SHIFTING SANDS:
SEARCHING FOR A COMPROMISE
IN THE WTO NEGOTIATIONS ON AGRICULTURE

by

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ABSTRACT

The WTO negotiations on agriculture remain deadlocked after four years of discussion, and efforts to find a solution at Cancún failed. Analysis shows that the recent draft Cancún text offers more flexibility than earlier proposals, and such flexibility most likely implies a lower level of ambition overall. However, developing countries are less able to take advantage of this flexibility and their bound tariffs will be reduced to levels at or below applied rates. The reduction in levels of intervention and the expiry of the Peace Clause make it more likely that there will be greater resort in the future to safeguards and countervailing measures.

Analysis of the various proposals using the UNCTAD/FAO Agricultural Trade Policy Simulation Model (ATPSM) shows that most of the benefits from liberalization accrue to developed countries, which currently have the highest levels of intervention. The group of developing countries, which include both exporters and importers of agricultural products, gain from liberalization, but those gains are small and unevenly distributed. In fact, net-food importing developing countries tend to lose because of higher world prices. Within developing countries, producers tend to gain from higher world prices at the expense of consumers. Since negotiating positions suggest that governments attach a higher weight to producer than consumer benefits, a possible solution to the impasse lies in switching support in developed countries from border measures to less-trade-distorting measures such as direct income support. Providing compensation to current beneficiaries of European Union support in ACP countries for the erosion of preferences may also assist in the search for a compromise.

ACKNOWLEDGEMENTS

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INTRODUCTION

Intransigence, shifting alliances and miscalculation have plagued and at least temporarily derailed the WTO sponsored multilateral trade negotiations. The Cancún Ministerial Conference, as part of the Doha Work Programme, ended in failure. The 2001 Doha Ministerial Declaration had launched new negotiations on a range of subjects, including agriculture, on which negotiations had begun earlier under the "built-in agenda" of the Uruguay Round. Agriculture was made part of Doha's Single Undertaking in which virtually all the linked negotiations were supposed to end by January 2005. After the first deadline for a commitment on "modalities" in March 2003 was missed, Ministers discussed in Cancún a framework for these modalities. Discrepancies about how to reform the agricultural trading sector were, together with the so-called Singapore issues, mainly responsible for the breakdown of the negotiations. The road ahead seems like a trackless waste.

What can be done to put the negotiations back on track? There are a large number of issues and options, with far-reaching but barely predictable consequences. Some restructuring of the negotiations seems to be necessary in order to exploit the possibilities of an agreement without endangering developing and less-developed countries on issues such as food security. Recognition of developing country concerns was emphasised at the Doha Ministerial Meeting in November 2001, which put development issues at the centre of the WTO work programme. The impact on developing countries of the various proposals under consideration is therefore a central focus of this study.

The study attempts to provide a rigorous quantitative assessment of various options being discussed in the WTO agriculture negotiations. In particular, it focuses on the Framework for Establishing Modalities in Agriculture, which was an annex of the draft Cancún Ministerial Text, Second Revision, submitted on the 13th of September. It analyses the positions of some of the key players and the joint EC-United States proposal. Earlier, the Chairman of the WTO Committee on Agriculture, Mr. Harbinson, had put forward, and subsequently revised, a compromise proposal.

In order to quantify the economic effects of these proposals, the study uses a computable global trade model, the Agriculture Trade Policy Simulation Model (ATPSM).[1] This model is a deterministic, comparative static, partial equilibrium trade model designed to analyse trade policy issues. A goal of the study is to show that a trade model can be used to assist in the preparation and evaluation of negotiating positions.

The study is laid out as follows. The next two chapters describe the negotiating context and the key proposals. In Chapter IV the computable model is described in some detail. In Chapter V the draft Cancún text and other recent proposals are analysed. Chapter VI deals with policy implications, limitations and conclusions.

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[1] The ATPSM modelling framework was initially developed by UNCTAD and further refined by FAO and UNCTAD.

I. THE STATE OF PLAY

(a)   Negotiations on Agriculture

The WTO Agreement on Agriculture was a significant step towards reforming agricultural trade. It brought agricultural products under more effective multilateral rules and paved the way for further liberalization of agricultural production and trade. The Doha Ministerial Declaration of 2001 launched new negotiations on a range of subjects, include the 'built-in' negotiations on agriculture which had already begun in 2000 under the Marrakesh Agreement. Agriculture is now part of the Single Undertaking in which virtually all the linked negotiations are to end by January 2005.

The Uruguay Round Agreement on Agriculture "tariffied" and bound many non-tariff barriers and some progress was made in reducing tariffs on fast-growing, high-value-added products. However, much remains to be done, including reducing tariff peaks and tariff escalation. Tariffs in agriculture are still significant, even high in some product areas.

Table 1 shows average applied and bound rates for country groups.

Before and at Cancún, countries expressed their disappointment with the draft Ministerial text. Developed Cairns Group members want to see a less flexible and more ambitious round, whereas countries including Japan, Norway and Switzerland want more flexibility, particularly in the areas of non-trade concerns, and less ambition. Most developing countries want the developed countries to liberalize, but, at this stage, for reasons of rural development and food security are reluctant to open their own markets. Some developed countries such as the European Union do not want at this time to eliminate export subsidies, although such subsidies constitute one of the most trade-distorting policy instruments. Essentially, the positions differ concerning the two dimensions of ambition and the degree of special and differential treatment. Figure 1 shows the positions of some WTO members.

Table 1
Bound and applied tariffs on agricultural products
(in per cent)

	MFN bound tariffs	Applied tariffs
Developed Countries	51	48
Developing Countries	57	20
Least-Developed Countries	79	17

Source: UNCTAD[2]

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[2] These are simple averages at the four digit level of *ad valorem* tariff equivalents for commodities listed in Table A1. Applied rates are set equal to bound rates if not specified. Tariffs are averaged over 142 countries for which data are available.

Figure 1
Interests and Alliances
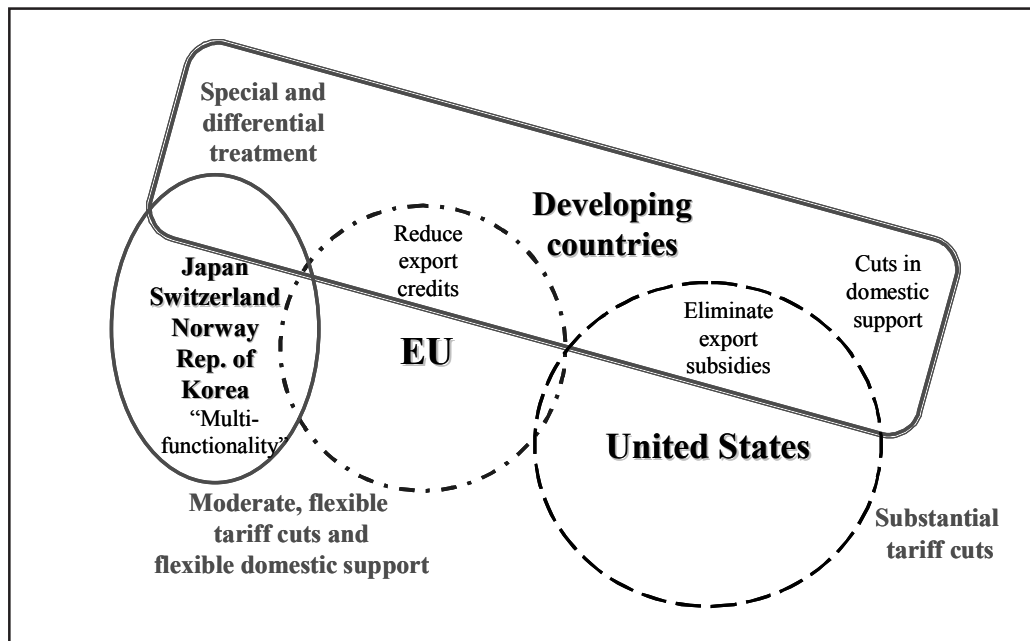
Source: UNCTAD

The horizontal axis describes the level of ambition and the vertical axis the degree of special and differential treatment to accommodate developing country needs. Any two-dimensional picture can only provide a rough overview because there are different dimensions in each of the pillars - market access, export subsidies, domestic support and non-trade concerns. Nonetheless, the diagram suggests that, as a group, developing countries have interests that overlap with the European Union, the United States and the friends of "multifunctionality" that focus on non-trade concerns. A problem is that developing countries are not a homogeneous group with common interests. Some are food importers, some exporters, while others have preferential access to consider.

In an attempt to guide the various parties to a mutually acceptable agreement, the Chairman of the Committee on Agriculture,

Mr. Stuart Harbinson, circulated in March 2003 a revised version of his first draft of modalities for the further commitments, submitted in February 2003. Many members on either side of the agricultural trade liberalization spectrum found the Harbinson revised draft inadequate. As a result, negotiations were deadlocked for months and only very limited progress was made. The first deadline for the agreement on modalities, agreed at Doha, was missed. In mid-August 2003, the EU and the United States jointly proposed a modalities framework for further reform of agriculture but developing countries expressed their disappointment at the framework. However, the EC-United States input galvanised the process such that several countries and country groups tabled alternative texts that modify the EC-United States draft. Among these texts is a counter-proposal submitted by 16 developing countries that has also found support from four other developing

countries. By the end of August 2003 a revised draft Cancún Ministerial Text from the WTO General Council was circulated and in September a second revision was released. Annex A of this draft Text is a framework for further reform of agriculture. The draft Cancún Ministerial Text covers the three pillars of the Agreement on Agriculture, i.e. market access, domestic support and export competition, and in this regard is comprehensive. It contains formulae, rules and special and differential treatment provisions on each of the three pillars but without specifying the level of ambition. The document does not contain specific figures or ranges for reductions, and many issues are left for further negotiations. The document contains a section for "other" issues for which the Harbinson revised draft is to serve as a reference document.

(b) Development Box

The Doha declaration gave different treatment of developing countries a central position in the current round of negotiations.

"*We agree that special and differential treatment for developing countries shall be an integral part of all elements of the negotiations and shall be embodied in the schedules of concessions and commitments and as appropriate in the rules and disciplines to be negotiated, so as to be operationally effective and to enable developing countries to effectively take account of their development needs, including food security and rural development.*" (Paragraph 13, Doha Declaration)

A large part of the current negotiations is focused on the degree of differential treatment. There is a narrow and a broad notion of a Development Box. The narrow notion is a box of measures that would be added to the green box and comprises various special provisions for developing countries in addressing food security, rural poverty, etc. The wider notion of a development box describes all concepts addressing the specific problems of developing countries such as hunger and poverty in food-insecure, low-income regions. Developing countries submitted various proposals aimed at protecting and enhancing their food production capacity, particularly in key staples, safeguarding employment opportunities for the rural poor, and protecting small farmers from cheap imports.[3] The most prominent mechanisms in a potential development box that are discussed in the negotiations on agriculture include:

- Lower reduction commitments concerning tariffs and domestic support measures such as "de minimis" payments.

- Longer implementation periods.

- Expanded government measures of assistance like domestic support to encourage agricultural and rural development (Article 6.2, Agreement on Agriculture).

- Expanded access to green box exempt measures.

- Different formulas for tariff reductions.

- Expanded tariff-rate quotas administered by developed countries.

- Special Products (SP).

- Special Agricultural Safeguard Mechanisms (SSM).

- Preferential access to developed country markets.

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[3] Informal paper from Cuba, Dominican Republic, El Salvador, Honduras, Kenya, Nigeria, Pakistan, Sri Lanka and Zimbabwe (2002). Here obtained from Braun, Wobst and Grote (2002).

- Special provisions for least-developed countries and net-food-importing developing countries.

Under the Special Product provisions, a limited number of sensitive products would be exempt from reduction commitments, so as to enable developing countries to take account of their food security, rural development and livelihood security concerns. The selection of the products turns out to be controversial in the negotiations because the additional flexibility waters down the level of ambition and threatens the growth in South-South trade. The intention with this provision is not to protect against temporary price shocks or import surges. For this purpose the Special Agricultural Safeguard Mechanism provides a time-limited safeguard against imports when they threaten to disrupt domestic production. It is supposed to be invoked in reaction to exceptional market conditions. It was debated whether the mechanism should be restricted to a limited number of food security crops like cereals or broadened to include particular crops important for the livelihood of many poor people in developing countries. The potential criteria to be used in the identification of eligible products could be based on numerous factors, each favouring some countries at the expense of others.[4] Agreement on suitable criteria has yet to be worked out.

One difficulty in the current negotiations is the determination of countries that can benefit from certain development box measures. Developing countries are diverse with respect to their resource endowments, level of development, degree of integration into the world economy, and their current poverty and food security situation. Hence, it is difficult to get agreement as to which countries should receive special and differentiated treatment.

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[4] For more details see e.g. Ruffer and Vergano (2002).

II. PROPOSALS FOR REFORM

(a)   Market Access

The early United States proposal for addressing market access issues is to reduce applied tariffs according to a harmonising Swiss formula by which higher tariffs are reduced more than proportionately (USDA 2002). Under this formula the maximum final tariff is proposed to be 25 per cent.[5] This implies, for example, that a tariff of 100 per cent would be reduced by 80 per cent while an initial tariff of 10 per cent would be reduced by about 30 per cent. Other elements of the proposal include elimination of in-quota tariffs and a 20 per cent expansion of import quotas. Since it focuses on applied tariffs, it has a significant impact on developing countries as it makes irrelevant the often substantial difference between applied and bound tariffs. Developing countries would be obliged to make proportionally greater cuts from their bound rates than developed countries. As countries with the same initial rates are treated similarly, the approach does not recognize special and differentiated treatment for developing countries as agreed in the Doha Declaration. However, the harmonizing formula is particularly appropriate in reducing tariff peaks and tariff escalation.

Tariff peaks and escalation are not specifically mentioned in the EC proposal, which is a continuation of the Uruguay Round approach, a 36 per cent average cut in bound tariffs with a minimum 15 per cent cut in each tariff line (EC, 2002). While the EU proposal mentions but does not specify the special and differentiated conditions that apply to developing countries, they are interpreted as similar to the Uruguay Round conditions, whereby developing countries implemented two-thirds of these reductions over a longer implementation period. This approach contains an inherent flexibility that may allow high tariffs to be maintained on sensitive products. For example, a reduction in tariffs on a sensitive product from 100 to 85 per cent could be offset by reducing a 10 per cent tariff to 4.3 per cent to give the required simple average cut of 36 per cent. While import-competing producers may feel this to be advantageous, exporters would likely be concerned that it does not adequately address tariff peaks nor provide them with sufficient improvement in market access.

The Harbinson Proposal is a compromise between the harmonizing and the flexible approach (WTO Committee on Agriculture, 2003). Out-of-quota bound tariffs would be reduced by a simple average for all agriculture products, subject to a minimum reduction per tariff line. The formula includes bands where, depending on the initial tariff, average and minimum reductions are higher for higher tariffs. For developed countries the proposed average reduction is between 40 and 60 per cent and the minimum between 25 and 45 per cent. For developing countries the reductions are between 25 and 45 per cent with a minimum between 15 and 30 per cent. Tariff quota quantities would be expanded to 10 per cent of current domestic consumption in developed and 6.6 per cent in developing

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[5] The proposed Swiss formula is *new tariff=(initial tariff*25)/(initial tariff+25)*.

countries. Least-developed countries would not be required to undertake any reduction commitments.

The EC-United States joint proposal is to apply the Uruguay Round approach to a certain, as yet unspecified, share of tariff lines, the Swiss formula to a further share of tariff lines, and the provision of duty-free access to the remainder. The first group would most likely include the more sensitive products. Furthermore, a maximum tariff or an equivalent additional market access is proposed. Developed countries would provide duty-free access for a certain percentage of imports from developing countries. Concerning special and differential treatment, the proposal is that developing countries may reduce tariffs by a smaller amount.

The draft Cancún Ministerial Text, second revision, put forward by the General Council of the WTO adopts the EC-United States blended formula (WTO General Council 2003). No maximum tariff is proposed for developing countries (although it would remain under negotiation) and the duty-free part of the blended formula is replaced by the alternatives to reduce tariffs to zero or 5 per cent. Tariff reductions are to be lower and implementation periods longer in developing countries.

Both the Harbinson and the draft Cancún Text foresee Special Products for developing countries. Harbinson proposed to reduce the corresponding tariff lines by an average of ten and a minimum of 5 per cent. The creation of a category of Special Products is a major demand by developing countries including the so-called group of 33 countries that want these products to be exempt from any reductions.

The draft Cancún text calls for developed countries to accept duty-free all imports from least-developed countries and a certain percentage of imports from developing countries. The EC had already proposed to provide duty-free access for 50 per cent of all imports from developing countries and 100 per cent for least-developed countries. Thus, the European Union itself substantially meets this criterion. Among the major importers Japan would have the most difficulty meeting this standard as only a quarter of its agricultural imports from developing countries are duty-free.

(b)   Domestic Support

Support levels are still significant despite various declarations of intent. For example, in the OECD countries total agricultural production in 2000 was valued at the farm gate at US$632 billion, but to encourage this production, producers received support of US$323 billion (OECD 2002). The major beneficiaries of this largesse are producers in the European Union (35 per cent of OECD receipts), the United States (27 per cent) and Japan, and most of the estimated gains from liberalization stem from reform in these regions. Most developing countries cannot afford and do not grant substantial domestic support.

Domestic support measures in developed countries appear to increase global production, forcing down world prices. This benefits consumers in net food importing developing countries at the expense of net exporters. Since producers in both groups of countries face lower prices as a result of domestic support in developed countries, most developing countries are demanding the reduction of domestic support.

In WTO terminology, domestic support in agriculture is classified by "boxes". Green-box support must be only minimally trade distorting, whereas amber-box support measures are considered to distort production and trade and, as such, are subject to reductions. The blue box is for direct payments that are tied to programmes that limit production, for example, payments are based on historical land area or number of livestock.

The United States proposal for domestic support reductions is to reduce over five years the non-exempt support as defined by the Aggregate Measurement of Support (AMS) (amber box) as well as production-limited (blue box) support to at most 5 per cent of the average value of agricultural production. By some later date, all non-exempt domestic support would be eliminated. *De minimis* payments, i.e. support not exceeding five per cent of the total value of production, would be excluded from reductions and subsequent elimination. Developing countries would have special conditions to enable them to provide additional support to facilitate development and food security.

The EC proposal involves maintaining the amber, blue and green boxes essentially unchanged and reducing the amber box Aggregate Measurement of Support by 55 per cent. The green-box criteria would be expanded to encompass so-called 'non-trade concerns' such as rural development, the environment and animal welfare. This is in contrast to the United States proposal whereupon the green-box criteria would not be expanded. At present the EU's AMS expenditure is not a binding constraint, but could become so in the future, depending on movements in world prices. A flexible green-box allows support to be switched from the non-exempt amber to the exempt green-box, as decided in June 2003 by the EC in the reform of the its Common Agricultural Policy (CAP) by increasing direct income support. Finally, the European Union proposes eliminating the *de minimis* provision in developed countries. The European Union makes less use of this provision than the United States.

The Harbinson proposal on domestic support is to maintain green-box support measures unchanged and to reduce blue box payments by 50 per cent in developed and 33 per cent in developing countries. The amber box Aggregate Measurement of Support would be reduced by 60 per cent in developed and 40 per cent in developing countries. The *de minimis* level of five per cent would be reduced to 2.5 per cent in developed and would remain unchanged at ten per cent in developed countries.

The EC-United States joint proposal also envisages leaving green-box support measures unchanged but broadening and weakening the definition of direct blue box payments. These "new blue box" payments would have to fulfil several requirements but would no longer have to be production-limiting. Under the proposal they would not exceed 5 per cent of the total value of agriculture production. The "most trade-distorting domestic support" and *de minimis* payments would be reduced in a certain range, with countries having the higher trade-distorting support making greater efforts. The sum of amber and "new blue" box and *de minimis* support would be capped at the sum of the amber and blue box and *de minimis* support level in 2004.

The draft Cancún text adopted the EC-United States proposal to modify and expand the blue box but required a linear cut of the corresponding payments. Green-box payments would remain under negotiation, which probably means that there would not be any changes in the next few years. As in the EC-United States proposal, amber box and *de minimis* payments would be reduced within a certain range.

(c)   **Export Subsidies**

Of the current 148 WTO members, 25 countries have export subsidy commitments, volume and budgetary outlay constraints, for various groups of products. Almost 90 per cent of all agricultural export subsidies are provided by the European Union. It is, therefore, perhaps not surprising that the United States proposes to eliminate export subsidies over five years whereas the European Commission suggests a modest reduction of an average 45 per cent in expenditure. As with tariff cuts, averaging provides flexibility by permitting

large cuts in lightly traded or lightly protected products.

Between 1995 and 2000 the EU's average subsidies were US$5.5 billion, only 20 per cent lower than its final bound expenditure level of US$6.8 billion. But in 2000 and 2001, outlays decreased to US$2.5 and US$2.3 billion respectively and, could therefore accommodate a reduction of more than 60 per cent in the total expenditure. However, several individual commodities are currently up against expenditure or volume constraints, including rice, sugar, cheese and other milk products, poultry, fresh fruits and vegetables and incorporated products.

The United States proposes, in addition to the elimination of export subsidies, that disciplines would be placed on officially supported export credits, food aid and other forms of export support without specifying quantitative limits. Globally, most export credits are provided by the United States to their farmers. The EU proposes that the trade-distorting elements of export credits for agricultural products should be identified and subjected to strict disciplines.

The Harbinson Proposal involves eliminating export subsidies in both developed and developing countries, although the latter would have a longer implementation period. Export credits would be subject to disciplines.

In their joint paper, the EC and the United States propose to eliminate export subsidies for as yet unspecified products that are of particular interest to developing countries, and to reduce export subsidies for the remaining products. Trade-distorting elements of export credits should be treated in the same manner as export subsidies.

In the draft Cancún text, the WTO General Council adopted the EC-United States approach with a view to eventually phasing out all export subsidies and trade-distorting elements of export credits.[6] Most developing countries, including the Group of 20, are seeking the elimination of all forms of export subsidies as an outcome in the current negotiations. The failure to meet the objective in the draft Cancún text was one of the major concerns of developing countries and especially net food exporting countries.

(d)   Non-trade Concerns and Other Issues

The agriculture negotiations provide scope for governments to pursue "non-trade" concerns such as the environment, rural development, labour standard and food security. However, not all countries are ready to negotiate these "non-trade" issues. The United States does not mention this issue at all and favours a narrow round excluding these issues.

The European Commission proposes that measures aimed at achieving certain societal goals such as the protection of the environment, traditional landscapes, rural development and animal welfare should be accommodated in the agreement on Agriculture. For example, payments to compensate for the additional cost of meeting higher animal welfare standards would be exempt from reduction commitments under the proposal. Other non-trade concerns include geographical indicators, such as 'Champagne', and restrictions on imports of genetically modified organisms. The Harbinson Proposal acknowledges non-trade concerns such as structural adjustments and animal welfare. Payments should be time-limited.

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[6] Agreed disciplines on export credits would address appropriate provisions for differential treatment in favour of least-developed and net food-importing developing countries.

So-called non-trade concerns are difficult to specify and hence cannot readily be modelled with models that are used to assess the economic effects of alternative scenarios. However, this doesn't imply they are unimportant. They may have an important bearing on the negotiations. Countries that are pushing strongly for these concerns to be addressed may well be prepared to compromise in other areas, such as export subsidies or domestic support. While many of these non-trade concerns may be understandable from a developed country's perspective, they tend to increase standards and the amount of legitimate farm support to levels that most developing countries cannot afford, and thus impose a disadvantage against developing countries in international trade.

These non-trade concerns add to the complexity of the negotiations on agriculture. Both the EC-United States joint paper and the draft Cancún text list a number of issues on which there is no agreement and on which further work on modalities is necessary. Among these are several non-trade concerns, the peace clause[7] and flexibility for certain groupings. These issues are not covered in greater detail in this study.

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[7] Under the WTO Agreement on Agriculture, it was agreed (Article 13) that members would refrain from the use of countervailing measures until the end of 2004. This was known as the 'peace clause'.

III. MARKET ACCESS: THE BLENDED FORMULA

The differences among the four proposals are reflected in the market access approaches. Each proposal contains a formula with which new tariffs can be calculated from the initial tariffs. The approaches differ according to average levels of reduction, flexibility inherent in the formula and, the extent to which tariff escalation and tariff peaks are addressed. A so-called harmonizing approach cuts higher tariffs by a higher percentage than lower tariffs and thus addresses tariff escalation and tariff peaks. This is a particular characteristic of the Swiss formula that the Uruguay Round approach does not possess to the same degree. Countries concerned to protect their own agricultural markets tend to reject a harmonizing approach, whereas agricultural exporters like Cairns Group members tend to believe it will open greater market opportunities for them. The Harbinson approach is a compromise between the Swiss formula and the Uruguay Round formula (see Figure 2).

Figure 2
Market access formula from various proposals
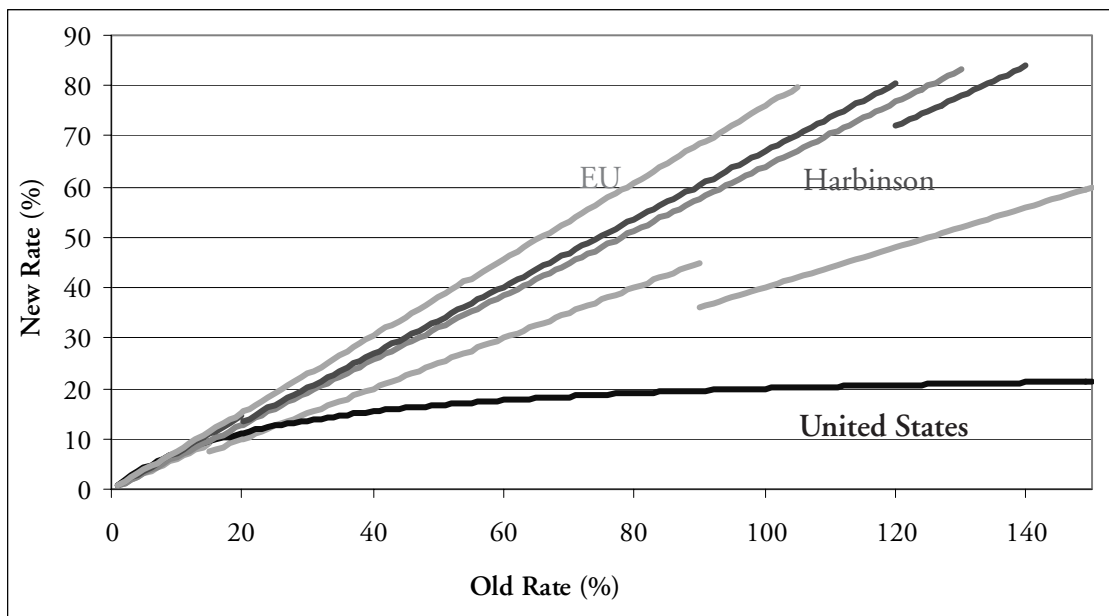
Source: UNCTAD

The blended formula in the Cancún text gives countries a degree of flexibility such that if countries take advantage of their potential clearance, it can even be anti-harmonizing. This can be seen in Figure 3 where final tariffs are plotted against hypothetical initial values. It is assumed that bound tariffs are equally distributed between 0 and 150 per cent and that high tariffs are subject to the Uruguay Round approach and, within this category the highest are reduced using the minimum requirement, intermediate tariffs are reduced using the Swiss formula and, small tariffs are reduced to zero. For developing countries the concept of Special Products has been taken into account and small bound tariffs are reduced to five rather than zero per cent. The issue of tariff escalation in developed countries is however, addressed since it is proposed in the Cancún text to apply an as yet unspecified factor to the tariff reduction of the processed product in cases where its tariff is higher than the tariff for the product in its primary form. This would increase the commitments for developed countries but could not be taken into account in our analysis.

Since the draft Cancún Ministerial text is a framework that does not contain specific targets, it is necessary to make assumptions about plausible values in order to analyse the blended formula. The following box contains the proposed formula where the assumed italic numbers replace the empty brackets in the Cancún Ministerial text (Paragraphs 2.1 and 2.7 of Annex A of the Cancún Ministerial text).

Figure 3
Impact of the blended formula on tariffs
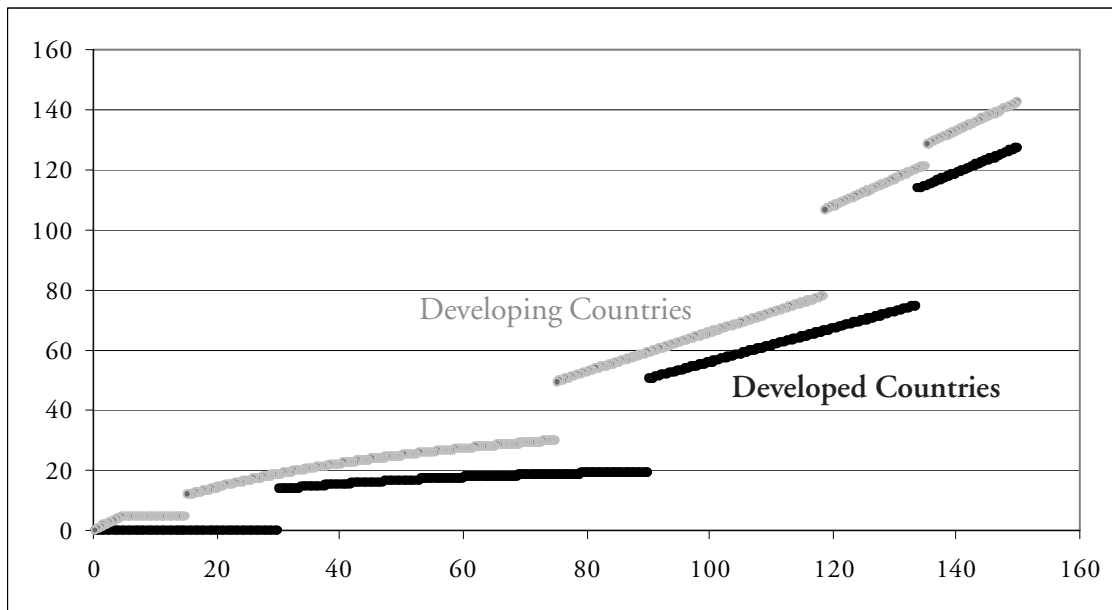
Source: UNCTAD

<div style="border: 1px solid black; padding: 10px;">

Box 1

Possible tariff reduction specifications under the Cancún proposal with assumed numbers

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.

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It is important to identify the consequences of the blended formula for developed and developing countries. To illustrate the effects of the possible specifications in Box 1, the three largest developed countries were chosen and 15 developing countries from different regions and with different tariff schemes were chosen arbitrarily. The blended formula was applied with the assumptions of reductions specified in Box 1 to bound tariff rates at the HS six-digit classification level. The final bound tariff rates were calculated and it was checked whether applied rates would have to be reduced or not. The general rule, which was applied when choosing which tariff lines fall under which part of the blended formula, was guided by the objective that applied tariffs are to be as little affected as possible.[8] Initial tariffs are ranked by the height of bound rates for developed countries. Since in most developing countries there is a significant difference between bound and applied rates, the ranking is according to the percentage difference between bound and applied rates in developing countries. Where the difference is high and bound tariffs are low, the bound rates are reduced to five rather than zero per cent.[9]

Table 2 shows the initial bound and applied rates as well as the final tariff rates.[10] It can be observed that the percentage

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[8] By choosing the reductions for each of the more than 600 tariff lines strategically a single country could better achieve the objective of reducing applied rates as little as possible. However, a transparent rule that can be readily applied to all countries was chosen instead. With this procedure the average reduction of bound rates is not minimized. A maximum tariff was not taken into account.

[9] For more details and the line of reasoning concerning these rules see also Section IV Modelling agricultural reform, Subsection (b) Scenarios.

[10] The percentage change of the bound and applied tariff rates in the last two columns do not match with the difference of tariffs shown in the table as the difference is the more accurate average of percentage differences at the six digit level.

Table 2
Applying the blended market access formula

	Initial values		Blended formula				Harbinson approach			
			Final values		Percentage reduction		Final values		Percentage reduction	
	Bound tariff	Applied tariff	Bound tariff	Applied tariff	Bound tariff	Applied tariff	Bound tariff	Applied tariff	Bound tariff	Applied tariff
	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10
	%	%	%	%	%	%	%	%	%	%
EU	17	17	11	11	22	22	8	8	35	34
United States	6	6	4	4	16	16	3	3	31	31
Japan	21	18	14	13	20	18	9	9	34	31
Bolivia	40	10	25	10	37	5	28	10	30	0
Cameroon	78	23	43	23	44	2	51	23	35	1
Cuba	37	11	24	11	35	0.2	26	10	29	2
Domi.Rep.	40	23	25	22	36	4	28	21	30	6
Egypt	96	52	20	19	32	14	61	50	28	9
Guatemala	52	11	26	11	39	0.2	35	11	31	1
Honduras	32	11	21	11	34	0.2	23	11	29	1
India	115	42	48	36	49	12	72	38	36	5
Indonesia	46	7	27	6	38	0.1	32	5	30	0.5
Kenya	100	24	56	24	43	0	65	24	35	0.1
Nigeria	150	33	75	32	50	5	90	32	40	0.2
Pakistan	97	23	49	22	46	3	63	21	35	3
Peru	31	18	20	16	34	9	22	16	30	7
Sri Lanka	49	21	29	20	39	0.2	34	20	30	1
Venezuela	31	16	20	16	34	2	22	16	30	0

Source: UNCTAD calculations

reductions in bound rates under the blended formula are 22, 16 and 20 per cent in the three developed countries, the EU, the United States and Japan respectively, much lower than the reductions of between 32 and 52 per cent in developing countries (column (5)). This is the case even though the commitments in each of the components of the blended formula were chosen to be higher for developed countries than for developing countries. Developed countries for example do not have Special Products and the Swiss coefficient of 25 much more ambitious in terms of liberalisation than the corresponding coefficient of 50 for developing countries. The reason for this is that bound tariff rates for developed countries are quite heterogeneous and therefore these countries can take advantage of the flexibility inherent in the blended formula. This is not the case for developing countries where bound rates for the various tariff lines are more homogenous and on average higher than in developed countries. Thus, concerning bound rates the blended formula includes higher obligations for developing than for developed countries even if special and differential treatment through smaller numbers in each of the components is taken into account. In terms of simple average bound rates, the blended formula appears to better suit the needs of developed countries. In effect, this would be a reverse special and differential treatment.

While WTO negotiations are a legal process concerned with the negotiation of reductions in bound rates, it is also instructive to look at applied tariff rates to ascertain likely direct economic effects of possible negotiated outcomes. With cuts between 16 and 22 per cent, reductions in the applied rates tend to be deeper in developed countries, whereas the reduction of applied rates in most developing countries are more moderate (Column 6). In nine out of the 12 developing countries reductions in applied rates are less than 5 per cent. Only in Egypt and India are cuts higher than 10 per cent. In developing countries, there is in general a degree of "water in the tariffs" (the gap between bound and applied rates), and, as seen in Table 2, the implication of the proposals is to squeeze out this water by bringing bound rates to the same level or lower than applied rates. This process completely removes any latitude for increasing applied rates, for example in response to import surges or subsidized imports. This suggests that, in the future (also with the passing of the Peace Clause on countervailing actions), there may be greater resort to safeguards or countervailing actions than in the past.

Comparing the blended formula with numbers as in Box 1 with the Harbinson approach, it can be seen in Table 2 that the reductions of bound rates are higher under the blended formula for all developing countries (columns (5) and (9)). Developed countries however, have lesser obligations under the blended formula. New bound and applied rates are lower with the Harbinson approach than with the blended formula. In some developing countries new applied rates are lower under the Harbinson approach smaller than under the blended formula. The reason for this is that advantage was not taken of the flexibility that the Harbinson approach gives countries when they calculate the new bound rates. As in the Uruguay Round component of the blended formula, bound tariffs can be reduced by a certain minimum whenever the required average is met. Furthermore, although suggested by Harbinson, Special Products were not taken into account when calculating new tariffs under the Harbinson approach. Therefore, although it is theoretically possible it is practically unlikely that the new applied rates in any developing country would be smaller under the Harbinson approach than under the blended formula with assumptions as in Box 1 (columns (6) and (10)). Taken the flexibility of the Harbinson approach and Special Products into account, new applied rates are likely to be smaller under the blended formula in all developing countries.

However, whether or not obligations of developing countries are higher with the blended formula depend on the numbers that are assumed. With the specified assumptions the average reduction in applied rates in developing countries is about 8 per cent.[11] In a much more ambitious Cancún scenario, where reductions in each of the components of the blended formula are higher and where the distribution of tariff lines among the components is stricter, the average reduction of applied tariffs is 14 per cent. This compares with the 10 per cent average reduction of applied tariffs in developing countries in the Harbinson scenario.[12] Reductions of applied rates in all developed countries are 24 per cent with the above stated assumptions, 32 per cent in the ambitious Cancún scenario and 26 per cent in the Harbinson scenario.

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[11] Based on the 99 developing countries that are in UNCTAD's ATPSM database (see Appendix for a list of countries).

[12] Note, that the numbers for all 99 developing and all 20 developed countries are calculated at the ATPSM aggregation level, which is roughly the 4-digit level. The ambitious Cancún scenario is described in greater detail in Section 6, Subsection Sensitivity analysis.

Tariff reductions are highly sensitive to the bands between components. The sensitivity of the average reduction in bound tariff rates in developing countries to changes in the distribution of tariff lines between components of the blended formula is shown in Figure 4. Since the Swiss formula component and the reduction to 5 per cent reduce relatively high bound rates considerably, the overall reduction increases with the number of tariff lines that are subject to these two components. The reduction within each category remains as assumed in Box 1. If for example, a country has all initial tariffs at 100 per cent and, if 80 per cent of the tariff lines are subject to the Uruguay Round component, 10 per cent to the Swiss formula and 10 per cent reduced to 5 per cent, then the new bound rates are on average 65 per cent and the average reduction is 35 per cent. However, if instead of 80/10/10 the distribution of tariff lines across components is 33.3/33.3/33.3, the average reduction increases dramatically from 35 to 62 per cent.

Improved access to developed country markets is important for developing countries. Assuming that the major developed countries would wish to preserve the sectors that are most vulnerable to import competition, they would put sugar, dairy products, beef meat and some cereals under the Uruguay Round component. Tariffs on sugar, which is an important product for developing countries since they can produce a substitute to sugar beet (which is produced in temperate regions) would only be reduced minimally. Also, processed chocolate, oil seeds and some fruits and vegetables, including some tropical fruits, would be put into the Uruguay Round component with low reductions. Products for which tariffs are already rather low, like tea, vegetable oils, coffee beans and cacao, are likely to be made subject to the Swiss formula or duty free component. Thus, the flexibility inherent in the Cancún proposal seems likely to water down substantially the level of ambition.

Figure 4
New bound rates after application of the blended formula with varying distributions
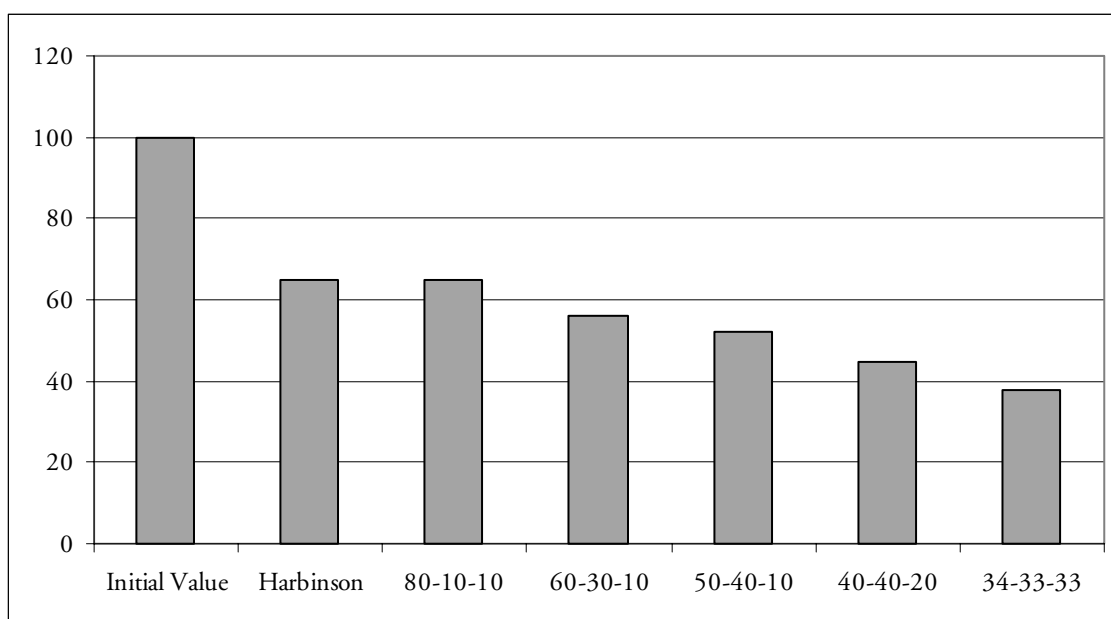
Source: UNCTAD

IV. MODELLING AGRICULTURAL REFORM

UNCTAD's Agricultural Trade Policy Simulation Model (APTSM) is used to estimate the potential impact of various proposals for reforming the agricultural trade sector, assuming their implementation is as specified.[13] The static, partial-equilibrium, global, agricultural-trade model is able to estimate the economic effects of changes in within-quota, applied and out-quota tariffs, import quotas, export subsidies and domestic support on production, consumption, prices, trade flows, trade revenues, quota rents, producer and consumer surplus and welfare. A more detailed description of ATPSM can be found in the Appendix to this paper.

The Uruguay Round reforms introduced several policies that present difficulties in quantification. Quotas and tariffs on imports and export subsidies generate quota rents of some US$10 billion.[14] It is assumed here that all the rents (over and above "normal" profits) generated by the EU and United States sugar policies and half of the rents from bananas are initially allocated to producers in exporting countries according to the distribution of trade.[15] Rents from the remaining products are initially allocated to the importing countries.

A second difficult modelling issue concerns the decoupling of domestic support, that is, the production effects of changes in support. This is a complex issue concerning the method of administration, perceptions of risk, the wealth effects of direct payments and the likelihood of changes in government policies. The approach taken here is to assume that most of the domestic support is decoupled or is conflated with border support.[16] Thus, the additional effects of removing domestic support are minimal in most cases. This assumption may give a downwards bias to the estimated benefits from liberalization.

Several modelling assumptions are also important to note. For example, the ATPSM allows two-way trade. This requires an additional equation to specify either exports or imports. In this version of the model the change in imports is determined through an "Armington" elasticity (determining the substitutability of differentiated products from suppliers at home and abroad), which is set at 2.2. Consumers first decide how much they consume and, in a second step, how much domestic and foreign products they want to buy. Exports are determined so as to clear the market, that is, supply plus imports equals demand plus exports.

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[13] An operational version of the model, associated database and documentation are available free of charge from UNCTAD (http://www.unctad.org/tab).

[14] This estimate assumes import quotas are filled. To the extent that import quotas are unfilled, the estimate is inflated.

[15] In a previous application of the model, reported in Vanzetti and Sharma (2002), it was assumed that the rent from all products went to producers, although this assumption is difficult to justify. The allocation of rents affects the distribution of gains from liberalization.

[16] See de Gorter (1999) for a discussion of the methodological issues involved in measuring domestic support.

Where producers receive rents they do not respond by changing quantities produced. This implies for example, that changes in within-quota tariffs change only quota rents, not quantities, prices or global welfare. The shifting of quota rents is a zero sum game. This is described in more detail in the Appendix,

The model does not have a specific time-dimension. The general interpretation is that the economic effects are of a medium-term nature, with the impacts taking three to five years to work through.

A final observation relates to limitations on modelling preferential access. Data on bilateral tariffs are not included in the database, although bilateral trade flows are available. Thus, it is not possible to liberalize on a bilateral basis and directly capture the effects of preference erosion as MFN rates are brought down closer to preferential rates held by many developing and all least-developed countries. However, much of the effect of diminishing preferences is captured by the depletion of quota rents allocated initially to exporters. The model structure does not allow for trade diversion from changes in rents, but where the quotas are filled this effect will be minimal, at least for small changes in prices.

The present version of the model covers 175 countries of which the current 15 European Union members form a single region. Countries designated here as 'developed' are defined by the World Bank as high-income countries with per capita GNP in excess of US$9,266 (World Bank, 2001). Another group is the 49 least-developed countries as defined by the United Nations. There are 36 commodities in the ATPSM data set, covering most of the agricultural sector. This includes many tropical commodities of interest to developing countries, although

many of these have relatively little trade by comparison with some of the temperate-zone products. Meat, dairy products, cereals, sugar, edible oils, vegetables, fruits, beverages, tobacco and cotton are among the products covered by the ATPSM database.

(a)   Data

The data in the model come from different sources, including OECD (AMAD), FAO, UN, WTO and UNCTAD (see Appendix).[17] The year 2000 represents the base year for the model.

An indicator of the degree of distortion is the revenue raised or government expenditure outlaid on each commodity. Most of the global protection in agriculture is on temperate products, particularly beef, wheat, maize, dairy products, vegetables oils and oilseeds. According to the ATPSM database, tariff revenues and rents for the products in the model amount to around US$45 billion, with export subsidies and production distorting domestic support accounting for an additional US$11 billion. Among the products that can be grown in tropical regions, tobacco, sugar and poultry attract substantial protection. These products or close substitutes can also be grown in temperate regions. There is relatively little tariff revenue raised on tropical products such as beverages (except chocolate) and cotton. For the products covered by ATPSM, tariff revenues amount to 17 per cent of import costs.

The European Union and Japan raise the largest amounts of agricultural tariff revenue (over US$4 billion each) but several other countries collect over US$1 billion annually. These are Mexico, the Republic of Korea, the United States, the United Arab Emirates, Egypt and Turkey. In fact, 50

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[17] The OECD maintains the Agricultural Market Access Database (AMAD), a cooperative effort between several international and national institutions (including the European Commission). The database is publicly available online.

countries gather in excess of US$100 million annually in agricultural tariff revenues. This illustrates the scope for global reform.

The major commodities attracting export subsidies are wheat, beef, dairy products and sugar. Of the US$4.6 billion attributed to commodities in the database, US$4 billion is paid by the European Union, with Switzerland, Norway and the United States responsible for much of the remainder. The European Union (US$2.3 billion) and Japan (US$1.9 billion) also provide most of the domestic support that is considered in the ATPSM database to be production distorting. Once again, the United States accounts for most of the remainder. Tobacco leaf, cotton, fresh milk and beef account for the largest slices of domestic support.

(b)   Scenarios

Four simulations are undertaken to analyse the proposals on agriculture. An ambitious scenario now seems off the agenda but indicates the opportunity cost of foregone gains. A conservative proposal is the Uruguay Round continuation that was once considered the least that could be gained from the current round. The third scenario is the Harbinson proposal that was the basis for discussion for months before the EC-United States proposal was submitted. Finally, the fourth scenario is the WTO's response to the EC-United States proposal. The four scenarios are listed in Table 3 and described in more detail in this section.

The *ambitious* scenario is relatively straightforward. It is based on the United States proposal of a Swiss cut with a maximum tariff of 25 per cent. Tariff cuts are based on applied rather than bound rates, an important distinction for developing countries where the gap between bound and applied rates can be significant.

The second scenario is the *conservative* proposal, an extension of the Uruguay Round approach. Developed countries make tariff cuts averaging 36 per cent with a minimum of 15 per cent and in developing countries the average must be 24 per cent with a minimum of 10 per cent. In modelling this, an attempt has been made to specify which products would be selected for the minimum tariff reductions. Concerning the flexibility that countries might have in selecting the reduction in single tariff lines, the following reasoning was used, which was also mentioned briefly in Chapter 3, where the blended formula was described. WTO members usually want other countries to liberalize whereas they want to protect their own markets or, at least they want to have the flexibility to protect them by not having strong binding commitments. For developed countries, it was assumed that products with high bound tariffs are (politically) sensitive products and, therefore, countries want to reduce these tariffs as little as possible. For the products with the highest tariffs, the minimum possible reduction is implemented and lower tariffs are reduced such that the required average is met. For developing countries, the same rule was applied but, the most sensitive products are defined as having the smallest percentage difference between out-quota bound and applied tariff rates.[18] Since most developing countries have much higher bound than applied tariff rates, this rule means that developing countries' applied rates are only slightly affected. The reduction for each country was not chosen such that applied rates are affected as little as possible but rather   a number of tariff lines were specified that are reduced according to the minimum reduction and the remaining tariffs reduced such that required averages were met.

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[18] In developed countries the difference between bound and applied rates is small so that for these countries this rule does not make sense.

In the *Harbinson* proposal, cuts depend on the initial tariff level. Although countries here also have the flexibility to apply within three or four bands minimum reductions whenever an average is met, the dependency of the average and the minimum on the initial tariff reduces the flexibility. Therefore, when analysing this proposal, the specified selection rule for sensitive products is not applied but rather all tariffs in each of the bands by the proposed average are cut.

The next simulation is the *Cancún* proposal. The main concern in specifying this simulation is the lack of detail in the proposal. For example, the draft Cancún Ministerial text does not contain specific targets, but phrases such as "[…]% of tariff lines would be subject to a […]% average tariff cut and a minimum of […]%, …". In order to assess these proposals, assumptions on the numbers have to be made. Therefore, it is not possible to predict the precise nature of the tariffs or even the distribution of tariff cuts.

Prior to Cancún the EC and the United States tried to bridge their differences and agreed on a compromise that combines the harmonising Swiss formula and the conservative Uruguay Round approach. Since the blended market access formula was adopted by the General Council for the Cancún proposal from the EC-United States proposal, a first natural approach is to assume for the Uruguay Round part the numbers that had been proposed by the EC in its own, earlier proposal (36 per cent average reduction with a minimum cut of 15 per cent) and for the Swiss formula component, a coefficient of 25 that had been initially proposed by the United States. However, it is assumed that the Swiss formula would be applied on out-quota bound rather than applied tariffs. Furthermore, it is assumed that the share of tariff lines subject to both the Uruguay Round and Swiss formula is twice as high as the share of duty-free tariff lines, which gives a distribution of 40-40-20. For two reasons a maximum tariff is not modelled. First, because it is proposed that

developed countries can alternatively ensure effective market access through a request-offer process that could include tariff rate quotas. Second, it is proposed that developed countries may have the additional flexibility for a very limited number of products to be designated as of non-trade concern that would not be subject to a maximum tariff.

For developing countries, it is assumed that 10 per cent of the products can be denominated as Special Products with a reduction of 5 per cent. For the Uruguay Round part, it is again assumed that the Uruguay Round numbers, i.e., an average reduction of 24 per cent and a minimum of 10 per cent, where the latter is applied to the 10 per cent most sensitive products, those with the highest tariffs, within the group of the 40 per cent of tariff lines subject to the Uruguay Round formula. The next 40 per cent most sensitive products are subject to a Swiss formula cut with a coefficient of 50, which was proposed earlier in the post-Doha negotiations by the Cairns Group. The remaining 10 per cent of tariff lines are reduced to 5 per cent. This approach differs slightly from the draft Cancún Text since it does not include the Special Products in the Uruguay Round set of reductions. This approach gives almost the same results as the approach where the Special Product category is included in the Uruguay Round part if this part is extended to 50 per cent of tariff lines. Furthermore, since developing countries, unlike the developed countries, do not already have a large number of tariff lines at zero rates, a reduction to 5 per cent would be a strong commitment, and therefore, it might be considered to be unlikely that this number of tariff lines is as large as the zero rate tariff-line number for developed countries. Therefore, the total number of tariffs was increased, subject to a linear reduction in developing countries, to 50 per cent compared to 40 per cent in developed countries. The tariff cuts are applied to the 36 ATPSM commodities, broadly the four-digit level, rather than the tariff-line level.

The export subsidy and domestic support reductions in the draft Cancún text, were assumed to be the same as for the Harbinson proposal. Since average reductions are proposed, this flexibility causes similar modelling problems as the flexibility concerning tariff reductions. Here, it is assumed in all four scenarios that the rates are binding and that countries do not take advantage of flexibility to vary the reductions across different commodities. This assumption thus overstates the likely impacts from reform, as is the case in all simulations where subsidies are not eliminated entirely. Additionally, the draft Cancún text distinguishes between subsidies on products of particular interest to developing countries and other products, an element that is not captured here.

Simulating the proposals is problematic. In some of them many details are specified that cannot be captured by ATPSM. For example, the Harbinson proposal includes the flexibility to reduce export subsidies in different steps. Similarly, the proposed expansion of import quotas depends on current quotas averaged across several commodities, whereas within ATPSM the changes are applied to each of the 36 commodity groups. Furthermore, a possibility to preserve preferential schemes and several other special and differential treatment issues are proposed. Additionally, the approaches provide flexibility for countries to self-select tariff and subsidy reductions. Although attempts were made to predict the countries' behaviour with the rules described above, countries may in practice act differently. Since it is not possible to model all the elements of the proposals, the simulation results can only provide a rough picture of the possible economic effects. Nonetheless, since the simulations reflect the major characteristics, the implications drawn from it are likely to be quite robust.

Tariff reductions and averages are calculated at the 4-digit commodity level of the ATPSM database. For developed countries, most sensitive products are defined as those with the highest out-quota bound tariff rates, and for developing countries they are the products with the highest percentage difference between bound and applied rates.

Table 3
Alternative liberalization scenarios

Label	Description
Ambitious	A reduction in applied out-quota tariffs according to the Swiss formula $t1=(t0*25)/(t0+25)$, elimination of in-quota tariffs, a 20% expansion of import quotas, elimination of domestic support and export subsidies in all countries and all commodities.
Conservative	A reduction in bound out-quota tariffs of the 10% most sensitive products of 15%, a 44.1% reduction of remaining products, a 55% reduction in domestic support and 45% reduction of export subsidy equivalent in developed countries with two-thirds of these cuts in developing countries. No reductions in least-developed countries.
Cancún	Developed countries: 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%), 40% of tariff lines are subject to the Swiss formula with a coefficient of 25, 20% of tariff lines with the lowest initial bound values are reduced to zero; export subsidies are reduced by 80% and domestic support by 60%.
	Developing countries: 10% most sensitive tariff lines are reduced by 5% (Special Products), next 40% most sensitive products are subject to Uruguay Round formula, where bound out-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%), 40% of tariff lines are subject to the Swiss formula with a coefficient of 50, while the remaining 10% are reduced to 5%; export subsidies are reduced by 70%, domestic support reduced by 20%. Least-developed countries: no reductions.
Harbinson	A reduction in bound out-quota tariffs of 60% where the initial tariff is higher than 90%, 50% (initial tariff between 15 and 90), or 40% (initial tariff smaller than 15); an 80% reduction in export subsidies; and a 60% reduction of domestic support in developed countries. In developing countries: a 40% reduction where the initial tariff are higher than 120%, 35% (initial tariff between 60 and 120), 30% (initial tariff between 20 and 60) and 25% (initial tariff smaller than 20); a 70% reduction of export subsidies; and a 20% reduction of domestic support. A 20% expansion of import quotas in developed and developing countries. No changes in least-developed countries.

V. RESULTS - CONFLICTING INTERESTS AND IMPACTS

(a) The EU and the United States, Two Major Players

It seems unlikely that there will be an agreement on agriculture unless the United States and the European Union agree.[19] Thus, the impact of any proposal on these countries is particularly important. The initial proposals in the Doha negotiations from the two major players were very different in their level of ambition. The United States proposal sought a greater degree of liberalization than that of the EU. As a competitive exporter of major agricultural products, the United States has more to gain from an ambitious proposal than the EU. The results of the analysis confirm this.

Considering the impact on the two regions, Table 4 shows that the more conservative proposals have fewer producer losses for the EU than the more ambitious approaches, while the opposite is the case for the United States. Furthermore, in the United States the increase in export revenue is much higher under an ambitious liberalization scenario. The reason is the different structure of the agriculture sectors. Although both countries protect their markets and provide trade-distorting subsidies, the United States agriculture sector is, overall, more competitive in world markets than that of the EU. The initial export revenue in the United States is overall about twice as high as in the EU, even

Table 4
Impacts of Alternative Proposals on the EU and the United States
(in US$billion)

		Cancún	Harbinson	Conservative	Ambitious
European Union					
Consumer Surplus	$	19.2	23.9	13.3	29.2
Producer Surplus	$	-19.6	-22.4	-13.8	-26.8
Government Revenue	%	4.1	4.1	3.2	3.9
Export Revenue	%	-6.9	-6	-4.5	-4.3
Welfare	$	3.8	5.6	2.8	6.3
United States					
Consumer Surplus	$	-4.5	-5	-2.2	-9.9
Producer Surplus	$	4.9	5.8	2.2	11.4
Government Revenue	%	0.1	-0.05	0.3	0.1
Export Revenue	%	3.2	3.9	1.9	8.6
Welfare	$	0.6	0.8	0.3	1.6

Source: ATPSM simulations.

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[19] Under the WTO consensus principle for decision-making all member countries have an effective veto, but the larger trading countries are able to bring political pressure to bear.

though subsidies in the EU are much higher. Overall welfare gains for the EU result from removing border support to farmers, which leads to lower production, lower consumer prices and reduced export subsidy expenditures. That the EC favours a conservative approach reflects the political weight attached to transfers to producers.

The EU and the United States cannot predetermine the outcome. The impacts of the various proposals on the other players are discussed here. It should be kept in mind that all groups are rather heterogeneous, and alliances may shift according to the particular issue.

(b)   Trade Flows

The purpose of trade liberalization is ultimately to improve the economic well-being (growth/development) of participants but, in the immediate effect of removing trade barriers for agricultural goods will increase imports and exports. However, the estimates show that the changes resulting form current proposals are modest in the aggregate. Most of the benefits, in terms of export revenues at least, are mainly concentrated in the area of temperate-zone products.

The trade-weighted average increase in export revenues is only about 5 per cent in the Cancun and Harbinson scenarios. Highly protected developed countries import more of almost all products, but especially temperate products cereals, fruits, oilseeds and vegetables. Because world food prices increase, least-developed countries import lower volumes of most products in the scenarios where they do not liberalize themselves. However, their import bills rise. Figure 5 shows the percentage increase of total import costs by various country groups.

In developed countries, the highest percentage increases in imports are for fruits and vegetables while, in developing countries, the highest increases in imports are in vegetables and dairy products and, in least-developed countries, dairy products and cereals. The EU and other developed countries with relatively high protection in agriculture, export less of almost every commodity, but most other countries export more agricultural products. Largest trade increases are in fruits and vegetables, dairy products and meat. Developing and least-developed countries and developed Cairns group members can increase their exports of products within these groups considerably. Exports of tropical beverages like
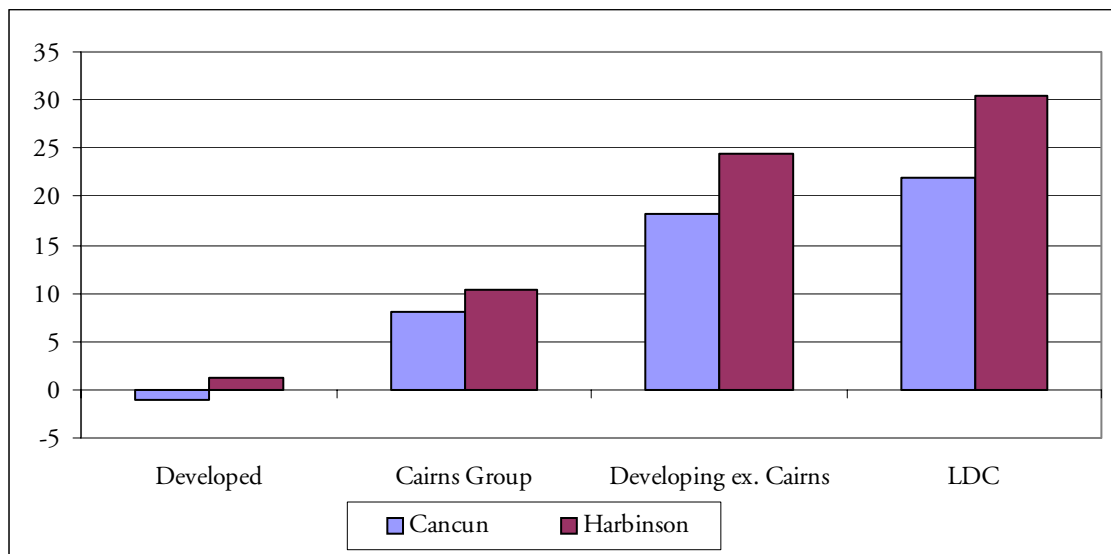
Figure 5
Percentage change in import cost in the Cancun and Harbinson scenario
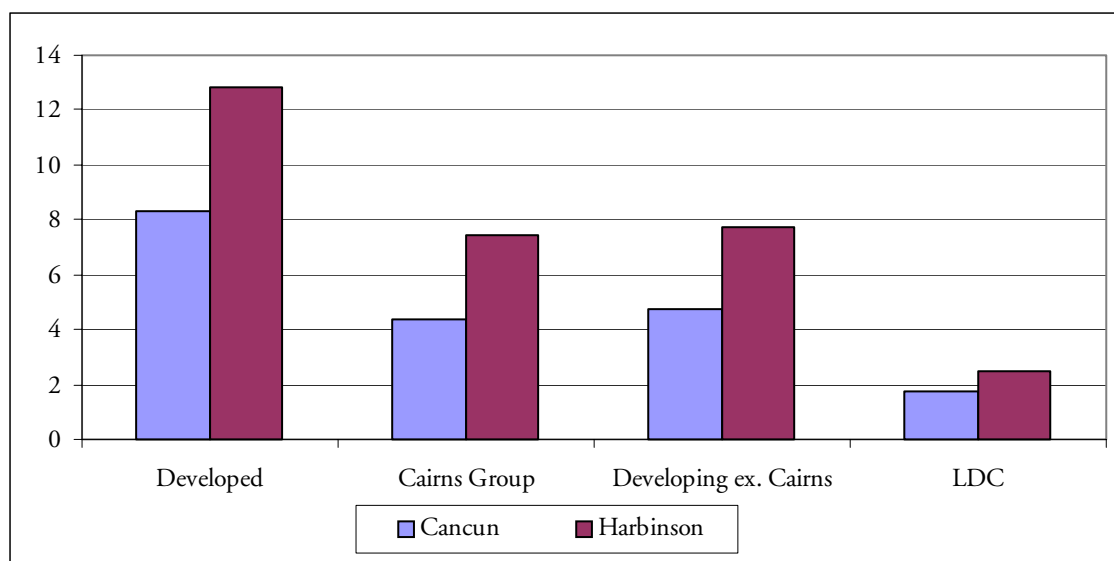
Source: UNCTAD

Figure 6
Percentage change in export revenue in the Cancun and Harbinson scenario

Source: UNCTAD

tea and coffee, which are important export products for many least-developed countries, are almost unchanged. Oilseeds are in the product groups with the highest absolute increases in export revenues for developing countries, but the percentage increases in exports are modest. The total export revenue is slightly reduced or almost unchanged in percentage terms for developed countries and slightly higher for Cairns Group members, for developing countries that are not Cairns Group members and for the least-developed countries (see Figure 6).

The marked increase of export revenues in the least-developed countries comes however, from a very low base. Since the initial export revenues of the Cairns Group are almost twice as high as the initial revenues for developing countries excluding Cairns Group members, the per capita increase in Cairns Group countries is the highest among all other groups. Thus, as expected, Cairns Group members' exporters would strongly benefit from trade liberalization as would exporters from other developing countries and least-developed countries, albeit to a lesser extent. However, since the blended formula gives countries the flexibility to not reduce applied

tariffs considerably, the global increase of export revenues of US$12 billion in the Cancun scenario compares with US$19 billion in the Harbinson scenario and US$44 billion in the ambitious scenario.

(c)   Price changes and distribution effects

Average price changes provide an indication of the level of ambition of the various proposals. A greater price increase means a higher level of ambition. The trade-weighted price increases are 2.4 per cent in the Cancún simulation and 3.1 per cent in the Harbinson simulation. This compares with a weighted increase of 1.4 per cent in the Conservative and 5.8 per cent in the Ambitious scenario. Comparing world prices across commodities confirms that the more highly protected sectors such as dairy products, sheep meat, sugar, beef and vegetable oils are most affected in all scenarios. Price changes are lower for tropical than temperate products. In the Cancún scenario, the trade-weighted average increase for tropical products is 1.3 per cent compared with 3.1 per cent for temperate products. About half of the world price increase can be attributed to the reduction of export subsidies in this scenario.

The changes in world prices have major distributional effects, both between countries and among different economic agents. Exporters gain from increasing world prices, whereas importers are hurt by rising prices. Net-food-exporting countries benefit from more ambitious liberalization scenarios and the reduction of subsidies. On the other hand, net food importing developing countries are expected to face higher prices from a more ambitious agreement. In fact, 83 per cent of all net food-importing countries, according to the ATPSM dataset, face net welfare losses from the Cancún scenario. The net food importing countries which do not lose from trade liberalization are mostly those developed countries that benefit from reduced subsidies.

The distributional impacts on groups of consumers, producers and taxpayers differ among various country groups. In developed countries, consumers gain and producers lose from reductions in domestic prices (Tables 5 and 6). However, this result is strongly influenced by the EU numbers. Due to decreasing domestic prices in the EU there is a huge consumer surplus that exceeds the negative producer impacts.

The third component of the total welfare, government revenue (Table 7) is in aggregate positive in developed countries because of a reduction in export subsidy expenditure in the EU. In many developing countries government revenue is decreasing.

Table 5
Consumer surplus impacts from Cancún scenarios

	Cancún	Harbinson	Conservative	Ambitious
	US$ m	US$ m	US$ m	US$ m
Developed	20 032	34 735	13 452	44 866
Developing	-14 529	-18 023	-3 681	667
Least Developed	-1 760	-2 455	-1 295	4 141
World	3 743	14 256	8 476	49 674
Group of 20	-11 123	-11 558	-2 966	-1 675
Cairns	-5 954	-7 090	-2 949	-7 962

Source: ATPSM simulations.

Table 6
Producer surplus impacts from Cancún scenarios

	Cancún	Harbinson	Conservative	Ambitious
	US$ m	US$ m	US$ m	US$ m
Developed	-16 543	-24 403	-12 358	-27 222
Developing	17 707	19 204	5 239	14 486
Least Developed	1 600	2 230	1 200	-2 625
World	2 764	-2 970	-5 918	-15 361
Group of 20	11 481	12 097	3 532	8 753
Cairns	7 266	8 900	3 789	12 933

Source: ATPSM simulations.

Table 7

Government revenue impacts from Cancún scenarios

	Cancún		Harbinson		Conservative		Ambitious	
	US$ m	%	US$ m	%	US$ m	%	US$ m	%
Developed	3 730	31	1 652	14	3 972	33	-2 735	- 23
Developing	-3 014	- 15	- 140	- 1	- 816	- 4	-9 401	- 46
Least Developed	19	1	26	2	12	1	- 470	- 30
World	735	2	1 538	4	3 167	9	-12 605	- 37
Group of 20	- 162	- 2	381	4	66	1	-2 814	- 33
Cairns	- 84	- 3	217	8	170	6	- 437	- 16

Source: ATPSM simulations.

Table 8

Welfare impacts from Cancún scenarios

	Cancún US$ m	Harbinson US$ m	Conservative US$ m	Ambitious US$ m
Developed	7 220	11 983	5 066	14 910
Developing	163	1 040	742	5 752
Least Developed	- 141	- 199	- 83	1 045
World	7 242	12 824	5 725	21 707
Group of 20	196	920	631	4 264
Cairns	1 228	2 027	1 009	4 535

Source: ATPSM simulations.

Global total welfare gains increase with the level of ambition. Table 8 shows that the gains are about between US$5 billion and US$22 billion. Using the standard welfare measure (consumer and producer surplus plus government revenue) to identify winners and losers, the analysis shows that there are quite a number of losers behind the world's overall welfare gains. Welfare increases in only 49 out of the 161 countries in the Cancún scenario. In the Harbinson scenario this number is 55 and in the Ambitious scenario 77. Thus, the number of winners increases with the level of ambition. However, since the amount that would have to be put aside to compensate all losing countries also increases with the level of ambition, the latter's losses are greater under the Ambitious scenario.[20]

In developing and least-developed countries, consumers lose as a group and producers gain because the rise in world prices lifts domestic prices. The government revenue changes only slightly, between 1 and 2 per cent. In less ambitious scenarios, the total welfare for developing countries is positive but small and for least-developed countries it is negative. This is influenced to a large degree by the reduction of export subsidies, which increases prices for temperate products, and somewhat by a reduction in quota rents on sugar received by a significant number of developing countries. Developing countries gain more from more ambitious scenarios that require them to make significant reductions in applied tariffs, giving rise to allocative efficiency gains.

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[20] A total of US$1.5 billion would need to be put aside to compensate all the losing countries in the Cancun scenario. In the Compromise and Ambitious scenario it is US$1.7 and US$2.4 billion, respectively.

Table 9

Export revenue impacts from Cancún scenarios

	Cancún		Harbinson		Conservative		Ambitious	
	US$ m	%	US$ m	%	US$ m	%	US$ m	%
Developed	- 938	- 1	1 189	1	185	0	10 475	11
Developing	12 272	13	16 557	17	9 815	10	31 106	32
Least Developed	904	22	1 254	30	859	21	2 109	51
World	12 237	6	19 001	10	10 859	5	43 690	22
Group of 20	7 861	15	10 951	21	6 489	12	20 594	40
Cairns	6 415	8	8 297	10	4 967	6	15 805	20

Source: ATPSM simulations.

Least-developed countries, with a higher proportion of net food importing countries, gain only if they liberalize themselves (under this comparative static analysis, with no account being taken of short-term adjustment costs). However, as in developing countries, producers gain more from the more ambitious scenario. Table 9 shows for all scenarios that the least-developed countries have the highest percentage increase in export revenues, although from a low base.

For the Group of 20 developing countries that formed a coalition and supported a counter-proposal to the EC-United States joint proposal and for the Cairns Group, the qualitative results are similar to the results for the group of developing countries. Producers gain slightly more than consumers lose and overall they gain more from more ambitious scenarios.

(d)   Wider Implications of Welfare Estimates

The merit of each proposal thus depends on whether policymakers emphasize the gains to producers, exporters, consumers or taxpayers. The estimated welfare impacts are the sum of these three effects. Transfers between these groups are equally weighted, so

the net welfare effect is positive if the estimated benefits to consumers and taxpayers exceed the losses to producers, as is often the case following the reduction of tariffs. A problem with such welfare estimates is the presumption of equal weights. The existence of policies favouring producers (in developed countries) or consumers (as used to be the case in some developing countries) is evidence that policymakers favour one group over another. From the observed policies in the current round of negotiations it seems that governments tend to attach greater weight to their producers rather than consumers. There are often internal political reasons for this. In developing countries, the argument goes that in order to achieve development needs, the poor rural population, where a large share depends on the agricultural sector, must be supported.[21] The negotiation strategy of most developing countries, namely to demand improved access to developed countries' markets and the elimination of trade-distorting subsidies and to protect their own markets, is a strategy aimed at maximising the producer surplus in these countries, at least in the short term. However, it has negative impacts on consumers as a result of higher domestic food prices.

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[21] Support for agriculture runs counter to the import-substitution industrialization policies, which favour industry over agriculture as a development strategy.

If producers happen to be the poorest members of society and the targets of government support, it may be that reforms that reverse these policies are detrimental to poverty reduction programmes. Assessment of the impact of alternative proposals should be taken in the light of such considerations. The economic analysis merely points out the potential impacts of reforms. Social, political and environmental considerations should be assessed. The modelling has little to say on poverty reduction for example, because it is not clear a priori whether it is producers or consumers who constitute these groups and that is a judgement for the government concerned. Furthermore, in many developing countries a large proportion of the population are subsistence farmers and this adds to the complexity. Rising world prices tend to benefit producers, and hence many of the rural poor, although this is not the case if tariffs are reduced by more than the rise in world prices. Price rises are greatest for the temperate products, such as livestock and grains and, since developing countries tend to be importers of these products, such increases are to the detriment of consumers. The analysis indicates the likely impacts on consumers and producers, but the desirability of these impacts needed to be assessed for each country depending on its individual circumstances and objectives. Thus, rather than looking at total welfare, policy makers and negotiators may prefer to look at how consumers and producers are affected, and bring this in relation with the poverty structure and possible distribution effects in their own country.

(e) **Special and Differential Treatment**

Developing countries, and especially the Group of 20, have been seeking higher commitments for developed countries and lower commitments for themselves. Most developed countries do not support a high degree of special and differential treatment for developing countries, although there is provision for some differentiation specified in the Doha Declaration. Both interests can be better understood by looking at changes in producer surpluses following the liberalization of various magnitudes. Figures 7 and 8 show

Figure 7
Special and differential treatment: Impact on developing countries
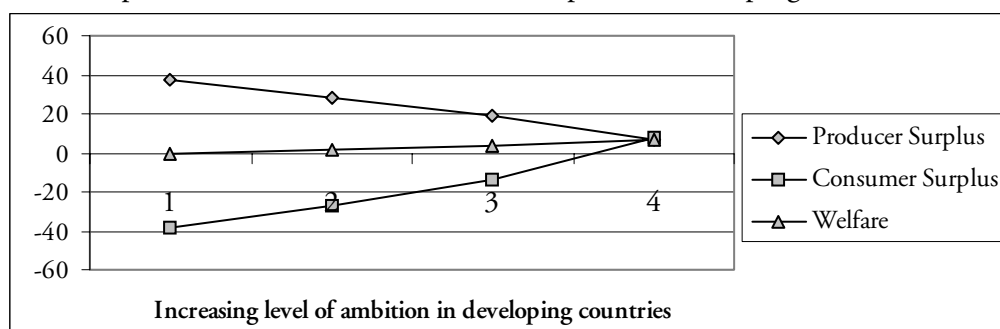
Figure 8
Special and differential treatment: Impact on developed countries
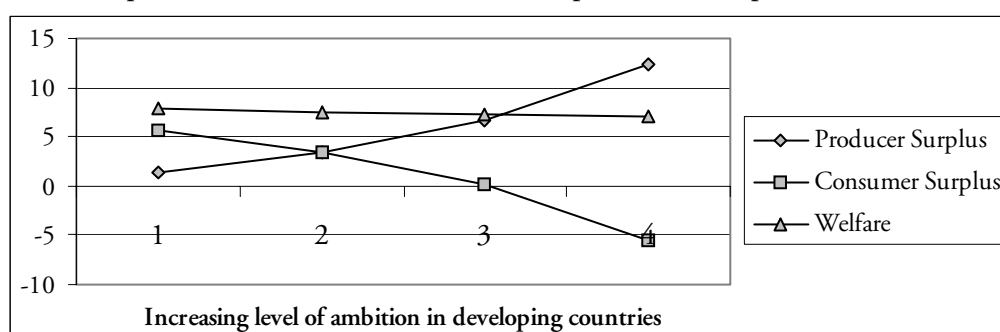
the results when the reductions in the developed countries are fixed at the Uruguay Round level and the reductions in the developing countries are increased up to the same values.[22] The producer surplus in developing countries (here including least-developed-countries) decreases when the level of ambition is increasing in developing countries (Figure 7), which can be interpreted as a decreasing degree of special and differential treatment because the lower reduction commitment for developing countries is progressively eliminated so that in scenario 4 both country groups have the some cuts. Producers of protected products are worse off as liberalization erodes domestic prices. The opposite holds for the producer surplus in developed countries (Figure 8) and also for the consumer surplus in developing countries (Figure 7).

Figures 9 and 10 show the results when both groups of countries liberalise and therefore bring the market access and allocative efficiency effects together. For this, the four scenarios defined in Table 3 were used. Interestingly, the producer surplus in developing countries is inversely U-shaped. As the level of ambition increases, the negative domestic prices effect from reducing tariffs starts to dominate the positive world price effect of developed countries reducing their tariffs. This lag occurs because of the gap between bound and applied tariffs in developing countries. However, as domestic prices fall in developing countries consumers are better off and overall welfare is increasing. In developed countries, all three measures are strictly monotonically increasing or decreasing because there is no gap between bound and applied rates.

Figure 9
Impact of liberalization on developing countries

Conservative, Cancun, Harbinson, Ambitious
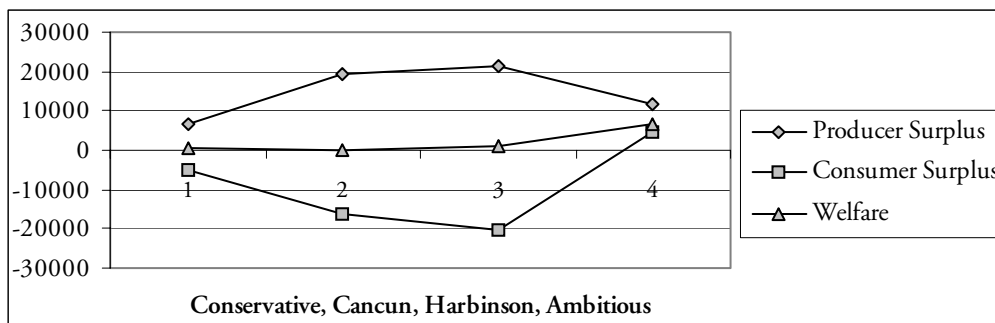
Figure 10
Impact of liberalization on developed countries

Conservative, Cancun, Harbinson, Ambitious

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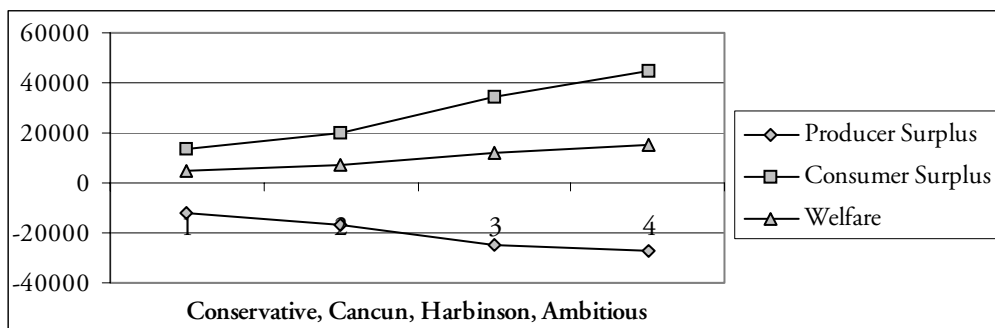
[22] Uruguay Round approach means a reduction in bound tariff rates by 36 per cent in developed and 24 per cent in developing countries, a reduction in export subsidies by 36 (24) per cent and a reduction in domestic support by 21 (14) per cent.

(f) Declining Ambitions

As the negotiations have progressed the proposals appear to be converging. The annual estimated global welfare gains are about US$7 billion in the Cancún scenario and US$13 billion in the Harbinson scenario compared with US$5 billion and US$22 billion in the Conservative and the Ambitious scenarios respectively. However, the latest Cancún proposal is near the bottom of this range. Thus, the flexibility given to developed and developing countries by the Cancún market access formula waters down the welfare gains. Even though the formula contains one tariff-harmonizing Swiss formula component with rather ambitious coefficients of 25 for developed and 50 for developing countries, implementing the Uruguay Round numbers for the linear-cut portion of the formula gives overall welfare effects that are not much higher than a continuation of the Uruguay Round approach, along the lines of the initial EU proposal. Assuming the same smaller export subsidy and domestic support reductions in the Cancún scenario as in the Harbinson scenario (that is, reducing export subsidies by 45 per cent and domestic support by 55 per cent) further reduces the global welfare gains. However, since developing countries have in general higher bound tariff rates and since their tariffs do not in general vary as much as developed countries' tariffs, the Swiss formula part in the Cancún formula would require relatively higher reductions in developing countries. This depends on the coefficients that would be

chosen. The Group of 20 proposal and the draft Cancún text, *first* revision, proposed for developing countries the opportunity to apply the Uruguay Round reductions to all tariffs. This increases the degree of special and differential treatment with the above shown consequences, namely higher producer surplus and a lower consumer surplus and welfare in developing countries.[23]

(g) Sensitivity Analysis

The declining ambition of the Cancun scenario in comparison to the Harbinson scenario depends on the assumed numbers for the blended formula. In order to verify the results a further simulation with a more ambitious blended formula was implemented.[24] With these revised numbers both developed and, above all developing countries liberalize their own markets more than under the "standard" Cancún scenario. Least-developed countries do not liberalize and changes in domestic support and export subsidies are as in the standard Cancún scenario. The results presented in table 10 should be compared with table 8.

Table 10 shows the results from the ambitious Cancún scenario. The overall level of ambition lays between the standard Cancún and the Harbinson scenario. However, since developing countries have to make considerable tariff reductions consumer surplus losses are lower than in both the standard Cancún and the Harbinson scenarios. The

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[23] For simulation results see Peters and Vanzetti (2003).

[24] For developed countries the average cut in the Uruguay Round formula component is 50 per cent and the minimum 25 per cent as it was over all bands in the Harbinson proposal of March 2003. For developing countries the average is 32.5 per cent and the minimum 15 per cent for non-Special Products, as in the Harbinson draft. Special Products are reduced by 10 per cent, which is the average reduction for these products proposed by Harbinson. The coefficients in the Swiss formula part remain at 25 and 50, respectively. The distribution of tariff lines among the three components in the blended formula is a third each in developed countries. In the first third the 33 per cent most sensitive products are reduced by the minimum reduction of 25 per cent. In developing countries the distribution is: 8 per cent of tariff lines Sensitive Products, 31 per cent Uruguay Round formula, where within this category 27 per cent are reduced by the minimum of 15 per cent, 31 per cent Swiss formula and 31 per cent reduced to 5 per cent.

balance of higher world prices increases and lower domestic tariffs leaves producers in developing countries no worse off than the standard Cancún scenario. Competitive agricultural producers, such as in the United States and the Cairns Group countries, are better off in the ambitious Cancún scenario than in both the Harbinson and the standard Cancún scenarios. Producers in least-developed countries are also better off from higher world prices but consumers in these countries are worse off. The global welfare gains of US$10 billion are between the standard Cancún and the Harbinson scenarios. This is also true for developed countries, whereas developing countries are better off and least-developed countries are worse off, with the ambitious Cancún scenario compared to the standard and the Harbinson scenarios. In summary, the analysis indicates that the impacts are not particularly sensitive to reasonable values of assumed tariff reductions.

Table 10
Results from an ambitious Cancún scenario

	Consumer surplus	Producer surplus	Welfare
	US$ m	US$ m	US$ m
Developed	24 379	-17 289	8 985
Developing	-10 758	17 388	1 722
Least Developed	-2 627	2 370	- 231
World	10 993	2 469	10 476
Group of 20	-8 462	11 144	1 360
Cairns	-6 849	9 488	2 164
European Union	21 497	-20 741	4 430
United States	-5 646	6 488	831

Source: ATPSM simulation.

VI. CONCLUSIONS

The road to Cancún has proved long and winding, and in the negotiations on agriculture WTO Members were not able to agree on the road ahead. Therefore, there is no agreement on modalities for further commitments (at the time of writing – November 2003). For the 5th Ministerial meeting at Cancún, the General Council prepared a draft framework for establishing modalities in agriculture. Since the draft did not contain specific targets, it is difficult to judge the text and to assess its economic effects. In this paper we assume possible numbers drawn from previous proposals including one from the Chair of the Committee on Agriculture. In an effort to reach a negotiated outcome, proposals have been modified by increasing the flexibility in the formulae.

The missing numbers in the EC-United States proposal make it difficult to assess the level of ambition but it seems more in line with the limited liberalisation goal of the EU. The analysis shows that if the EU were to put a sufficiently high weight on conserving producer surplus, they would tend to favour a more conservative approach. In the United States, producers gain more from an ambitious approach and, since agricultural tariffs are already rather low in the United States, this country has little to lose and much to gain from imposing this formula on highly protected countries. However, for two reasons it is understandable that the EU and the US agreed on a flexible approach. First, the fallback position is either the *status quo* or, given the Doha Declaration, a limited liberalization scenario such as a continuation of the flexible Uruguay Round type of approach. This increases the EU's bargaining power. Second, both countries are better off with a multilateral agreement than going it alone. Thus, these two countries want an agreement, not only on agriculture, but also in the other negotiating areas of the Doha Round Single Undertaking not analysed here, including non-agricultural market access and services. The resulting compromise between the EU and the United States is at the expense of net-food exporting countries, producers in developing countries and global welfare gains. A result that was shown previously for other liberalization scenarios (see for example Vanzetti and Peters, 2003) and also using general equilibrium models is that developing countries gain – as a group – more from a more ambitious liberalisation scenario because positive allocative efficiency effects start to outweigh the negative terms of trade effects. However, least-developed countries and net-food-importing developing countries suffer a welfare loss if tariffs and subsidies are ambitiously reduced. Tariff cuts reduce quota rents to countries with preferential access and, reductions in exports subsidies raise prices of temperate products that are imported rather than exported by many of these countries.

Since there are efficiency gains from liberalization, finding an agreement may be a question of compensating the losers. This is true within a country and among country groups. Therefore, one possible solution to the current impasse is for developed countries to switch support from output-related to direct-income support. By decoupling domestic support from production levels, the EU CAP reform is a step in the right direction. However, it is unlikely that this is a big enough step to encourage other countries to follow. If production levels were to be reduced sufficiently for export subsidies to be

eliminated, a successful agreement would be much more likely. On a multilateral level, the World Bank and the IMF could play a role in compensating losing developing countries, although this is beyond the bounds of the WTO system. The EU could also compensate ACP countries that lose from the erosion of preferences, just as it compensates its own producers for reductions in output related support.

Limitations to the analysis should be kept in mind. The conclusions are based on the simulation of several proposals for an agreement on agriculture. However, not all elements of the proposals could be captured adequately. To simulate the draft Cancún Ministerial text, assumptions about the bracketed numbers had to be made. Thus, the results have to be interpreted with care.

There are further limitations of the analysis. One is the lack of knowledge of the distribution of quota rents. A second is the assumption in the model that domestic prices are determined by the higher out-quota tariff, in spite of the number of observed unfilled import quotas. This may lead to an overestimation of the impacts. Limitations that apply to all models of this nature are that estimated annual gains are static rather than dynamic and, that adjustment costs are not taken into account. A more ambitious scenario causes higher adjustment costs, which are likely to be higher in developing countries than in developed countries. Finally, data quality is an issue, especially when considering the results for a particular country or sector.

In spite of these limitations, the results provide a useful indication of the possible impacts of an agreement on a framework like the draft Cancún Ministerial text. At this stage, it seems likely that the modalities will not be very ambitious, and potentially important welfare gains will be forgone. However, if developing countries push for a more ambitious round, then they would likely come under pressures to undertake more liberalization than they seem willing or able to consider at the present stage of their development, despite potential longer term gains. Least-developed countries and net-food-importing countries should be aware of the possible negative impacts that they may face as a result of rising food prices, although this may be advantageous to their producers, which include some of the poorest sections of society. Finally, developing countries should note the flexibility that a Uruguay Round type approach gives developed countries. Some flexibility is necessary to forge an agreement, but too much means there is little progress in promoting trade and development. In pointing out these conflicts, this analysis may make a small contribution to getting the negotiations back on the road.

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Appendix

Table A1
Country coverage in ATPSM

Developed	Developing	Developing (cont.)	Least developed
Australia	Albania	Latvia	Afghanistan
Brunei	Algeria	Lebanon	Angola
Canada	Argentina	Libya	Bangladesh
China, Hong Kong	Armenia	Lithuania	Benin
China, Taiwan	Azerbaijan	Macedonia	Burkina Faso
Cyprus	Bahamas	Madagascar	Burundi
European Union	Barbados	Malawi	Central African Rep.
French Polynesia	Belarus	Malaysia	Cambodia
Iceland	Belize	Malta	Cape Verde
Israel	Bolivia	Mauritius	Comoros
Japan	Bosnia Herzegovina	Mexico	Congo
Kuwait	Botswana	Moldova	Congo Dem. Rep.
Macao	Brazil	Mongolia	Djibouti
Neth. Antilles	Bulgaria	Morocco	Eritrea
New Zealand	Cameroon	Namibia	Ethiopia
Norway	Chad	Nicaragua	Gambia
Slovenia	Chile	Nigeria	Guinea
Switzerland	China	Pakistan	Guinea Bissau
U. A. Emirates	Colombia	Panama	Haiti
United States	Costa Rica	Papua New Guinea	Lao PDR
	Croatia	Paraguay	Lesotho
	Cuba	Peru	Liberia
	Czech Rep.	Philippines	Maldives
	Dominica	Poland	Mali
	Dominican Rep.	Romania	Mauritania
	Ecuador	Russia	Mozambique
	Egypt	Saudi Arabia	Myanmar
	El Salvador	Seychelles	Nepal
	Estonia	Slovakia	Niger
	Fiji	South Africa	Rwanda
	Gabon	Sri Lanka	Sao Tome
	Georgia	St. Lucia	Senegal
	Ghana	St. Vincent	Sierra Leone
	Grenada	Suriname	Solomon Islands
	Guatemala	Swaziland	Somalia
	Guyana	Syria	Tanzania
	Honduras	Tajikistan	Togo
	Hungary	Thailand	Uganda
	India	Trinidad Tobago	Vanuatu
	Indonesia	Tunisia	Yemen
	Iran	Turkey	Zambia
	Iraq	Turkmenistan	
	Ivory Coast	Ukraine	
	Jamaica	Uruguay	
	Jordan	Uzbekistan	
	Kazakhstan	Venezuela	
	Kenya	Viet Nam	
	Korea DPR	Yugoslavia	
	Korea Rep.	Zimbabwe	
	Kyrgyzstan		

Note: Among the 49 least-developed countries, Bhutan, Chad, Equatorial Guinea, Kiribati, Madagascar, Malawi, Samoa, Somalia, Sudan, Togo and Tuvalu are not included in the model.

Table A2
Commodities in ATPSM

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

The ATPSM modelling framework

ATPSM is a deterministic, comparative static, partial equilibrium model. This means that there are no stochastic shocks or other uncertainties, and there is no specific time dimension to the implementation of the policy measures or to the maturing of their economic effects. The comparative static nature of the model doesn't imply that the policies take effect instantaneously. Rather, it is 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 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.

Equation system

After a trade policy change, like a change in tariffs, export subsidies and/or domestic support, is specified, the model calculates the new equilibrium. The equation system for all countries has four equations:

$$1) \quad \hat{D}_{i,r} = \eta_{i,i,r}\hat{P}_{Ci} + \sum_{\substack{j=1 \\ j \neq i}}^{J} \eta_{i,j,r}\hat{P}_{Cj};$$

2) $\quad \hat{S}_{i,r} = \varepsilon_{i,i,r} \hat{P}_{Pi} + \sum_{\substack{j=1 \\ j \neq i}}^{J} \varepsilon_{i,j,r} \hat{P}_{Pj};$

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

4) $\quad \Delta M_{i,r} = \dfrac{A_{new}}{1+A_{new}} D_{i,r} \hat{D}_{i,r} - \left(\dfrac{A_{init}}{1+A_{init}} - \dfrac{A_{new}}{1+A_{new}} \right) D_{i,r},$ where $A_y = \left(\dfrac{\alpha_m}{\alpha_d} \left(\dfrac{P_d}{P_m} \right) \right)_{y}^{\sigma} \Bigg|_{i,r};$

where: $D, S, X,$ and M denote demand, supply, exports and imports, respectively;
$\wedge$ denotes relative changes and Δ absolute changes;
P_C denotes consumer price, P_p producer price, P_d price for domestic supply,
$\quad P_m$ price for imports (see below);
ε denotes supply elasticity, η denotes demand elasticity;
i and j are commodities indexes, r is a country index;
$y{=}init$ indicates initial values and $y{=}new$ indicates values after the policy changes;
σ denotes the Armington elasticity between imports and domestically
$\quad$ produced goods.

Equations 1 and 2 specify that the new demand and supply are determined by the price changes, trade policy changes and the corresponding elasticities and cross-price elasticities. Equation 4 ensures that the relation of imports and domestic supply are determined by the price ratio of domestic supply and imports.

$$\frac{M}{D-M} = \left(\frac{\alpha_m}{\alpha_d} \frac{P_d}{P_m} \right)^{\sigma}$$

Equation 3 clears the market, so that production plus imports equals domestic consumption and exports.

These equations can be transformed into matrix notation and the equation system solved arithmetically for world prices by matrix inversion. A market equilibrium requires that, globally, the sum of the change in exports equals the total change in imports for each commodity:

5) $\quad \sum_{n=1}^{N} (\Delta X_n - \Delta M_n) = 0;$

Prices
Domestic prices are all functions of the world market price and border protection or special domestic support measures. Thus, domestic price data is not required and transaction costs (such as wholesale and retail margins) are not taken into account. All protection measures are expressed in tariff rate equivalents.

The relationship between world and domestic prices is complicated by the existence of two-way trade of the one (aggregated) good. To accommodate heterogeneous goods with one price, the approach taken here is to estimate a composite price and a composite tariff for determining the domestic consumption and production price, respectively. To derive a composite price, products are divided into three groups: imports, exports and, production supplied to the domestic market (S_d).

First, a domestic market price wedge (t_d) is computed as the weighted average of two tariffs, the export tariff (t_x) and import tariff (t_m), where the weights are exports (X) and imports (M): $t_d = (X t_x + M t_m)/(M + X)$.

The price for domestic supply is $P_d=P_w(1+t_d)$, where P_w is the world price, and the price for imports is $P_m=P_w(1+t_m)$. Then, a composite consumer price is computed as $P_C = \left(\alpha_m^\sigma P_m^{1-\sigma} + \alpha_d^\sigma P_d^{1-\sigma}\right)^{1-1/\rho}$. The producer price wedge is computed as the weighted average of the export tariff (t_x) and the domestic market price wedge (t_d), where the weights are exports (X) and domestic supply (S_d) plus the domestic support tariff (t_p): $t_s = (X t_x + S_d t_d) / S + t_p$. The producer price is $P_s=P_w(1+t_s)$. The calculations of consumer and producer prices are applied both to the baseline and the final tariffs.

A feature of this structure is that if there are no exports, domestic producer prices are determined by the tariff plus the domestic support. If there are no imports the export subsidy effectively determines the producer price. Finally, if there is two-way trade the share of total production or consumption influences the importance of each tariff.

The need for a composite price such as this is the requirement for one price with essentially two goods. The heterogeneous nature of imports and exports also requires a means of specifying the volume of either imports or exports. In this model imports are specified so that the relation of imports and domestic supply are determined by the price ratio of domestic supply and imports (equation 4). This is the so-called Armington specification. Exports are determined as the residual of production, consumption and imports.

Trade revenue
Once changes in world prices and hence domestic prices are determined from the model solution, volume changes can be derived from equations 1-4. Given the volume responses DX, DM, DS, and DD, the trade revenue and welfare effects can be computed. The trade revenue effect of the policy changes is computed for each country and each commodity from:

$$\Delta R_1 = \left(P_w + \Delta P_w\right)\left[\left(X + \Delta X\right) - \left(M + \Delta M\right)\right] - P_w\left(X - M\right)$$

Secondly, there is a change in quota rents DU, which generates a further trade revenue effect (in each country and for each commodity):

$$\Delta R_2 = \left(U + \Delta U\right)\left[X + \Delta X\right] - UX$$

The total trade revenue effect is the sum of these components: $DR = DR_1 + DR_2$.

Welfare

The welfare change has three components. The first two are the changes in producer surplus (DPS) and consumer surplus (DCS). These changes depend on the domestic market price changes and their own price domestic demand and supply volume responses. The change in producer surplus is also dependant on the change in quota rent. For each country and commodity:

$$\Delta PS = \Delta P_p \left[S + 0.5\left(\Delta S_d\right)\right] + \Delta R_2; \quad \Delta CS = -\Delta P_c \left[D + 0.5\left(\Delta D_d\right)\right];$$

The third part is the change in net government revenue (DNGR), consisting of change in tariff revenue, change in export subsidy expenditure and, change in domestic support expenditure. For each country and commodity:

$$
\begin{aligned}
\Delta NGR &= \Delta TR - \Delta ES - \Delta DS \\
&= \underbrace{\left(t_w + \Delta t_w\right)\left(Q + \Delta Q\right) - t_w Q}_{\text{Change in within-quota revenue}} + \underbrace{\left(t_o + \Delta t_o\right)\left[\left(M + \Delta M\right) - \left(Q + \Delta Q\right)\right] - t_0\left(M - Q\right)}_{\text{Change in out-of-quota revenue}} \\
&\quad - \underbrace{\left[\left(t_x + \Delta t_x\right)\left(X + \Delta X\right) - t_x X\right]}_{\text{Change in export subsidy expenditure}} - \underbrace{\left[\left(t_d + \Delta t_d\right)\left(S + \Delta S\right) - t_d S\right]}_{\text{Change in domestic support expenditure}}
\end{aligned}
$$

The sum is the total welfare effect: $DW = DPS + DCS + DNGR$..

APTSM is able to estimate the economic effects of changes in within-quota and out-of-quota 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. The assumptions of filled quotas made here imply that changes in within-quota tariffs and import quotas will not have price and quantity effects, as these instruments are not binding. (However, they do change the distribution of rents.)

Data

Volume data are from 2000 and are compiled from FAO supply utilization accounts.[25] The year 2000 represents the base year for the model. Most of the price data is also from FAOSTAT. Parameters on elasticities and feedshares are from FAO's World Food Model. These are based on a trawling of the literature and are not econometrically estimated specifically for the model. Some of the elasticities were modified by the authors to adjust them to the special ATPSM features. Within-quota tariffs, out-of-quota tariffs and global quotas, notified to the WTO, are obtained from the AMAD database where available or directly from the WTO and aggregated to the ATPSM commodity level.[26] Export subsidy and setaside data are notified to the WTO. Bilateral trade flow data relate to 1995 and are from the UNCTAD Comtrade database. These are used to allocate global quotas to individual countries. The UNCTAD TRAINS database is the source of information on applied tariffs.

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[25] This is a revision of data used in previous applications of the model (Vanzetti and Sharma, 2002) and results in a substantial downward revision of welfare estimates.

[26] AMAD database http://www.amad.org

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