, in spite of their inherent flaws, negotiators may be more interested in exports. Policy makers may also attach greater weight to producers rather than consumers, and some would prefer to see gains going to the poor rather than the more wealthy. Whatever ones perspective, welfare, trade and price effects are presented in this section.

Price impacts

The impact on domestic prices of the simulated tariff reductions is shown in table 6. The price changes are correlated with the level of distortions removed and are also a broad indicator of how price-taking countries are likely to be affected. Price rise are less significant under the Swiss cut, and also lower for tropical than temperate products. (Unless specified, percentage changes in prices refer to the 50 per cent linear cut.)

In the livestock sector the dairy product and sheepmeat prices rise the most reflecting the cuts in domestic prices in dairy products in Japan (-33 per cent) and sheepmeat in the European Union (-12 per cent). Changes in the beef sector are more modest because the applied tariff in the European Union, 89 per cent, is well below the bound rate (141 per cent) from which negotiated reductions are based. In the grains sector the rise in wheat prices reflects the high tariffs on Japanese and to a lesser extent Pakistan imports. Domestic prices fall 22 per cent in these markets in the linear case and more in the Swiss cut scenario.

Among the tropical products price changes in the European Union and Israel policies appears to drive the price for fruit. EU banana policies have been a sensitive issue for years. US protection on tobacco (95 per cent tariff) is currently holding down the world price for

that product. Imports would increase an estimated 10 per cent following liberalisation under this scenario. Prices change little for the other commodities.

Table 6: **World price impacts of linear and proportional tariff reductions**

	Scenario 1 (linear = 50%)	**Scenario 2 (proportional, max=200%)**
	%	$m
Bovine meat	3.5	1.3
Sheepmeat	7.5	3.3
Pigmeat	2.5	0.4
Poultry	3.2	1.5
Milk, fresh	3.5	1.7
Milk, conc.	6.2	6
Butter	7.4	6.3
Cheese	5.4	2.5
Wheat	10.1	3.2
Maize	17.5	3.2
Sorghum	7.1	0.5
Barley	15.4	2.8
Rice	2.4	1.2
Sugar	1.7	1
Oil seeds	4.1	1
Vegetable oils	4	0.9
Pulses	2.2	0.7
Roots, tubers	1.3	0.4
Sub-total		
Tropical products		
Tomatoes	0.9	0.3
Non-tropical fruits	5	1.8
Citrus fruits	0.8	0.3
Bananas	5.9	2.4
Other tropical fruits	1.1	0.4
Coffee green bags	-3.3	-1
Coffee roasted	-0.7	-0.2
Coffee extracts	-0.2	0
Cocoa beans	0.3	0.1
Cocoa butter	1.7	0.5
Cocoa powder	1.2	0.4
Chocolate	1.3	0.4
Tea	0.7	0.3
Tobacco leaves	3.8	2.9
Cigars	3.6	1.1
Cigarettes	0.2	0.1
Other tobacco - mfr.	2.6	1
Cotton linters	0.4	0.1
Sub-total		
Global welfare		
$m	**20990**	**21026**

Welfare gains

Looking first at the 50 per cent linear reduction in tariffs, global gains are around $21 billion. The first observation is that most of the gains accrue to developed countries. As a group developing countries lose $752 million and 71 of the 161 countries in the model lose. This is partly because most of the protection for agricultural commodities is on temperate products in developed countries, as tables 2 and 3 suggest. The second reason is that only 30 odd of the developing countries are assumed to liberalise. The liberalising developing countries gain $1.9 billion, while the non-liberalising countries lose $2.2 billion. This demonstrates the importance of being in the negotiations. Non-liberalising countries as a group lose from higher world prices yet receive none of the benefits of liberalisation.

Estimated global welfare gains of $21 billion are lower than those observed in some other studies. ABARE, for example, using a dynamic general equilibrium model with a different aggregation, estimated developing country gains in 2010 from a similar scenario to be $13 billion out of a total of $53 billion (Freeman *et al.* 2000, p65). Much of the difference can be attributed to the treatment of the European Union, for which ABARE estimated gains of $28 billion, compared with less than $3.3 billion here. This reflects water in the tariff. The ABARE study assumed 50 per cent cuts from applied rates, whereas here the negotiated cuts are from bound rates, and have no impact until the applied rate is reached. A World Bank study, report in Ingco (2001) suggests aggregate welfare gains of $160 billion from complete liberalisation (including domestic support) on agricultural and food products. Complete liberalisation gets around the problem of the difference between bound and applied tariffs, as both are eliminated, but can overestimate the benefits if water in the tariff is not accounted for. This is difficult to do.

Of course not all developing countries experience welfare losses. Those that sell rather than import temperate products are better situated. The major beneficiaries from the liberalisation modelled here are Pakistan ($1.0 billion), Argentina ($676 million), Romania ($227 million), India ($189 million) and Turkey ($186 million). In Pakistan the reduction of its outquota tariff on wheat from 150 to 75 per cent leads to an 8 per cent decrease in production and a 270 per cent increase in imports.

Amongst the major losers, in absolute terms, are Brazil (-$357 million), Russia (-$351 million), Indonesia (-$324 million), Taiwan (-$225 million) and Venezuela (-$224 million). Brazil suffers from higher prices for milk and wheat, and this is not sufficiently offset by higher prices for exports of sugar, oilseeds and tobacco.

An analysis of welfare gains by type of tariff reduction shows that developing countries have more to gain from a Swiss cut (table 6). These two scenarios are constructed to provide the same global welfare gains (US$21 billion). The pattern of tariff cuts differs. For example, under the Swiss cut tariffs over 200 percent are reduced more than under the linear case and vice versa (see figure 2). As a result there are greater reductions in Japanese tariffs for rice and dairy products and for Korean tariffs on coarse grains. By contrast, EU tariffs are reduced by lesser amounts than under a 50 per cent linear cut. In welfare terms, the major beneficiary is Japan because it makes deeper cuts, particularly for rice. Overall welfare gains for Japan rise from $11.2 billion to $13.7 billion with the Swiss cut. A careful examination of the welfare gains by commodity and country group for the two approaches, shown in tables A2 and A2, indicate that liberalising developing countries gain in the cereals sector, specifically wheat and maize. The gains are widespread because cereals prices do not rise as much as in the linear case. For this reason the Cairns Group is not as well off, but the position of net food importers is improved.

Table 7: **Welfare changes from alternative tariff reductions ($m)**

	Scenario 1 (linear)	**Scenario 2 (proportional)**
Cairns Group	1986	679
Liberalising developed	20541	18265
Liberalising Eastern Europe	772	489
Liberalising developing	1942	3327
Non-liberalising Eastern Europe	-266	-176
Least developed	-284	-118
Net food importing.	-554	-279
Other non-liberalising developing	-1161	-483
All liberalising	23200	22000
Non-liberalising	-2210	-974
All developed	21742	19461
All developing	-752	1565
World	**20990**	**21026**

Trade flows

It is perhaps more relevant to look at trade flows rather than welfare. Negotiators, at least, tend to favour this view. The impact of 50 per cent across-the-board tariff changes on export revenues is shown in table 8 each commodity for developing and developed regions and the world. It is noteworthy that export revenues don't necessary move in the same direction as welfare. Where protection is removed, such as in the European Union, reduced trade flows are compatible with increased welfare. Where market access is improved, as for New Zealand's livestock products, increased exports lead to increased welfare.

From the perspective of a successful negotiation it is worth noting that of the 161 countries in the model, all but 7 have an increase in exports. The notable exceptions are Ecuador, Honduras, Romania and the USA. This is in contrast to the welfare measure that has many countries losing a little because of rising import prices.

Across the commodities the pattern is for developing countries exports to replace developed country exports. This reflects the EU reform that leads to exports from this region falling in 15 of the 36 sectors, the most notable being beef and wheat. However, the European Union exports more milk powder and pigmeat and overall exports rise marginally. Japanese imports increase 25 per cent following a 28 per cent fall in domestic prices. Most of the additional Japanese rice imports appear to be supplied by India, Indonesia and China.

The world rice market deserves more comments, as it is one crop, like sugar, grown in temperate and tropical climates. Although rice is a thin market with a relatively small percentage of production entering world trade, it is an important crop to developing countries. Moreover, in contrast to other grains, developing countries tend to be exporters rather than importers. In reality the rice market is differentiated between two varieties, Japonica and Indica. Japonica is favoured in the heavily protected Japanese and Korean markets, and supplied by Australia, the United States and Northern China. It is these countries, rather than India, Thailand or Vietnam, which should gain from Japanese liberalisation. This feature is ignored here. Estimated falls in rice production amount to 3000 kt in Japan. India exports an additional 2900 kt, partly because consumption in that country falls with the 2.4 per cent rise in world and domestic prices. Indian rice has an elasticity of demand in the model of –0.4, whereas Japan's is –0.1.

Markets for fresh milk and roots and tubers are also very thin, and the large

percentage increases presented for these sectors should be discounted.

Table 8: **Estimated change in exports following 50% tariff reduction**

	Developing	**Developed**	**Global**
Temperate products	%	%	%
Bovine meat	63	-5	6
Sheepmeat	155	9	20
Pigmeat	20	18	19
Poultry	18	6	10
Milk, fresh	297	174	219
Milk, conc.	9	4	5
Butter	63	-1	2
Cheese	47	11	13
Wheat	50	-2	6
Maize	-31	8	4
Sorghum	15	-4	1
Barley	43	-6	2
Rice	22	-11	17
Sugar	13	-5	6
Oil seeds	2	3	3
Vegetable oils	1	1	1
Pulses	3	-1	1
Roots, tubers	0	34	6
Tropical products			
Tomatoes	2	-3	2
Non-tropical fruits	10	5	7
Citrus fruits	2	12	7
Bananas	3	1	3
Other tropical fruits	7	-17	4
Coffee green bags	0	1	0
Coffee roasted	0	4	4
Coffee extracts	0	2	1
Cocoa beans	0	0	0
Cocoa butter	0	4	1
Cocoa powder	0	3	2
Chocolate	0	2	1
Tea	1	-1	0
Tobacco leaves	1	6	2
Cigars	0	-1	-1
Cigarettes	0	1	1
Other tobacco - mfr.	0	7	6
Cotton linters	0	0	0

Revenues and rents

In spite of a 50 decrease in bound tariffs outquota tariff revenue increases from $34 billion to $36 billion, inquota tariff revenue stays about the same and quota rents fall from $8.7 to $5.9 billion. This revenue increase reflects water in the tariff and the prohibitive nature of some tariffs. In many instances a 50 per cent cut from bound rates had no affect on domestic prices because applied rates were below bound rates. In the case of Japanese rice tariff revenue rise as tariffs fall and imports rise sufficiently to offset the revenue losses attributable to the fall in the rate. Tariff revenue rises in the almost all of the temperate product sectors except beef, oilseeds, vegetables and pulses. However, it falls for almost all tropical commodities.

6. Implications, limitations and conclusions

Implications

The results presented here imply that there are significant welfare gains to be had from further tariff reform, but few of these gains accrue to developing countries, particularly if they do not undertake liberalisation themselves. However, developing country export revenues are estimated to increase from developed country liberalisation.

Liberalisation from bound tariffs has its limitations, as applied tariffs are below bound rates in many instances and the actual reform may be negligible. This is particularly the case if cuts are small, such as 20 or 36 per cent. The United States proposed cuts from applied rates but other WTO members did not appear to agree to this approach. A distinction between bound and applied rates allows countries some flexibility that seems necessary to reach agreement.

The proportional tariff cutting approach has the benefit of addressing tariff peaks and lowering tariffs on processed products. This may help developing countries establish value-adding industries. In the simulation presented here the major benefits to developing countries seems to come from the reduced impact on world prices, as the bulk of the welfare gains are concentrated in particularly markets with very high tariffs and potentially high trade flows.

Beneficial reforms are not constrained to one or two sectors, such as sugar, but are to be had across a range of commodities, including wheat, rice and oilseeds. On a global scale there appear to be few benefits from liberalisation of tropical products, but this is somewhat

misleading. There are high tariffs on some tropical products, many exceeding 100 per cent. This suggests there are potential benefits for South – South trade from further reform. Because trade flows between developing countries are relatively small the benefits appear slight but for individual countries they may be quite significant, particularly for countries with high export dependence on few commodities.

The welfare gains from the removal of deadweight losses are trivial compared with the distributional effects within countries. A price rise following a tariff reduction leads to transfers from consumers to producers far greater than any overall welfare impact. Indeed, there might be no net gains at all, merely transfers. However, it is obvious that policy makers may have a greater concern for one group or another. Producers tend to be favoured in developed countries and consumers in developing countries. If producer and consumer surplus is not equally weighted, policy changes with little apparent impact might in fact have quite significant effects.

Eliminating tariffs removes a source of government income. Taxes can be raised elsewhere in the economy, but the cost of raising income or consumption based taxes may be greater as a result of distortion effects or compliance costs. Developing countries often lack the administrative capacity gather taxes effectively, ostensibly a reason for maintaining high tariffs. What is noteworthy from these results is that tariff revenue rises following a 50 per cent liberalisation. Obviously this doesn't hold for complete elimination.

What do these results imply for the negotiating position of developing countries? There greatest gains appear to be had from removing one's own tariffs. There are also gains from improved market access to other countries markets. A strategic concern here is whether a country should reform unilaterally or use its own market access provisions to negotiate openings in other countries markets. Unfortunately this issue is beyond the scope of this paper, although perhaps it is relevant to note that trade negotiators tend to take the latter approach, whereas economists are more inclined towards the former.

Limitations

Limitations of the analysis should be noted. First, the welfare gains, although significant, are hardly substantial, even though the gains, once negotiated, are available every year. However, the model is not able to calculate dynamic gains. Trade liberalisation

is likely to enhance productivity by introducing improved technology, increased ability to capture economies of scale and improved production efficiencies. Imported goods often embody technologies that are unavailable locally. Admittedly, this doesn't apply so much to trade in bulk commodities such as wheat or rice.

When considering the estimated impacts of liberalisation, it is worth paying attention to the importance of particular assumptions in the model. These relate particularly to the significance of unfilled import quotas and product homogeneity and price determination. It is assumed here that inquota tariffs are not relevant, even where quotas are unfilled. This means that the higher outquota tariffs are taken as determining domestic prices (if there is no applied tariff). This assumption overstates the benefits of liberalisation, as there may be cases where inquota rates are the relevant determinant of domestic prices. This assumption also limits the value of increasing import quotas. With the outquota tariff binding increasing the quota merely results in a transfer from tariff revenue to quota rent, with little or no quantity effects. Likewise, reducing inquota tariffs merely increases the quota rents. Under the assumption of 100 per cent rent capture by exporters, these changes involve a transfer from importers to exporters.

Intersectoral effects are not captured here. An expanding agriculture in response to liberalisation would draw capital, labour and land from sectors not included in the model. Output in these sectors would decrease. This feature means the gains from trade liberalisation may be overstated. However, far greater gains could be obtained by liberalising other sectors.

The model doesn't take into account issues of structural adjustment, the cost of moving resources from one sector to another. These are once-off costs.

The usual caveats should apply to model parameters and policy data. It is difficult to know how the results would be affected by better quality data, but policy makers should be aware of the limitations. A particular constraint here is the limitation of liberalising countries to 48 because the data quality relating to the remainder was not considered adequate.

In spite of these limitations, the model results appear relatively robust, and given the level of detail on developing countries, provides a useful guide to the likely impacts of agricultural liberalisation.

Further work is currently being undertaken with ATPSM. The influence of domestic support on production (the decoupling issue) and the treatment of export subsidies is also being reconsidered. Advances in data and analytics will make ATPSM a more useful model in the forthcoming negotiations.

Conclusions

The interests of developing countries appear to have been somewhat neglected in the Uruguay Round of multilateral trade negotiations, with few benefits appearing to flow from liberalisation, partly because little real liberalisation actually occurred. Developing countries have staked a claim for a greater say in the current round.

The introduction of a two-tier tariff system has thrown up data and modelling challenges. ATPSM is a trade model with detailed commodity, country and policy coverage, and attempts to measure quota rents. Analysis of tariff liberalisation shows which individual countries may gain or lose from particular policies. The main result is that developing countries experience increased trade flows but few welfare gains from developed country liberalisation, as many of them are adversely affected by rising world prices for grains. Countries that do not liberalise themselves are the most disadvantaged.

A feature of trade negotiations is that there are net gains, and every country can share in these if they are distributed appropriately. With so many individual countries adversely affected from rising prices, it would be difficult for the WTO to reach a consensus on reform through agricultural negotiations alone. It may be necessary to broaden the negotiations to include non-agricultural sectors so that all countries have a greater probability of gaining.

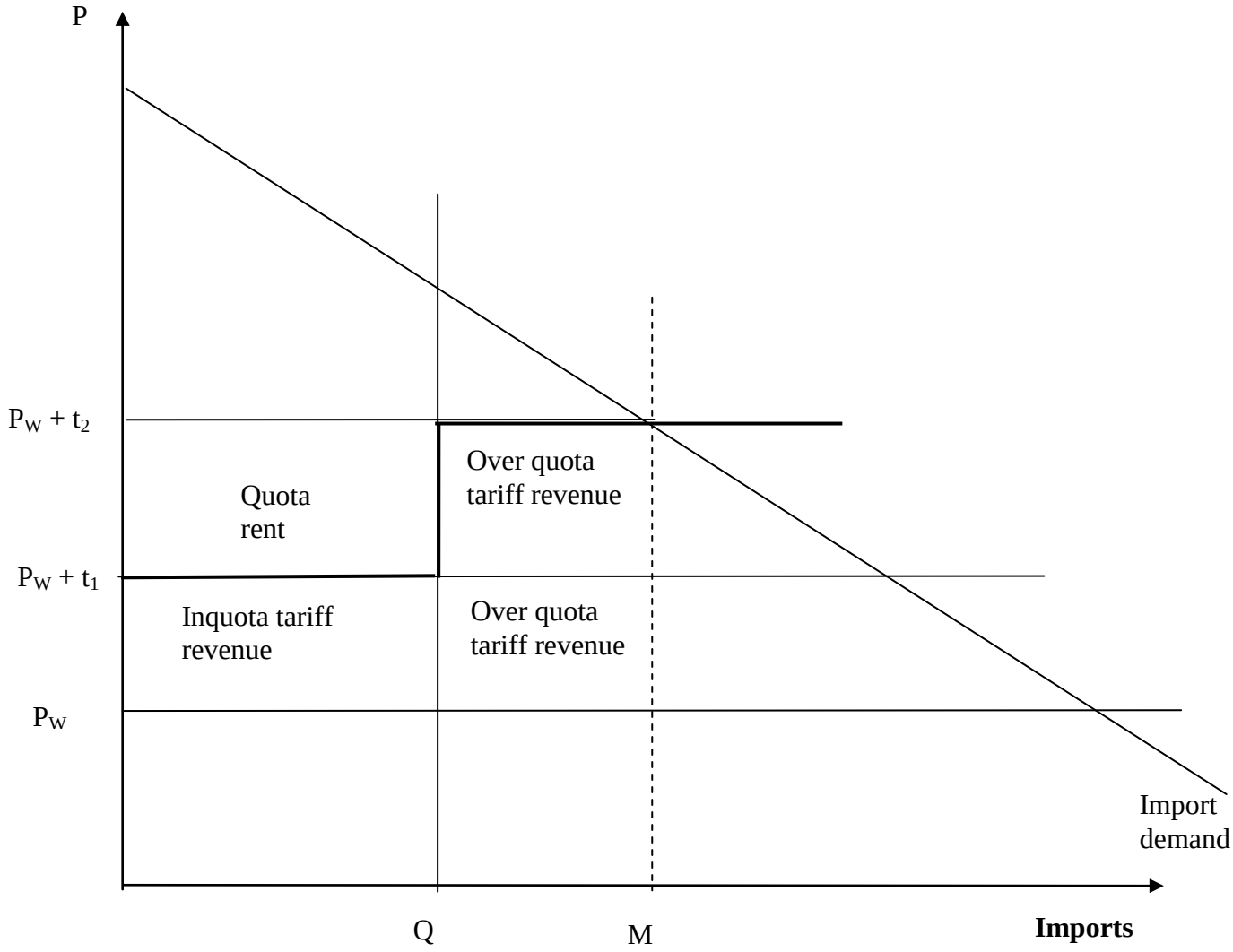
Table A1: **Welfare changes from 50% linear tariff reduction ($m)**

	Meats	Dairy products	Cereals & sugar	Oils and oilseeds	Vege tables	Fruits	Tropical beverages	Tobacco & cotton	Total
Cairns Group	494	656	245	514	6	8	-96	68	1986
Liberalising developed	2291	7403	10238	-323	18	547	293	74	20541
Liberalising Eastern Europe	287	347	58	-4	1	30	17	36	772
Liberalising developing	1430	-935	601	317	4	477	-128	176	1942
Non-liberalising Eastern Europe	-144	-61	14	10	0	-59	-5	-20	-266
Least developed	-4	-165	-169	-44	4	-2	-32	9	-284
Net food importing.	-4	-165	-331	-36	-2	5	-20	-2	-554
Other non-liberalising developing	-71	-278	-680	-71	-2	-34	-28	2	-1161
All liberalising	3982	6802	10889	-11	24	1048	182	284	23200
Non-liberalising	-198	-536	-1158	-140	0	-84	-85	-9	-2210
All developed	2504	7791	10319	-328	20	997	306	133	21742
All developing	1281	-1526	-588	178	3	-33	-209	142	-752
World	3785	6266	9731	-150	23	964	97	275	20990

Table A2: **Welfare changes from Swiss cut tariff reduction ($m)**

	Meats	Dairy products	Cereals & sugar	Oils and oilseeds	Vege-tables	Fruits	Tropical beverages	Tobac co & cotton	Total
Cairns Group	205	557	-305	117	2	40	-29	91	679
Liberalising developed	1439	7712	8814	-11	6	143	89	73	18265
Lib. Eastern Europe	63	343	32	-1	0	11	7	33	489
Liberalising developing	1355	-947	1964	121	3	687	-26	170	3327
Non-lib. Eastern Europe	-60	-54	-23	3	0	-23	-2	-17	-176
Least developed	-2	-161	-62	-10	1	-1	-10	8	-118
Net food importing.	-2	-161	-102	-8	-1	3	-5	-3	-279
Other non-lib. dvpg	-34	-254	-163	-17	-1	-13	-9	6	-483
All liberalising	2824	7085	10793	108	10	837	69	274	22000
Non-liberalising	-64	-488	-332	-31	0	-29	-25	-5	-974
All developed	1530	8107	8853	-12	8	757	94	124	19461
All developing	1229	-1510	1608	89	2	52	-50	146	1565
World	2759	6597	10461	77	10	808	44	270	21026

Figure 1: Quota rents with binding outquota tariff



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