

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

POLICY ISSUES IN INTERNATIONAL TRADE AND COMMODITIES  
STUDY SERIES No. 24

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**USER MANUAL AND HANDBOOK ON  
AGRICULTURAL TRADE POLICY SIMULATION MODEL  
(ATPSM)**

by

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Geneva, Switzerland



UNITED NATIONS  
New York and Geneva, 2004

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UNCTAD/ITCD/TAB/25

<b>UNITED NATIONS PUBLICATION</b>
Sales No. E.04.II.D.3
ISBN 92-1-115609-6
ISSN 1607-8291

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## ACKNOWLEDGEMENTS

This handbook was prepared by David Vanzetti and Ralf Peters of the Trade Analysis Branch, UNCTAD. Brett Graham and Odd Gulbrandsen contributed to earlier versions of the handbook. Jenifer Tarcardon-Mercado assisted in the preparation of the manuscript. The model and the handbook were developed in collaboration with the United Nations Food and Agricultural Organization (FAO). UNCTAD received financial support from the United Kingdom Department for International Development (DFID).

## ABSTRACT

The Agricultural Trade Policy Simulation Model (ATPSM) is designed of detailed analysis of agricultural trade policy issues. It can be used as a tool by researchers and negotiators alike for quantifying the economic effects at the global and regional level of recent changes in national trade policies.

ATPSM is a deterministic, partial equilibrium, comparative static model covering 161 countries and 35 agricultural commodities. Features of the model include the extensive database, the distinction between bound and applied tariffs, and quota rents. Rents associated with two-tier tariff rate quotas are explicitly modelled within ATPSM. The model solution gives estimates of the changes in trade volumes, prices, government revenues and welfare indicators associated with changes in the trade policy environment. The model is distributed for free from UNCTAD's website at [www.unctad.org/tab](http://www.unctad.org/tab).

Instructions in the use of ATPSM are contained in this report. No prior knowledge of modelling or programming is required to install and run the model. The instructions cover use of the interface to set up scenarios and report the results, the model structure and the data.



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# USER MANUAL

## Agricultural Trade Policy Simulation Model (ATPSM Version 3, August 2004)

### Installation

ATPSM Version 3 can be downloaded free of charge from the UNCTAD website at <http://www.unctad.org/tab/> and automatically installed by running the installation program. It may also be installed from a CD available from the Trade Analysis Branch at UNCTAD. To start the program the user will need merely to click on an icon on the desktop.

ATPSM may need to be installed manually in some situations, for example if the program has been obtained via e-mail.

Manual installation instructions:

Unzip the zip file to any folder, keeping the folder structure within it. It is useful to keep the database file *atpsm.mdb* in a separate folder to prevent it being overwritten with subsequent updates. The main installation task is to create a link to this database as follows:

Create an ODBC data source called *atpsm* using the file *atpsm.mdb*:

Control Panel  
Administrative Tools  
Data Sources (ODBC)  
*Add* Button  
select Microsoft Access Driver (\*.mdb)  
*Finish* button  
Data Source Name = *atpsm*  
Click *Select* and find the file *atpsm.mdb*  
*Ok*

Then just double-click on *atpsm.exe* in the Explorer to open the model. A shortcut can be created by right-clicking on this file.

To check that the Microsoft Access database file *atpsm.mdb* is correctly linked, go to the scenarios page and click on "All countries" under the heading "Country code". A long list of countries should appear. If not, try the ODBC data source linking procedure again.

Help files are provided via the menu. Previous scenarios can be loaded, or new ones created by entering the shocks, saving the scenario definition and pressing "simulate". When the simulation is "finished" go to the results.

## Getting started with ATPSM

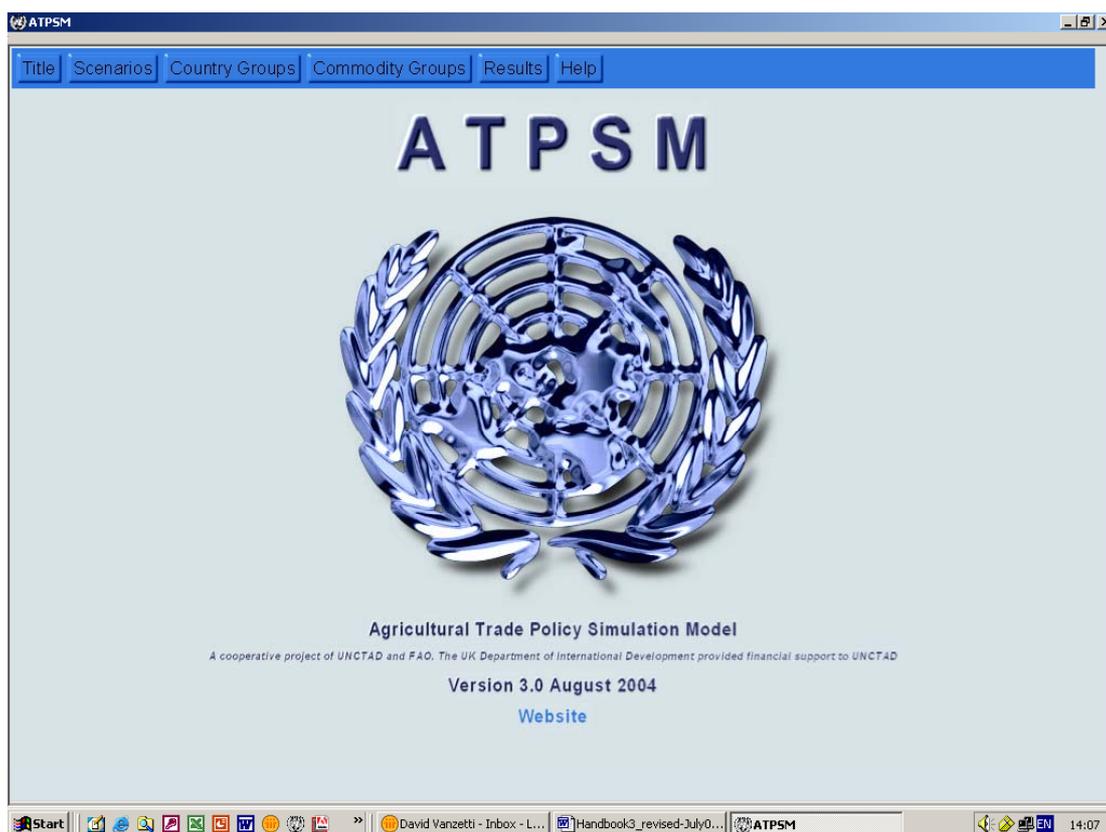
ATPSM is a trade policy simulation model. It can be used as a tool for quantifying economic effects of changes in trade policies. The user specifies a specific change in trade policy, the model simulates the new prices and trade flows and calculates welfare effects. The results can be analysed and saved by the user.

General information about ATPSM, its structure and functionality, can be obtained from the **ATPSM Handbook**.

ATPSM has a graphical user interface to assist the user in setting up scenarios, running the simulations and storing and reading the output data. Context-specific on-line help is available.

Instructions on using the graphical user interface are given here. Instructions on how to run a simulation and how to check results are given at the on-line help pages belonging to **Scenarios** and **Results**.

### The graphical user interface



Shows the name, version and date of the program and contains a link to the ATPSM website.

## Scenarios

The changes in trade policy to be simulated are specified here.

## Country Groups | Commodity Groups

For the convenient and effective application of ATPSM country and commodity groups can be created. The pre-specified country group, e.g. *Latin America*, comprises Argentina, Belize, Bolivia, etc. With this, a policy scenario where the change is the same among all the countries in the group can easily be simulated. However, all countries and commodities are modelled individually regardless of the aggregation.

## Results

Results from the latest simulation are accessed here. Prices, trade policies, trade revenues, volumes and welfare data can be viewed. It is possible to rearrange and save the results.

## Help

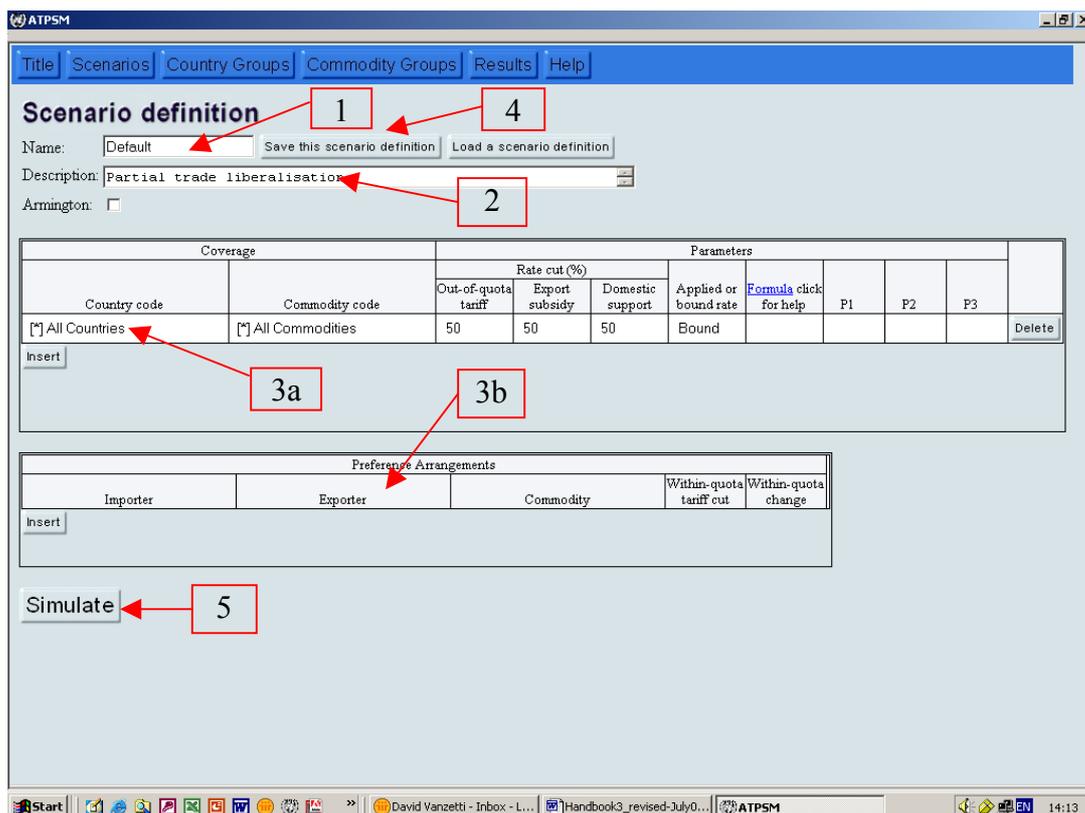
This page gives information on how to use ATPSM. The help function is context-specific. An index of contents concerning the on-line help is available.

## Scenarios

Changes to the trade policy regime are specified on the Scenarios page. When this page is opened for the first time during a new session, an example called *Default* is loaded. The results of this simulation can be seen on the page *Results*. Some other policy simulations have been run and can be loaded by clicking on the button *Load a scenario definition*.

When running a new scenario the main task on this page is to specify and save the shocks. The simulation is also initiated from here. The numbers in the following paragraph correspond to the illustration below.

1. Type in an arbitrary name into the field *Name*.
2. Describe the policy regime that should be simulated in the field *Description*. This is optional, i.e. the program runs without this. Do not use special characters (e.g. % and “ ”).
3. Choose a policy scenario: It is possible to:
  - (a) select one of the policy changes that are offered in the big box in the middle of the screen; and/or
  - (b) change the preference arrangements.



If there is no row between the button *Insert* and the name of the columns, a row is to be inserted by clicking on *Insert*. By clicking on the white field under *Countrycode*, one can choose either an already defined country group or a single country for which a change in trade policy is required. In the white field under *Commoditycode* one can select a specified commodity group or a single commodity to which the policy change should be applied. In the three fields under *Rate cut (%)* a percentage decrease of the corresponding tariff rate is specified by putting in an integer between 1 (tariffs decrease by 1 per cent) and 100 (tariffs are zero).

**Formula.** Several non-linear formulae are pre-specified and can be accessed from the Scenarios page through *formula*. Clicking this label will provide help on these formulae. The default formula is linear (i.e. proportional cuts) shown as a blank in the particular row. Alternatives are Swiss, Harbinson, Target, Maximum and Cancun. Most of these formulae require the user to specify a parameter under P1. The bands and rate cuts for the Harbinson formula are pre-specified and can be altered in *formulaclass.ods*. The Cancun formula reads in a prepared file stored in column *SpecifiedOQT* in table *FinalOQT* in *atpsm.mdb*. This table contains final tariffs calculated outside the model. Users may wish to edit this table before running this simulation. Parameters P2 and P3 are unused at the moment, but users may write formulae of the own using these parameters as input, following the example in *formulaclass.ods*.

In the field *Applied or Bound rate* it can be specified whether the tariff reductions should be from the negotiated bound tariff rates or the applied tariff rates.

For all shocks different changes in different countries or for different commodities can be simulated by *inserting* further rows. A particular shock can be specified twice or more, but

latter rows overwrite earlier rows. For example, if *All commodities* are specified in the first row and *Sugar* in the second, the latter is read last.

The button *Delete* deletes single rows. If there is no row between the button *Insert* and the name of the columns, a row is to be inserted by clicking on *Insert*.

It is possible to simulate a change in the preference arrangements by choosing an importer, an exporter, a commodity and specifying a *within-quota tariff cut* and/or a *within-quota change* in the quota itself (see illustration below). Inquota tariff rates are specified bilaterally in the initial database and this box allows them to be reduced bilaterally. Not all exporters need experience the same reduction in tariff rates. In the field *Within-quota tariff cut (%)* a positive integer corresponds to a percentage increase of the quota up to which the usually lower within-quota-tariff is applied. Negative numbers correspond to decreasing quotas. More than one change is possible in a single simulation. Empty fields mean that there is no change. For more information on preference arrangements, see B.8.2.

Preference Arrangements				
Importer	Exporter	Commodity	Within-quota tariff cut	Within-quota change
<input type="button" value="Insert"/>				

4. After the changes have been specified, the scenario can be saved by clicking on the button *Save this scenario definition*. Saved scenarios can be opened in a later session by clicking on *Load a scenario*. By opening a saved and already simulated scenario, one can see the results without simulating the scenario a second time since all results are stored (in the directory \script\policy). Scenarios can be deleted from this directory using Windows Explorer.
5. The scenario will be simulated by clicking on *Simulate*. Depending on the capacity of the computer, it takes between 1 and 10 minutes before the results are available. A progress message box will indicate the functions undertaken and the seconds elapsed. On completion the word "Finished" will appear, a sound may be heard and the time taken will be presented.

A further item on the scenarios page is the *Armington* check box, located immediately below the *Description* on the Scenarios page. The Armington specification requires that changes in consumption be allocated to imported and domestically produced goods depending on relative prices. However, imports are not differentiated by source. This contrasts with the standard version where exports are a constant proportion of production, which implies that the percentage change in exports equals the percentage change in production. The user can switch the model to an Armington approach by checking the *Armington* box. See Section C.3 for more details on the Armington equation structure.

## Country groups

Users can create country groups to more conveniently specify shocks and report input and output. However, for the purpose of the simulation countries within groups are treated separately.

To create a new group:

1. Click on *Country Groups* or *Commodity Groups* in the main menu.
2. Enter an arbitrary code of a few letters or numbers in the field *Code* and enter a country group name in the field *Name*.
3. Click *insert*.
4. Highlight the new group name in the window *Currently defined groups*.
5. Click on the button *Countries*.
6. Add countries to the group by clicking on the sign  $\triangleright$  in front of a country in the window on the left-hand side.
7. Countries can be deleted by clicking on the sign  $\triangleleft$  in front of a country in the window on the right-hand side.
8. It is not necessary to confirm or save the input.

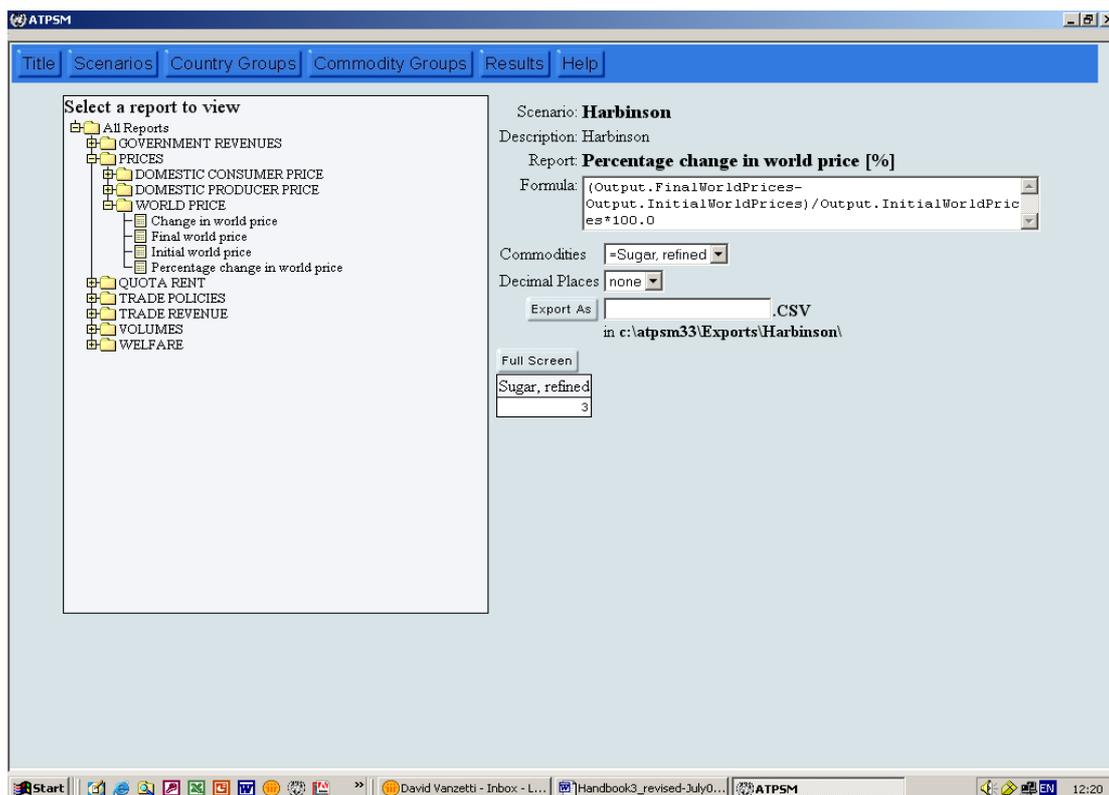
The new defined groups remain available after the end of a session.

There are several predefined country groups. A list of predefined groups can be seen in the ATPSM Handbook, B.1.

## Results

Results on prices, trade policies, trade revenues, volumes and welfare data from the latest simulation are accessed here. Click on the plus sign  $\oplus$  to see the contents of the categories. A table can be opened by pressing the corresponding button .

The output shows the chosen name of the scenario, a description of the proposal, the name of the variable displayed and the formula with which the output is calculated within the program. The latter may be changed by editing the text box containing the formula. For example, values can be expressed in millions by dividing by 1000000.0 (e.g. write:  $(\text{Output.FinalWorldPrices}-\text{Output.InitialWorldPrices})/1000000.0$ ). However, the labelling will not reflect the modified formula.



There are several options for rearranging the output:

- In the field behind *Commodities* a single commodity can be selected to be shown in the table below. By choosing *Columns* or *Rows* all commodities are shown (the selection must be different from the one chosen for countries.)
- The aggregated data for all commodities or countries can be seen by selecting *Summed*.
- In the dropdown menu behind *Countries* a single country can be selected. By choosing *Columns* or *Rows* all countries are shown (the selection must be different from the one chosen for commodities). **Warning: If countries are grouped, summing may involve double counting if some countries are members of two or more groups.** For example, by default countries are grouped by development status and by region. Summing the groups doubles the true aggregate value.
- The output can be displayed either in full screen (press *Full Screen*) or *with Parameters*.

Every table can be stored as a csv file by choosing an arbitrary name. The directory is shown under the input field. These files can be opened with Microsoft Excel.

Assuming the program has run successfully, it is useful first to examine world prices. Initial prices, and absolute and percentage changes, are tabulated. If price changes seem counterintuitive in some way, it is useful to look next at the shocks to ensure that they have gone in correctly. This information is found in Trade Policies.

It is next useful to look at domestic producer prices to ensure that they have moved in the expected direction and are of the expected magnitude. Recall that the domestic producer prices are derived

from a blend of the import tariffs and export subsidies. The domestic price change is a result of the world price change and the exogenously determined trade policy change. Hence, the domestic producer price may either rise or fall.

The user may then read and analyze trade revenues, volumes of consumption, production, exports and imports, as well as welfare effects. Bilateral (country to country) information is shown for quotas, rent and within-quota tariffs. Menus for importers and exporters are shown on the interface. To avoid a delay in presenting bilateral three dimensional information, it is useful to limit one dimension (importer, exporter or commodity) to a single element.

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# HANDBOOK

Agricultural Trade Policy Simulation Model  
(ATPSM Version 3, August 2004)

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## **PART A: INTRODUCTION**

### **A.1. Modelling agricultural trade policies**

The Agricultural Trade Policy Simulation Model (ATPSM) is a trade policy simulation model capable of detailed analysis of agricultural trade policy issues. It can be used as a tool by researchers and negotiators alike for quantifying the economic effects at the global and regional levels of recent changes in national trade policies. Alternatively, it can be used to consider the potential changes resulting from future unilateral action by individual countries or actions required under negotiated agreements.

ATPSM is a deterministic, partial equilibrium, comparative static model. It analyses the effects of price and trade policy changes on supply and demand using a system of simultaneous equations that are characterized by a number of data and behavioural relationships designed to simulate the real world. The model solution gives estimates of the changes in trade volumes, prices and welfare indicators associated with changes in the trade policy environment. A feature of the model is its handling of a two-tier tariff structure whereby imports within a quota level attract a relatively low tariff, and out-of-quota imports face a higher tariff. Rents associated with these quotas are explicitly modelled within ATPSM.

Given limitations in the data and the abstract nature of such models, the user should interpret the results with caution. However, the model has detailed commodity and country coverage and for the comparison of various policy scenarios, it can be very helpful in indicating the relative magnitudes of the effects of policy changes on welfare, trade and prices.

### **A.2. The origins of ATPSM**

The development of ATPSM was initiated by UNCTAD in 1988. A detailed description of the model and its results was published for the first time in 1990 in a United Nations study entitled, *Agricultural Trade Liberalization in the Uruguay Round: Implications for Developing Countries* (UNCTAD/ITP/48).

In the late 1990s, the model was significantly enhanced in a joint effort by UNCTAD, with funding from the United Kingdom Department for International Development, and the Food and Agriculture Organization of the United Nations (FAO) to address issues arising from the outcome of the Uruguay Round. The model database coverage was increased to enable policy analysis in an increasing number of commodities and countries. The model equations were refined to enable the analysis of changes in tariff quotas and tariff quota rates and to distinguish between bound and applied tariff rates.

### **A.3. ATPSM: A deterministic comparative static partial equilibrium model**

The model consists of a system of equations that represent supply, demand and trade flows for different agricultural goods in different countries.

In an attempt to simulate the real world a number of assumptions are made. The model is deterministic. There are no stochastic shocks or other uncertainties. It is static. There is no specific time dimension to the implementation of policy measures or to the maturing of their economic effects. Finally, it is a partial equilibrium model. 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, effects on the industrial and service parts of the economy or the labour market are not subject to analysis.

Simplifying the model in these respects allows a detailed specification of the most relevant agricultural trade policies having computable economic effects. Similarly, the model reports results for many different countries. It gives results not only globally but also for various country groups, geographical as well as political. There is extensive coverage of agricultural commodities and the model considers interrelationships between the agricultural commodities in both supply and demand (for example, when competing for land or consumer preferences). Finally, the model accounts for three different economic agents within each economy – producers, consumers and government. Therefore, results can be presented by commodity and by agent for each country, each region or the world.

#### **A.4. Quantifiable and non-quantifiable trade policies**

The ATPSM focuses on standard agricultural trade policies, such as tariff cuts, subsidy reductions and quota changes. However, a number of other agricultural trade interventions exist, such as sanitary and phytosanitary regulations, seasonal import restrictions and anti-dumping measures. Such interventions cannot be simulated unless a tariff equivalent can be derived.

Another set of non-quantifiable policies is found in the farm price support over and above the market access measures. These range from subsidies on agricultural inputs to research and development financing, favourable interest rates and amortization periods on loans etc. The primary problem in modelling such policies is that the support they provide is general and not specifically assigned to certain commodities. These policies support agricultural production capacity as a whole. Although one could envisage simulating such support in a model, it is not currently possible in the ATPSM.

#### **A.5. Overview of the content of the Handbook**

This Handbook is prepared with two main purposes:

- to facilitate the understanding of the model's capabilities and outcome of policy scenarios;
- to allow users to formulate policy scenarios, execute the model and interpret the results.

The Handbook is structured as follows: Part B of this Handbook provides a non-technical description of the ATPSM. The countries, commodities and policies that are included in the model are specified and defined. Details on policies related to market access, import quota rents, export subsidies, domestic support and bilateral quotas are provided. An explanation on how to interpret the results is presented.

Part C of the Handbook provides details on how to operate the model. The main features of the model, implementing trade policy scenarios and reading the output are outlined. Since ATPSM has a graphical user interface with context-specific online help, further features are addressed briefly.

Part D of the Handbook provides a detailed mathematical description of the model. Technical issues relating to trade equilibrium, domestic price determination, quota rents and feedshare effects are explained.

#### A.6. Changes to ATPSM since Version 1.1

The current (August 2004) version of ATPSM is 3. In this version several changes to the database have been implemented:

- (i) Several commodities have been removed or aggregated (coffee, tobacco) and others split (sugar) or added (livestock, rubber).
- (ii) Volume data have been updated to the average of three years 1999-2001.
- (iii) Price data have been updated to 1999-2001.
- (iv) Applied tariff data have been updated to 2001 or 2000.
- (v) Export subsidy data have been revised and now include the value of export credits. In addition, reductions in exports subsidies now depend on the volume and expenditure constraints, just as applied tariff reductions depend on the difference between bound and applied tariffs.
- (vi) Bilateral in-quota tariff data have been included, so in-quota tariff reductions can be specified bilaterally.
- (vii) Elasticities have been revised to include more cross-elasticities. These are derived from own price elasticities plus various axioms (homogeneity, symmetry, Slutsky condition).
- (viii) Capture rates are specified in the database. Rents are assumed to accrue to producers where tariff rate quotas are allocated historically.

There have been a number of cosmetic changes to the graphical user interface:

- (i) In-quota tariffs can be specified and reported bilaterally.
- (ii) Users can specify their own tariff-cutting proposals in a customized formula box.
- (iii) A progress box is included to indicate running time.
- (iv) An Armington toggle is included on the interface so users can choose how two-way trade is determined.
- (v) Commas are inserted between thousands and millions to improve clarity.
- (vi) Negative numbers have a minus (-) sign, and are no longer in red.

Details of recent changes are given in the table *xxDataModifications* in the ATPSM Access data file *atpsm.mdb*.

Version 3 contains modifications to the data, script and executable files. Users of previous versions of ATPSM can update without having to install the program again. New files can merely be copied over the previous version. The new database file *atpsm.mdb* should be placed in the same folder as the previous one so that the link to the database is maintained. After changing the data file, the saved scenarios have to be rerun if the user is still interested in their results.

## **PART B: A NON-TECHNICAL DESCRIPTION OF ATPSM**

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The ATPSM has a global coverage of agricultural commodities with protection barriers that significantly distort world trade. It estimates the effects of barrier reductions on terms of trade, tariff revenues, welfare, supply and demand allocation and prices. It takes into account almost all the agricultural trade policy measures having computable economic effects.

### **B.1. Country coverage**

The present version of the model covers 176 countries and includes all larger economies. The countries that are not explicitly covered by the model are mostly small island economies and are included in the Rest of World. The economy of each country is represented individually, except the 15 countries that are part of European Union which are represented as a single country group.

The lack of agricultural trade policy data prevents extended policy analysis for some countries. In the present version of the model, no policy data are available for 20 countries. For a further 37 countries there are either no applied or no bound tariff rates available. These countries are essentially price takers in the model, with domestic prices moving with world prices and production, consumption, exports and imports adjusting accordingly. Country coverage is found in [Appendix I, table A.1](#).

For the convenient and effective application of ATPSM it is possible to define one's own country and commodity groups. This can be done on the pages Country Groups and Commodity Groups. Using these groups in the simulations, the policy changes correspond to all countries or commodities that belong to the group. The new defined groups remain available after the end of a session.

There are several predefined country and commodity groups available. One category of groups is the partition in Developed, Developing and Least Developed Countries. Each country in the model belongs to one of these three groups. Another classification is regional. There are eleven regional groups and, again, every country belongs to one and only one of these eleven groups. The predefined regions are:

- Caribbean
- Central America
- Central and Eastern Europe
- Central Asia
- North Africa and the Middle East
- North America
- Oceania
- South America
- South, East and South-East Asia
- Sub-Saharan Africa
- Western Europe.

The assignment of countries to groups can be changed by the user.

## B.2. Commodity coverage

Many agricultural commodities are subject to agricultural trade policy distortions. Those with particularly high barriers having substantially distorting economic impact are the basic foodstuffs, such as animal and cereal products, sugar, and vegetable oils and oil seeds. Tropical products of interest to developing countries include beverages, cotton and tobacco. Although not part of the Agreement on Agriculture, rubber is also included in the 35 ATPSM commodities.

The commodities can be aggregated into groups. The predefined commodity groups are:

- Beverages (cocoa, tea, coffee)
- Cereals (wheat, rice, barley, maize and sorghum)
- Dairy products (milk concentrates, butter and cheese)
- Fruit (apples and pears, citrus, bananas and other tropical fruit)
- Meat (livestock, bovine meat, sheep meat, pig meat and poultry)
- Oilseeds (vegetable oils and oilseeds)
- Sugar (sugar, raw and sugar, refined)
- Tobacco and cotton (tobacco and cotton)
- Vegetables (pulses and roots and tubers, and tomatoes).

The assignment of commodities to groups can be changed by the user. The commodity concordance is specified in [Appendix I, table A.2](#).

## B.3. Trade policies included

While ATPSM can analyse many general trade policy issues, its main purpose is to simulate and evaluate the various agricultural trade policy changes that may be suggested for or in the WTO negotiations on agriculture. The present version can simulate general policy changes common for all countries and commodities involved in these negotiations or policy changes specific to individual countries or groups of countries.

Trade policy changes that can be simulated by the model include:

- Reduction of out-of-quota tariffs, either by a linear percentage reduction or by several non-linear formulae, such as the so-called Swiss formula;<sup>1</sup>
- Reduction of bilateral within-quota tariffs, by a certain percentage;
- Reduction of the tariff equivalent of domestic support (over and above market-access measures), by a certain percentage;
- Reduction in the tariff equivalent of export subsidies, by a certain percentage;
- Change in bilateral import quotas, by a certain percentage;
- Different percentage changes in all the above policies applied to selected countries or country groups and commodities;
- Use of applied tariff rates instead of bound out-of-quota rates.

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<sup>1</sup> The Swiss formula implies the higher the tariff, the deeper the tariff cut (for example, a 100% tariff is cut by 50%, but a 150% tariff is cut by 60%).

#### **B.4. Economic estimates**

The model produces five categories of economic estimates for each country:

- Volume changes in production consumption, imports and exports;
- Trade value changes – changes in export, import and net trade revenue;
- Welfare changes – changes in producer surplus, consumer surpluses; and net government revenue;
- Price changes – world market, wholesale (consumer) and farm prices;
- Changes in tariff quota rents – forgone and receivable.

The introduction of a two-tier tariff system with import quotas that resulted from the Uruguay Round agreement created a new category of economic effects – the tariff quota rents. The capture rate of these rents can be specified by country and commodity from the menu. The default setting in ATPSM is that producers from the exporting country capture 100 per cent of these rents.

Because the model produces figures for all these estimates, by country, by region, by commodity and by policy scenario, there is considerable scope for the evaluation of trade policy proposals by comparing results from different scenarios. Users can examine the effects on the country or commodity that is of primary interest to them. Alternatively, it is possible to concentrate on the overall effects of the trade policy proposals and make recommendations based on an overall analysis.

#### **B.5. Interpretation of the economic effects**

As previously noted, the model does not have a time dimension. Therefore, nothing can be inferred about the time length within which the economic effects would be fully realized. The general interpretation is that the economic effects are of a long-term nature, with the implementation spread over several years. The elasticities that govern supply and demand responses to price changes have been estimated on the basis of a 10-year time horizon.

There is a distinct difference in the speed of reaction between demand and supply response to price changes. The reaction of the former is relatively quick, with full response from one to two years. The full response of the latter, however, may be from one to more than ten years, depending on the commodity. If there were an immediate reduction in trade barriers this imbalance in the timing of responses could create a temporary disequilibrium. As the lag in supply response would be greater than that in demand there could be an excessive increase in prices or a substantial reduction in the stocks (or both). However, as negotiated reductions in trade barriers are generally spread over several years, the impact of the potential imbalance resulting from differing response times is likely to be minimal.

#### **B.6. Specification of trade policies**

In ATPSM the changes in supply and demand are estimated from percentage changes in domestic prices. To estimate the percentage change in domestic prices from trade policy changes all tariffs must be expressed as a percentage of the world market price. In ATPSM specific and mixed tariffs are converted into ad-valorem equivalents.

In ATPSM tariff cuts are expressed as a percentage of the initial tariff. The default method in the model for implementing tariff cuts is to reduce all tariffs by an equal percentage (linear cuts). However, alternative methods have been suggested and implemented in previous negotiating rounds. One of these methods is the Swiss formula, which makes progressively higher proportional tax cuts in progressively higher tariffs. Global and specific tariff cuts using this method can also be simulated in ATPSM. Other cuts include the Harbinson bands approach and a pre-specified Cancun or blended formula. Final tariffs can also be set to a maximum or to a pre-specified target level.

Export subsidies and extra farm support are measured as tariff ad-valorem equivalents in the model. Hence, cuts in these supports are measured as percentage reductions of the ad-valorem equivalents.

The model is capable of analysing global trade policy changes, specific trade policy changes to individual countries and commodities or some combination thereof. In any simulation the global tariff cuts apply to all countries and commodities that are not assigned specific tariff cuts.

Tariff quotas are expressed in volumes. A policy change is expressed as a percentage change of the quota. Positive changes in tariff quotas allow more imports to enter under a lower within-quota tariff.

## **B.7. Tariffs and prices**

In the model domestic prices are determined as a function of world market prices and of the support measures, tariffs, subsidies and quotas. There is no independent behaviour of domestic prices. Also, no account is taken of domestic trade margins. Domestic prices have the character of border wholesale prices. An exception is the farm (supply) price, which might be affected by extra farm price support (for example, deficiency payments) over and above the market access support.

In the ATPSM datasets a country is often an importer and exporter of the one (aggregated) good. To accommodate this feature of trade data, composite tariffs for determining the domestic consumption and production price are estimated. This is in contrast with other trade models that determine domestic demand with a nested import demand structure, which requires knowledge of import elasticities between all foreign goods, so-called Armington elasticities. These elasticities are notorious for their importance in determining trade model outcomes, but little detailed quantitative assessment of them has been done.

The first step to estimate this tariff is to compute a tax on domestically consumed production. This tax is assumed to be a trade-weighted average of the import tariff and the export tariff equivalent. The domestic wholesale price is then estimated as the average of the import tariff and the tax for the domestically consumed production, weighting the former by imports and the latter by the domestically consumed production. The producer (farm price) is computed as the average of the export support and the domestically consumed production tax, weighting the former by exports and the latter by the domestically consumed production, plus the tariff equivalent of extra farm support.

One of the attractive properties of this price specification is that where a commodity is exclusively imported, the wholesale and farm price are equal to the world market price plus the import tariff. Similarly, if the commodity is exclusively exported, the domestic wholesale and farm price are equal to the world market price plus the tariff equivalent of the export subsidy.

Tariff cuts can be specified for the out-of-quota and within-quota tariff and for the tariff equivalents of export subsidies and extra farm support. If the applied tariff is lower than the policy-determined reduced bound out-of-quota tariff, the former is applied. Alternatively, the user can specify that tariff cuts be made to the applied rates.

## **B.8. Quotas**

The model can estimate the economic consequences of import quota changes. Import quotas are assumed to be binding. Changing the import quotas exogenously changes the allocation of quota rents and tariff revenues, but not the level of imports.

### **B.8.1. Tariff quotas and quota rents**

The Agreement on Agriculture of the Uruguay Round instituted a new system of tariffication that can be characterized as a general preferential arrangement. The system consists of a two-tier tariffication with a low tariff applying to an import quota (the “within-quota tariff”) and a high tariff applying above the import quota (the “out-of-quota tariff”). The importing country controls (although with the obligation to notify the WTO) the size of the quota, referred to as the global quota, and the distribution of it among suppliers, referred to as bilateral quotas.

This system has the peculiarity of generating rents. Their size makes them an important determinant of welfare and therefore warrants inclusion in the model.

Quota rents are the quota times the difference between the domestic prices and world price plus the within-quota tariff. There are three possible scenarios:

- (1) If the within-quota tariff is binding, the quota is unfilled, domestic prices equal world prices plus the within-quota tariff and there is no quota rent;
- (2) If the quota is binding, imports equal the quota and the rent is positive but indeterminate;
- (3) If the over-quota tariff is binding, imports exceed the quota and the rent is the quota times the difference between the within-quota and out-of-quota tariff rates.

Ideally, the import quota fill rate should determine the domestic price. If the quota is unfilled domestic prices should be determined by the within-quota tariffs, and prices should be high only if the quota is filled or overfilled. However, it is often observed that quotas are unfilled but domestic prices are high nonetheless. This may be because administrative constraints prevent the quotas being filled, or perhaps quotas are allocated on an historical basis to countries that are no longer exporters. More to the point, countries with high domestic prices are unlikely to be prepared to see them eroded by a shift in the supply of imports. As a result, the assumption here is that the out-of-quota tariffs (or possibly the applied tariffs) determine the domestic market price.

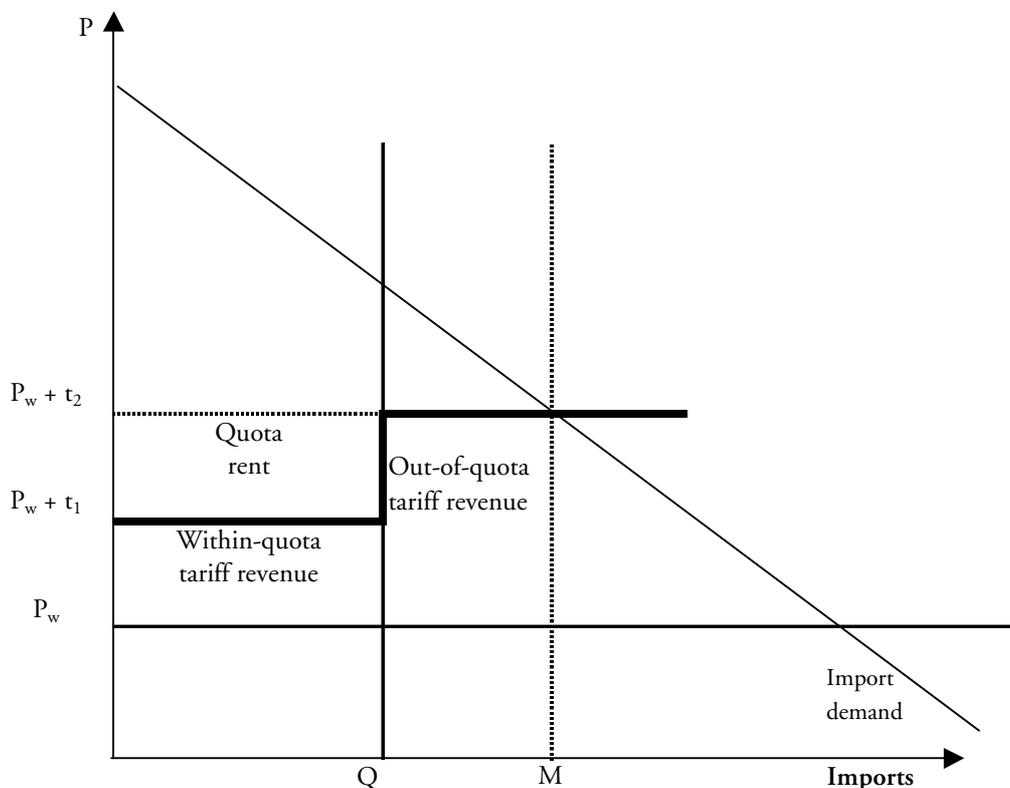
This assumption restricts the model in two important ways. Firstly, it is not possible to model an increase in import quotas above the initial level of imports. Secondly, changes in quota rents make no impact on the exporting countries' supply decisions because, on the margin, the price received by the supplier does not change as quota rents change. The quota rent is effectively a lump sum transfer from the importing country's Government to the exporting countries' supplier.

This also implies that global quotas should not exceed imports. The calculation of tariff revenues and rents is based on this assumption. This is illustrated in figure 1. Of interest is what happens to rents and tariff revenue as within-quota tariffs, out-of-quota tariffs and import quotas are altered. It is clear from figure 1 that:

- A reduction in within-quota tariffs will increase quota rents and decrease tariff revenue;
- A reduction in out-of-quota tariffs will decrease quota rents and out-of-quota tariff revenue;
- An increase in import quotas may merely increase quota rents and decrease tariff revenue. If the quota is increased sufficiently it, rather than the over-quota tariff, will become binding and out-of-quota tariff revenues will be eliminated.

To measure the rents it is necessary to have observations of global quotas, bilateral quotas, within-quota and out-of-quota tariffs, world market prices and imports.

**Figure 1**  
Quota rents with a binding out-of-quota tariff



Global quotas, specifying the total level of imports at the lower tariff level, are notified to the WTO, but most bilateral quotas are not and have to be estimated. The model uses bilateral trade flows to estimate the bilateral quota distribution. For each bilateral trade flow of each commodity the rent is calculated.

Which agent actually captures the rent created by the tariff rate quota depends on institutional factors and market structures. Rents could accrue to a number of agents, including exporting producers, exporting Governments, importing Governments, importing consumers or distribution and processing agents. Alternatively, the rent could be dissipated through unproductive rent-seeking activities. For a discussion on tariff rate quota administration see Abbott and Morse (1999), de Gorter and Sheldon (2000) and Skully (2001).

In ATPSM the capture rate of the rent can be specified by country and by commodity in the *capture rate* column in table *RentCapture* in the database. The rent can be allocated to the supplier and the importing country Government. The capture rate specifies the share in the quota rent, so 100 implies all the rent accrues to the exporter.

The model measures the rents forgone by importers, given a 100 per cent rent capture by exporters. Global rents forgone equate with rents receivable. For countries with special preferences, such as the ACP countries that have preferential access to EU markets, rent is equal to the whole out-of-quota tariff times the bilateral quota.

### **B.8.2. Preference arrangements**

Some countries allow other countries to bring in commodities at reduced or zero tariffs. Users can specify reduction in bilateral tariffs facing exporters with preferential access to specific markets. This is only relevant where quota rents accrue to exporters. This is specified by the *capture rate*. These are contained in the database (see the *RentCapture* table in *atpsm.mdb* or the variable *initial quota rent to exporter* in the results tab on the interface) and may be respecified by the user.

### **B.8.3. Export subsidies and quotas**

Export subsidies and export quotas are intrinsically linked in ATPSM. If the export quota determines the size of exports, the unit tariff of the export support is equal to the subsidy divided by the quota. The ad-valorem tariff equivalent is the ratio of the unit tariff to the world market price. However, if exports exceed the quota, the subsidy becomes simply a transfer of wealth as, on the margin, the additional exports are sold at world market prices and eliminate the domestic market protection. In such a case it is assumed that the subsidy extends to total exports. The unit tariff is then calculated as the total value of the subsidy divided by the export volume.

This treatment ignores two possible complications in the application of export subsidies. It is possible that an export subsidy is applied at a lower rate than the import tariff on the same commodity, this making the export subsidy redundant. In addition, sometimes farmers pay for the subsidies, thus reducing the farm price below the wholesale price. While such situations can be modelled, data on export subsidies are much less abundant than for tariffs and are often not available. Therefore, the model uses the above treatment of export subsidies.

## B.9. Domestic support

As part of the Agreement on Agriculture obligations Governments are required to report the total expenditure on domestic support of agricultural production. The amounts reported include market access measures and other types of support, such as deficiency payments. To improve transparency, efforts have been made to separate the market access measures from other support that is price-distorting. The GATT and, later, the WTO have defined various coloured “boxes” of support (green, blue, amber and red). The box containing the price-distorting support over and above the market access measures is reflected in *DomesticSupport* in *atpsm.mdb*. Users can change these data.

The ATPSM explicitly models extra farm price support. The data from a study done by Cornell University on behalf of UNCTAD have been included in the model database in the form of ad-valorem tariff equivalents. To obtain the farm (supply) price, these equivalents are added to the wholesale price. In a policy scenario the equivalents can be reduced by a desired percentage. It is the change in the sum of the producer and extra farm support tariff that represents the supply support change.

## B.10. Analysing economic effects of trade policy proposals

The purpose of ATPSM is to evaluate the economic effects of agricultural trade policy changes. These changes may be tariff cuts, introduction of or increases in market access preferences and/or modification of quotas. The model computes the associated changes in several variables, including trade revenue, welfare, tariff revenue and tariff quota rent.

The principle of ATPSM is that trade policy modifications induce price changes that alter supply, demand, exports and imports. The model calculates a market clearing world price where the global sum of net import changes equals zero. The model estimates all effects in terms of changes from a reference period (calibrated to the year 2000). The model analyses the outcome of policy scenarios that specify cuts in out-of-quota tariffs, within-quota tariffs, farm support and export subsidies. Changes in tariff rate quotas may also be specified.

When a country unilaterally cuts a tariff on a commodity this results in an increase in demand and reduction in supply of that commodity in that country that leads to an increase in the world price. Thus, for the country undertaking the tariff cut there are two effects on the domestic price. The first is a negative effect as a result of the reduction in the tariff and the second is a positive effect as a result of the increase in the world market price. The net effect is a fall in the domestic price (though this cannot be guaranteed when reforms are on more than one commodity in one region).

The trade revenue change is the difference between the change in export and import values. For a country that unilaterally cuts tariffs the export volume decreases while the export price change is unclear. The direction of the export value change is indeterminate (but usually negative). Both the volume and price of imports increase as a result of a unilateral tariff cut, resulting in an increase in import value for that country.

Welfare in ATPSM has three components. The first, producer surplus, is the aggregate difference between price and marginal cost plus any quota rent received on exports. The second, consumer surplus, is the aggregate difference between marginal valuation and price. The third, net government revenue, only relates to revenue from import tariffs, including both within-quota and out-of-quota tariffs, and expenditure on export subsidies and domestic support. The fall in the domestic price resulting from a unilateral tariff cut reduces producer surplus and increases consumer surplus in that country. It also results in a reduction in government revenue if the initial tariff is small and there are no tariff rate quotas. These two conditions are not trivial and are worth discussing in more detail.

The principle underlying the first condition is simple enough. Where tariffs are high enough a reduction in those tariffs will lead to an increase in imports that more than outweighs the fall in the tariff revenue per import. The most extreme example is where a prohibitive tariff is lowered to a non-prohibitive level, thereby increasing tariff revenue from nothing to some positive amount.

The effect of tariff-rate quotas on government revenue is illustrated in [figure 1](#), shown earlier. Given that out-of-quota tariff is assumed to be binding, government revenue will fall following:

- (1) a reduction in within-quota tariffs;
- (2) a reduction in out-of-quota tariffs; or
- (3) a increase in the tariff rate quota. This involves a transfer of out-of-quota tariff revenue to quota rents.

The net effect of a unilateral tariff cut on a particular commodity is an increase in aggregate welfare for the country unless that country is able to significantly influence the world price of the commodity as a result of its size in the market. In this case there will exist some optimal tariff level for that country in that market.

In the rest of the world the increased world price leads to an increase in producer surplus and a fall in consumer surplus. However, the reduction in the out-of-quota tariff could mitigate somewhat the increase in producer surplus in the rest of the world through a reduction in quota rents. The change in government revenue is indeterminate.<sup>2</sup> Those countries that are net exporters of the commodity experience a gain in welfare (in the absence of changes in quota rents) while those countries that are net importers experience a loss. The net effect is a global increase in welfare.

When a country unilaterally reduces its export subsidies on a commodity the results in the domestic economy are similar. There is a fall in the domestic price as producers can no longer receive a higher price from exporting the good. There is an increase in demand and a reduction in supply of that commodity in that country that leads to an increase in the world price. Domestic producer surplus falls and consumer surplus increases. However, government expenditure unambiguously falls as a result of the reduction in the export subsidy. Again, the net effect is an increase in aggregate welfare for the country unless that country is able to significantly influence the world price of the commodity as a result of its size in the market.

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<sup>2</sup> There will be an increase in government revenue if the elasticity of demand for the commodity in that country is less than 1.

## B.11. Model limitations

Like every model, ATPSM involves compromises. The most obvious are noted here.

(1) Unfilled import quotas. It is assumed here that within-quota tariffs are not relevant in price determination, even where quotas are unfilled. This means that the higher out-of-quota tariffs or applied tariffs are taken as determining domestic prices. This assumption overstates the benefits of liberalization, as there may be cases where within-quota rates are the relevant determinant of domestic prices.

(2) A further limitation is the handling of preferences. The model assumes that import quotas are filled regardless of the size of the rent. The benefits of preferential access are eroded when more general liberalisation occurs, and this is not captured completely by the model. The erosion of quota rents is taken into account but the trade creation and diversion effects are not.

(3) In the absence of quality data, bilateral quotas are allocated by a complex procedure based on each country's imports and exports. Quota rents are proportionate to trade flows. Unfortunately, there is no simple means of specifying particular bilateral quotas if or when better data become available. Initial quota levels can be obtained by examining the file `BilateralQuotas.csv`, and initial rents can be seen from `BilateralRents.csv`. These are large files and are not normally generated, but can be produced by activating the write statements in `newequation.ods`:

```
//ExportMatrixComCounCoun(&BilateralQuotas,"BilateralQuotas","",""<> shows  
source country, {} shows destination");  
//ExportMatrixComCounCoun(&Bilateralrent,"Bilateralrent","",""<> shows  
source country, {} shows destination");
```

To do this remove the `//` at the beginning of each statement. Source countries (exporters) are listed page by page. The first page, of 161 rows, shows EU exports to all countries. Commodities are in columns.

(4) Model parameters and policy data. Some countries in the model do not have policy data. Data quality is particularly an issue where there are many commodities and countries to deal with. In addition, there are problems in aggregating policy data across several tariff line items, and reliable information on applied rates, which are not notified to the WTO, is not available for some countries.

## PART C: ATPSM EQUATIONS AND PROCEDURES

### C.1. Main features of ATPSM

The Agricultural Trade Policy Simulation Model (ATPSM) is a comparative static partial equilibrium global model with the following main features:

1. An equation system for all countries, rendering incidences of supply, demand, export and import volume responses to world market price changes, given a set of price support changes, price transmission mechanisms and market structures;
2. Derivation by country (group) and commodity (group) of the volume, trade revenue and welfare effects of the policy changes.
3. Estimation of the size and distribution of tariff revenues and tariff quota rents among countries.
4. Presentation of estimation results in various dimensions, such as by country (group or region), commodity, policy scenario and economic variable.

### C.2. Domestic price formation

One principal characteristic of the model is that domestic prices are all a function of world market prices and border protection or special domestic support measures. Thus, no data are provided about domestic prices and no transaction costs (such as wholesale and retail margins) are taken into account. All protection measures are expressed in tariff rate equivalents.

In the ATPSM datasets a country is often an importer and exporter of the one (aggregated) good. To accommodate this feature of trade data, composite tariffs for determining the domestic consumption and production price are estimated. The technique chosen to derive the composed tariffs is to divide the volumes into three groups – imports, exports and production supplied to the domestic market ( $S_d$ ).

First, a domestic market tariff ( $t_d$ ) is computed as the weighted average of two tariffs – the export tariff ( $t_x$ ) and import tariff ( $t_m$ ) – where the weights are export (X) and imports (M):

$$t_d = (X t_x + M t_m) / (M + X);$$

Then, a consumption (domestic market) tariff is computed as the weighted average of the import tariff ( $t_m$ ) and the domestic market tariff ( $t_d$ ), where the weights are imports (M) and domestic supply ( $S_d$ ):

$$t_c = (M t_m + S_d t_d) / D;$$

Similarly, a supply (domestic market) tariff is computed as the weighted average of the export tariff ( $t_x$ ) and the domestic market tariff ( $t_d$ ), where the weights are exports (X) and domestic supply ( $S_d$ ) plus the domestic support tariff ( $t_p$ ):

$$t_s = (X t_x + S_d t_d) / S + t_p;$$

These calculations are applied both to the baseline and to the final tariffs.

### C.3. Equation system for individual commodity and country

#### Standard

The standard equation system for all countries has four equations:

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

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

$$(3) \quad \Delta X_{i,r} = \gamma_{i,r} \Delta S_{i,r};$$

$$(4) \quad \Delta M_{i,r} = D_{i,r} \hat{D}_{i,r} - S_{i,r} \hat{S}_{i,r} + \Delta X_{i,r};$$

where  $D$ ,  $S$ ,  $X$ , and  $M$  denote demand, supply, exports and imports, respectively;

$\hat{\phantom{x}}$  denotes relative changes and  $\Delta$  absolute changes;

$P_w$  denotes world price;

$t_c$  denotes the domestic consumption tariff and  $t_p$  denotes the domestic production tariff;

$\varepsilon$  denotes supply elasticity,  $\eta$  denotes demand elasticity, and  $\gamma$  denotes the ratio of exports to production;

$i$  and  $j$  are commodities indexes; and

$r$  is a country index.

Equation 3 requires that the change in exports in each market is some proportion of the change in production. This proportion is determined by the ratio of exports to production. For example, if all the initial production is exported, all the change in production is exported. If half the initial production is exported, half of the change in production is exported. This implies that the proportion of exports to production is maintained. Equation 4 clears the market, so that production plus imports equals domestic consumption and exports.

#### Armington

The Armington version of the model contains different equations for imports and exports:

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

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

where  $D$ ,  $S$ ,  $X$ , and  $M$  denote demand, supply, exports and imports, respectively;

$\hat{\phantom{x}}$  denotes relative changes and  $\Delta$  absolute changes;

$P_w$  denotes world price;

$t_c$  denotes the domestic consumption tariff and  $t_p$  denotes the domestic production tariff;

$\varepsilon$  denotes supply elasticity,  $\eta$  denotes demand elasticity, and  $\gamma$  denotes the ratio of exports to production;  
 $i$  and  $j$  are commodities indexes;  
 $r$  is a country index;  
 $(P_d/P_m)_y = (P_w(1+t_d)/(P_w(1+t_m)))_y$ , where  $y=init$  indicates initial values and  $y=new$  indicates values after the policy changes;  
 $\sigma$  denotes the Armington elasticity between imports and domestically produced goods.

Equation 4 requires that the relation of imports and domestic supply is determined by the price ratio of domestic supply and imports:

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

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

The default value for the elasticity is 2.2, although for homogeneous goods there may be a sound argument for increasing this value.

For both versions of the mode, the following equations hold:

By transforming  $\hat{D}$ ,  $\hat{S}$ , and  $\Delta M$  and  $\Delta X$  to vectors with dimensions of 5832 (162\* 36) by 1, the equation system above can be simplified to the following four equations:

$$\begin{aligned} \hat{D} &= k_1 \hat{P}_w + k_2; \\ \hat{S} &= k_3 \hat{P}_w + k_4; \\ k_5 \hat{S} + \Delta X &= 0; \\ k_6 \hat{D} + k_7 \hat{S} + k_8 \Delta X + \Delta M &= 0; \end{aligned}$$

where:

$$\begin{aligned} k_1 &= \eta + \sum \eta_j; \\ k_2 &= \eta \left( 1 + \hat{t}_c \right) + \sum \eta_j \left( 1 + \hat{t}_{c_j} \right); \\ k_3 &= \varepsilon + \sum \varepsilon_j; \\ k_4 &= \varepsilon \left( 1 + \hat{t}_p \right) + \sum \varepsilon_j \left( 1 + \hat{t}_{p_j} \right); \\ k_5 &= -X; \\ k_6 &= -D; \\ k_7 &= S; \\ k_8 &= -1; \end{aligned}$$

Using matrix inversion and multiplication techniques, the model solves the equation system for world prices. Define the main determinant  $\mathbf{F}$  and the vectors  $\mathbf{V}$ ,  $\mathbf{y}_2$ , and  $\mathbf{y}_3$  as follows:

$$\mathbf{F} = \begin{vmatrix} \mathbf{I} & 0 & 0 & 0 \\ 0 & \mathbf{I} & 0 & 0 \\ 0 & k_5 & \mathbf{I} & 0 \\ k_6 & k_7 & k_8 & \mathbf{I} \end{vmatrix}; \quad \mathbf{V} = \begin{vmatrix} \hat{D} \\ \hat{S} \\ \Delta X \\ \Delta M \end{vmatrix}; \quad \mathbf{y}_2 = \begin{vmatrix} k_1 \\ k_3 \\ 0 \\ 0 \end{vmatrix}; \quad \mathbf{y}_3 = \begin{vmatrix} k_2 \\ k_4 \\ 0 \\ 0 \end{vmatrix};$$

Then:

$$\mathbf{FV} = \mathbf{y}_3 + \mathbf{y}_2 \hat{P}_w;$$

Solving for  $\mathbf{V}$  gives:

$$\mathbf{V} = \mathbf{F}^{-1} \mathbf{y}_3 + \mathbf{F}^{-1} \mathbf{y}_2 \hat{P}_w;$$

Using the relevant horizontal element vectors of the inverted determinant allows the derivation of the export and import changes. Define:

$$\mathbf{y}_1 = |F_{31} \ F_{32} \ F_{33} \ F_{34}|; \quad \mathbf{y}_4 = |F_{41} \ F_{42} \ F_{43} \ F_{44}|;$$

Then:

$$\Delta X = \mathbf{y}_1 \mathbf{y}_2 \hat{P}_w + \mathbf{y}_1 \mathbf{y}_3; \quad \Delta M = \mathbf{y}_4 \mathbf{y}_2 \hat{P}_w + \mathbf{y}_4 \mathbf{y}_3;$$

The next step is to summarize the export and import changes over  $N_p$  countries.

Define:

$$\mathbf{T}_1 = \sum_{n=1}^{N_p} \mathbf{y}_{1,n} \mathbf{y}_{2,n}; \quad \mathbf{T}_2 = \sum_{n=1}^{N_p} \mathbf{y}_{1,n} \mathbf{y}_{3,n}; \quad \mathbf{T}_3 = \sum_{n=1}^{N_p} \mathbf{y}_{4,n} \mathbf{y}_{2,n}; \quad \mathbf{T}_4 = \sum_{n=1}^{N_p} \mathbf{y}_{4,n} \mathbf{y}_{3,n};$$

#### C.4. World market clearing prices

The totals of the  $\mathbf{T}$  coefficients are used to constitute the world market equation system:

$$\sum_{n=1}^N \Delta X_n = \mathbf{T}_1 \hat{P}_w + \mathbf{T}_2;$$

$$\sum_{n=1}^N \Delta M_n = \mathbf{T}_3 \hat{P}_w + \mathbf{T}_4;$$

Equilibrium requires that

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

i.e. the change in world excess supply is zero. This implies that

$$(\mathbf{T}_1 - \mathbf{T}_3)\hat{P}_w + (\mathbf{T}_2 - \mathbf{T}_4) = 0$$

Note that  $\mathbf{T}_1$  and  $\mathbf{T}_3$  are square commodity matrices and that all other variables are commodity vectors. Solving for the world market price change gives:

$$\hat{P}_w = -(\mathbf{T}_1 - \mathbf{T}_3)^{-1}(\mathbf{T}_2 - \mathbf{T}_4);$$

The absolute world market price change is:

$$\Delta P_w = \hat{P}_w P_w;$$

Once the world price changes are derived these changes can then be inserted into equations (1) to (4) to get the volume responses.

### C.5. Trade revenue and welfare effects

Given the volume responses  $\Delta X$ ,  $\Delta M$ ,  $\Delta S$ , and  $\Delta D$ , 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:

$$\Delta R = (P_w + \Delta P_w)[(X + \Delta X) - (M + \Delta M)] - P_w(X - M).$$

The welfare change has three components. The first two are the changes in producer surplus ( $\Delta PS$ ) and consumer surplus ( $\Delta CS$ ). These changes depend on the domestic market price changes and the own price domestic demand and supply volume responses. The change in producer surplus is also dependent on the change in quota rent received. Quota rents,  $U$ , are calculated for each country and each commodity as the volume of imports times the world price times the difference between the in-quota and out-of-quota tariffs:

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

where  $Q$  denotes the import quota,  $P_w$  world prices as previously noted,  $t_{m1}$  the in-quota and  $t_{m2}$  the out-of-quota or applied tariff rates. Rent accrues only if the importing country is applying the out-of-quota tariff rate. The capture rate,  $c$ , is the proportion of the rent captured by exporting producers as opposed to the proportion,  $1-c$ , going to the importing Government. The change in quota rent received,  $c\Delta U$ , is added to producer surplus. For each country and commodity:

$$\Delta PS = \Delta P_p [S + 0.5(\Delta S_d)] + c\Delta U;$$

$$\Delta CS = -\Delta P_c [D + 0.5(\Delta D_d)]$$

The third part is the change in net government revenue ( $\Delta NGR$ ), consisting of change in tariff revenue, change in export subsidy expenditure, change in domestic support expenditure and change in quota rent not received by exporters. For each country and commodity:

$$\begin{aligned} \Delta NGR &= \Delta TR - \Delta ES - \Delta DS + (1-c)\Delta U \\ &= \underbrace{(t_w + \Delta t_w)(Q + \Delta Q) - t_w Q}_{\text{Change in in-quota revenue}} + \underbrace{(t_o + \Delta t_o)[(M + \Delta M) - (Q + \Delta Q)] - t_o(M - Q)}_{\text{Change in out-of-quota revenue}} \\ &\quad - \underbrace{[(t_x + \Delta t_x)(X + \Delta X) - t_x X]}_{\text{Change in export subsidy expenditure}} - \underbrace{[(t_d + \Delta t_d)(S + \Delta S) - t_d S]}_{\text{Change in domestic support expenditure}} \\ &\quad + \underbrace{(1-c)\Delta U}_{\text{Change in quota rent forgone}} \end{aligned}$$

The sum is the total welfare effect:

$$\Delta W = \Delta PS + \Delta CS + \Delta NGR.$$

Note that for countries for which there is no information on agricultural trade policies, there is no change in net government revenue and changes in producer and consumer surplus only occur as a result of changes in the world price.

## C. 6. Animal product – feed relationships

ATPSM models the interdependences between animal products and feed.<sup>3</sup> The theoretical hypothesis is that the volume of animal production and, hence, feed production is determined by profitability rather than by price. Approximating profitability by gross value added (product value minus feed input value), the supply function for each country becomes:

$$S_i = f(P_i - \sum_j r_{ij} P_j);$$

where  $p$  denotes price,  $r$  feed share, subscript  $i$  animal product, and subscript  $j$  feed. Expressing the function in basic model terms, it becomes:

$$\hat{S}_i = \varepsilon \left\{ \left[ \alpha \hat{P}_{w,i} + \left( 1 + \hat{t} \right)_{p,i} \right] - \sum_j r_{ij} \left[ \beta \hat{P}_{w,j} + \left( 1 + \hat{t} \right)_{c,j} \right] \right\};$$

The terms for the animal product price change are already included in the equations shown above, but not the terms for the feed commodities. The volume responses to price changes have been modified in the following ways (the previously derived  $k$  coefficients are marked by a prime):

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<sup>3</sup> In Version 3 this feature is inoperable, as there is no feedshare data in the database. The feedshare relationships are modeled through cross price elasticities instead. However, the model structure is functional and users may include feedshare data if they wish.

$$\begin{aligned}
k_1 &= k'_1 - \eta_i \sum_j r_{ij}; \\
k_2 &= k'_2 - \eta_i \sum_j r_{ij} \left( \hat{1+t} \right)_{p,j}; \\
k_3 &= k'_3 - \varepsilon_i \sum_j r_{ij}; \\
k_4 &= k'_4 - e_i \varepsilon_i \sum_j r_{ij} \left( \hat{1+t} \right)_{c,j};
\end{aligned}$$

The results are somewhat imprecise because the supply and demand elasticities used in the model have been estimated in relation to product price rather than in relation to profitability.

### C.7. Tariff quota rents and tariff revenues

An importer that applies the tariff quota system generates quota rents for those suppliers that export goods within the quota, owing to the fact that within-quota tariff is lower than the out-of-quota tariff. In ATPSM, it is assumed that the exporter captures these rents. The distribution of the rents among exporters is determined by the difference between the out-of-quota and within-quota tariff and on the allocation of bilateral quotas.

Bilateral quotas need to be calculated by ATPSM. The principle adopted is to assume that the quotas are distributed on the basis of historical bilateral trade. However, bilateral trade information does not exist for all policy countries. The total volume of exports from each country is used to allocate the remaining global quota of a commodity where bilateral trade information does not exist.

This method can lead to the construction of a bilateral quota matrix where the total of bilateral quotas offered by all importers to an individual exporter can exceed that country's export capacity. Hence, bilateral quota redistribution is required to ensure that no supplier receives a sum of bilateral quotas that exceeds its export capacity. This redistribution is achieved through with the use of an iteration algorithm. In short, this algorithm can be described as follows:

Given the bilateral quota matrix for each commodity,  $c_{ij}$ ,  $i=1,..,n$ ,  $j=1,..,m$ , where  $i$ =importer and  $j$ =exporter, the bilateral sum vectors are:

$$\begin{aligned}
Q_i &= \sum_j c_{ij}; \quad j=1,..,m; \quad \text{hence } Q_i \text{ should equal the global quota } G_i; \\
Q_j &= \sum_i c_{ij}; \quad i=1,..,n; \quad \text{hence } Q_j \text{ should be less than or equal to the export capacity } \\
&\quad X_j.
\end{aligned}$$

If  $Q_j < X_j$ , for all  $j$  no adjustment is needed. Otherwise the bilateral quotas assigned to exporting country  $j$  are multiplied by the coefficient  $\rho$  where  $\rho = X_j / Q_j$ .

This adjustment ensures  $Q_i < G_i$  for some importing countries. Hence, the bilateral quotas from the importing country  $i$  are multiplied by the coefficient  $\gamma$  where  $\gamma = G_i / Q_i$ .

This process is iterated until the average ratio of  $G_i / Q_i < 1.001$ .

To estimate quota rents it is necessary to multiply the adjusted bilateral quota matrix by the unit value of the tariff difference. This unit value is obtained by multiplying the difference between the out-of-quota tariff rate ( $t_2$ ) and the within-quota tariff rate ( $t_1$ ) by the world market price. Thus the bilateral rent,  $r_{i,j}$  is:

$$r_{i,j} = c_{i,j} \cdot P_w (t_2 - t_1);$$

The bilateral rents are summed over importers for each exporter to get the rent  $r$ . The rent is computed for the reference case,  $r_{j,b}$ , and the policy scenario,  $r_{j,f}$ . The policy scenario rent is affected by changes in the bilateral quota matrix, changes in within-quota and out-of-quota tariffs and changes in world market prices. Thus:

$$r_{i,j,f} = c_{i,j,f} (P_w + \Delta P_w)(t_{2,f} - t_{1,f}); \text{ for the exporters } j=1, \dots, m;$$

The global sum of forgone quota rents is, by definition, equal to the global sum of receivable quota rents.

Tariff revenue,  $T$ , for each country and commodity is the sum of the within-quota tariff  $t_1$  multiplied by the global quota and by the out-of-quota tariff  $t_2$  multiplied by the difference between total imports,  $M$ , and the quota,  $Q$ . Thus:

$$T = P_w [t_1 Q + t_2 (M - Q)] ;$$

Two bilateral quota preference options are available to the user. The first eliminates the within-quota tariffs on all bilateral tariff rate quota exports of all commodities for selected country groups. The second eliminates all tariffs on all initial bilateral exports of all commodities for selected country groups. In this case the bilateral tariff rate quotas  $c_{i,j}$  are replaced by bilateral trade volumes. This calculation of this trade matrix follows the same procedures as for the tariff rate quota matrix.

## **PART D: THE ATPSM DATABASE**

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All initial data are stored in the Access database file `atpsm.mdb`. It is possible to run ATPSM without having Microsoft Access, but it is not possible to change the initial data without this software.

### **D.1. Country list**

The total number of countries in the model is 162 (or, counting the EU 15 members, 176 countries). One country is labelled Rest of World, essentially a residual to balance the initial database. The country names and codes can be found in Appendix I. The trade policy data requirements are discussed in the relevant sections below.

### **D.2. Prices and volumes**

The world market prices have been developed using several sources (International Financial Statistics, FAO Trade Yearbook and UNCTAD price statistics), extending the period covered from 1999 to 2001.

The volumes of trade and production have been obtained from the FAO supply utilization accounts. Consumption is obtained by adding imports and production and subtracting exports – so-called apparent consumption. This concept does not take into account movements in and out of stocks. Sometimes, owing to incompatibility between production and trade accounts, the apparent consumption can equate to a negative number. In such a case production is increased to ensure that consumption is non-negative.

As the commodity specification in the supply utilization accounts is more detailed than the one used in the ATPSM, the volumes were aggregated applying appropriate conversion factors. To stabilize the data for annual variations in yield, a three-year average of volumes from 1999 to 2001 was estimated.

### **D.3. Bilateral trade flows**

As bilateral tariff quotas are incompletely specified in the notifications to the WTO, information about bilateral trade flows becomes a necessary means for distributing the global tariff quotas among exporters. The procedure implies that the tariff quotas tend to be distributed to traditional suppliers.

The database of the UNCTAD trade deflator system is used as a data source. First, intra-EU trade is eliminated, as the EU countries are treated as one region in the model. As the trade flows are reported at HS line level, the next step is to sum up the HS flows to the level of the ATPSM commodity groups. The resulting bilateral trade flows are listed in the sub-file “TRADE” in the file `atpsm.mdb`.

#### D.4. Tariffs and tariff quotas

All import trade barriers (out-of-quota and within-quota tariff rates and tariff rate quotas) are derived using information from the Agricultural Market Access Database (AMAD). AMAD is publicly accessible from the website [www.amad.org](http://www.amad.org). It is maintained by the OECD, and a number of other organizations, including FAO, UNCTAD, the US Department of Agriculture, Agriculture Canada and the EU Agricultural Directorate, contribute to its development. Most of the data in AMAD come from WTO schedules and notifications. However, the applied rates are obtained from the [UNCTAD TRAINS database](#).

There are three problems to address in converting AMAD data to a format suitable for use in ATPSM:

1. For some countries and many tariff lines, the tariffs are specific or mixed;
2. The tariffs in the notifications provided by countries to WTO are specified by HS line;
3. For several countries, the implementation period for tariff cuts prescribed in the Agreement on Agriculture goes beyond the year 2000.

As mentioned previously, in ATPSM all tariffs must be expressed as a percentage of the world market price. The method for converting specific and mixed tariffs into ad-valorem equivalents is detailed in [Appendix II](#).

The AMAD files containing the within-quota tariff information also contain tariff quota data. Therefore, the quotas in these files are summed to ATPSM commodity group level simultaneously with the weighted (or simple) aggregation of the within-quota tariffs. The quota sums represent the global tariff quotas. The main difficulty encountered in this aggregation is that tariff quotas in several cases cover commodity groups both inside and outside the ATPSM framework. In such instances the quota is allocated to the commodity group (inside or outside ATPSM) with the most imports.

The data are listed in three ATPSM sub-files, “INQUOTAS”, “OUTQUOTA” and “AppliedTariffRates”.

#### D.5. Export subsidies

The data on export subsidies and quotas are based on government notifications to WTO. They can be found in the `atpsm.mdb` subfile `ExportSubsidies`.

#### D.6. Domestic support

The Uruguay Round Agreement on Agriculture calls for reductions in production-distorting (amber box) domestic support. However, it is not clear to what extent differing forms of domestic support distort production and trade. Direct income support and payments to factors of production have less effect on output than payments on output. In addition, in some instances administered prices appear to be providing domestic support, but such policies actually rely on border measures for their effect. Double counting can occur where domestic support is conflated with border protection. (See de Gorter, Ingco and Ignacio (2004, p. 122) for elaboration of this point.) The ATPSM database attempts to avoid this. The support has been converted into tariff ad-valorem

equivalents through dividing unit support by the world market price. The domestic support is found in the subfile “DomesticSupport”.

This approach implies low rates of domestic support for the European Union and the United States. The production-limiting (blue box) items in EU domestic support are debatable, as at present they are accompanied by production limits. The justification for excluding blue box support is that it is difficult to assess whether the production limits offset the additional support. Green box support is exempt from reduction commitments. The impact of amber, blue and green box support on production is a grey area, the subject of an ongoing decoupling debate.

#### D.7. Price elasticities

To calculate price elasticities for the ATPSM the supply and demand elasticities available in the FAO databases was used. The FAO database on price elasticities covers direct and cross-price elasticities for domestic demand, and area supply and yield of major agricultural commodities.

For the purpose of the ATPSM, the area and yield elasticities from FAO are used to estimate a supply elasticity. Given that supply (S) is the product of area (A) and yield (Y),

$$S = A Y$$

the supply elasticity is simply the sum of the area and yield elasticities. Taking the logarithm of the equation:

$$\log S = \log A + \log Y;$$

then, dividing all the three elements by log P, it follows that:

$$e_s = e_a + e_y$$

There are a number of countries represented in ATPSM for which no FAO estimate of supply or demand elasticity exists. In these instances, the elasticities are assumed to be the same as those for a geographically close proxy region. The price elasticities are listed in the sub-file “Elasticities”.

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- UNCTAD TRAINS database <http://www.unctad.org/trains/index.htm>

## APPENDIX I – ATPSM regions and commodity codes

### A.1. ATPSM region codes

No	Code	Name	No	Code	Name
1	004	Afghanistan	50	242	Fiji
2	008	Albania	51	258	French Polynesia, Territory of
3	012	Algeria	52	266	Gabon
4	024	Angola	53	270	Gambia
5	032	Argentina	54	268	Georgia
6	051	Armenia	55	288	Ghana
7	036	Australia	56	308	Grenada
8	031	Azerbaijan	57	320	Guatemala
9	044	Bahamas	58	324	Guinea
10	050	Bangladesh	59	624	Guinea-Bissau
11	052	Barbados	60	328	Guyana
12	112	Belarus	61	332	Haiti
13	084	Belize	62	340	Honduras
14	204	Benin	63	344	Hong Kong, China
15	068	Bolivia	64	348	Hungary
16	070	Bosnia and Herzegovina	65	352	Iceland
17	072	Botswana	66	356	India
18	076	Brazil	67	360	Indonesia
19	096	Brunei	68	364	Iran, Islamic Republic of
20	100	Bulgaria	69	368	Iraq
21	854	Burkina Faso	70	376	Israel
22	108	Burundi	71	384	Côte d'Ivoire
23	116	Cambodia	72	388	Jamaica
24	120	Cameroon	73	392	Japan
25	124	Canada	74	400	Jordan
26	132	Cape Verde	75	398	Kazakhstan
27	140	Central African Republic	76	404	Kenya
28	148	Chad	77	408	Korea, Democratic People's Republic of
29	152	Chile	78	410	Korea, Republic of
30	156	China	79	414	Kuwait
31	170	Colombia	80	417	Kyrgyzstan
32	174	Comoros	81	418	Lao People's Democratic Republic
33	178	Congo	82	428	Latvia
34	180	Congo, Democratic Republic of the	83	422	Lebanon
35	188	Costa Rica	84	426	Lesotho
36	191	Croatia	85	430	Liberia
37	192	Cuba	86	434	Libyan Arab Jamahiriya
38	196	Cyprus	87	440	Lithuania
39	203	Czech Republic	88	446	Macao
40	262	Djibouti	89	807	Macedonia, Former Yugoslav Republic of
41	212	Dominica	90	450	Madagascar
42	214	Dominican Republic	91	454	Malawi
43	918	EU 15	92	458	Malaysia
44	218	Ecuador	93	462	Maldives
45	818	Egypt	94	466	Mali
46	222	El Salvador	95	470	Malta
47	232	Eritrea	96	478	Mauritania
48	233	Estonia	97	480	Mauritius
49	231	Ethiopia	98	484	Mexico

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## A.1. ATPSM region codes (continued)

No	Code	Name	No	Code	Name
99	498	Moldova, Republic of	131	710	South Africa
100	496	Mongolia	132	144	Sri Lanka
101	504	Morocco	133	662	Saint Lucia
102	508	Mozambique	134	670	Saint Vincent
103	104	Myanmar	135	736	Sudan
104	516	Namibia	136	740	Suriname
105	524	Nepal	137	748	Swaziland
106	530	Netherlands Antilles	138	756	Switzerland
107	554	New Zealand	139	760	Syrian Arab Republic
108	558	Nicaragua	140	158	Taiwan Province of China
109	562	Níger	141	762	Tajikistan
110	566	Nigeria	142	834	Tanzania, United Republic of
111	578	Norway	143	764	Thailand
112	586	Pakistan	144	768	Togo
113	590	Panama	145	780	Trinidad and Tobago
114	598	Papua New Guinea	146	788	Tunisia
115	600	Paraguay	147	792	Turkey
116	604	Peru	148	795	Turkmenistan
117	608	Philippines	149	784	United Arab Emirates
118	616	Poland	150	840	United States of America
119	642	Romania	151	800	Uganda
120	643	Russian Federation	152	804	Ukraine
121	646	Rwanda	153	858	Uruguay
122	678	Sao Tome and Principe	154	860	Uzbekistán
123	682	Saudi Arabia	155	548	Vanuatu
124	686	Senegal	156	862	Venezuela
125	690	Seychelles	157	704	Viet Nam
126	694	Sierra Leone	158	887	Yemen
127	703	Slovakia	159	891	Yugoslavia
128	705	Slovenia	160	894	Zambia
129	90	Solomon Islands	161	716	Zimbabwe
130	706	Somalia			

## A.2. ATPSM FAO commodity concordance

Name	FAO code	ATPSM code	Name	FAO code	ATPSM code
<b>Livestock</b>			<b>Cheese</b>		
Cattle	866	00100	Cheese of whole cow milk	901	02400
Buffaloes	946	00100	Cheese of skimmed cow milk	904	02400
Sheep	976	00100	Whey cheese	905	02400
Goats	1016	00100	Processed cheese	907	02400
<b>Bovine meat</b>			Cheese of bufmilk	955	02400
Meat of cattle	867	01100	Cheese of shmilk	984	02400
Offals of cattle, edible	868	01100	Cheese of goat mlk	1021	02400
Meat of cattle, boneless	870	01100	<b>Wheat</b>		
Meat of beef, drd, sltd,smkd	872	01100	Wheat	15	04100
Meat of buffaloes	947	01100	Flour of wheat	16	04100
Offals of buffaloes, edible	948	01100	<b>Rice</b>		
<b>Sheepmeat</b>			Rice paddy	27	04200
Meat of sheep	977	01210	Rice husked	28	04200
Offals of sheep, edible	978	01210	Milled/husked rice	29	04200
Meat of goats	1017	01210	Rice milled	31	04200
Offals of goats	1018	01210	Rice broken	32	04200
<b>Pigmeat</b>			Rice flour	38	04200
Meat of pigs	1035	01220	<b>Barley</b>		
Offals of pigs, edible	1036	01220	Barley	44	04300
Pork	1038	01220	Barley flour and grits	48	04300
Bacon and ham	1039	01220	<b>Maize</b>		
<b>Poultry</b>			Maize	56	04400
Meat of chickens	1058	01230	Flour of maize	58	04400
Offals liver chik	1059	01230	<b>Sorghum</b>		
Meat of ducks	1069	01230	Sorghum	83	04530
Meat of geese	1073	01230	Flour of sorghum	84	04530
Offals liver g.se	1074	01230	<b>Pulses</b>		
Offals liver duck	1075	01230	Beans dry	176	05420
Meat of turkeys	1080	01230	Broad beans dry	181	05420
Offals liver turk	1081	01230	Peas dry	187	05420
Pigeon meat, other birds	1089	01230	Chick-peas	191	05420
<b>Milk, concentrate</b>			Cow peas dry	195	05420
Milk whole cond	889	02222	Pigeon peas	197	05420
Milk whole evp	894	02222	Lentils	201	05420
Milk skimmed evp	895	02222	Bambara beans	203	05420
Milk skimmed cond	896	02222	Vetches	205	05420
Milk whole dried	897	02222	Lupins	210	05420
Milk skimmed dry	898	02222	Pulses nes	211	05420
<b>Butter</b>			Flour of pulses	212	05420
Butter cow milk	886	02300	<b>Tomatoes</b>		
Ghee, butteroil of cow milk	887	02300	Tomatoes fresh	388	05440
Butter of bufmilk	952	02300	Tomatojuice concentrated	389	05440
Ghee oil of buf	953	02300	Juice tomatoes	390	05440
Butter, ghee of sheep milk	983	02300	Paste tomatoes	391	05440
Butter of goat mlk	1022	02300	Tomato peeled	392	05440

.../...

## A.2. ATPSM FAO commodity concordance (continued)

Name	FAO code	ATPSM code	Name	FAO code	ATPSM code
<b>Roots &amp; tubers</b>			Pineapples cand	575	05790
Potatoes	116	05480	Juice of pineapples	576	05790
Potatoes flour	117	05480	Dates	577	05790
Frozen potatoes	118	05480	Pineapple juice conc	580	05790
Tapioca of potatoes	121	05480	Mango juice	583	05790
Sweet potatoes	122	05480	Mango pulp	584	05790
Cassava	125	05480	Persimmons	587	05790
Flour of cassava	126	05480	Cashewapple	591	05790
Tapioca of cassava	127	05480	Kiwi fruit	592	05790
Cassava dried	128	05480	Papayas	600	05790
Yautia (cocoyam)	135	05480	Fruit tropical fresh nes	603	05790
Taro (cocoyam)	136	05480	Fruit tropical dried nes	604	05790
Yams	137	05480			
Roots and tubers nes	149	05480	<b>Sugar, raw</b>		
Flour of roots and tubers	150	05480	Sugar cane	156	06110
Roots and tubers dried	151	05480	Sugar beet	157	06110
			Cane sugar	158	06110
<b>Apples &amp; pears</b>			Beet sugar	159	06110
Apples	515	05700	Sugar crops nes	161	06110
Applejuice single streng	518	05700	Sugar raw centrifugal	162	06110
Applejuice concentrated	519	05700	Sugar non- centrifugal	163	06110
Pears	521	05700			
Quinces	523	05700	<b>Sugar, refined</b>		
			Sugar refined	164	06120
<b>Citrus fruits</b>					
Oranges	490	05710	<b>Coffee, green</b>		
Juice of oranges	491	05710	Coffee green	656	07110
Oranj juice concentrated	492	05710			
Tang.mand. Clement.satsma	495	05710	<b>Coffee, proc.</b>		
Tangerine juice	496	05710	Coffee roasted	657	07120
Lemons and limes	497	05710	Coffee subst. Cont.coffee	658	07120
Lemonjuice single-streng	498	05710	Coffee extracts	659	07120
Lemonjuice conc.	499	05710			
Grapefruit & pomelo 0	507	05710	<b>Cocoa beans</b>		
Juice of grapefruit	509	05710	Cocoa beans	661	07210
Grapefruit juice cocentr	510	05710			
Citrus fruit nes	512	05710	<b>Cocoa, processed</b>		
Juice of citrus fruit nes	513	05710	Cocoa paste	662	07220
Citrusjuice conc.	514	05710	Cocoa butter	664	07220
			Cocoa powder&cake	665	07220
<b>Bananas</b>			Chocolate prsnes	666	07220
Bananas	486	05710			
Plantains	489	05710	<b>Tea</b>		
			Tea	667	07410
<b>Other tropical fruits</b>			Mate	671	07410
Watermelons	567	05790	Extracts tea, mate,prep.	672	07410
Melons incl. Cantaloupes	568	05790	Tea nes	674	07410
Figs	569	05790			
Figs dried	570	05790	<b>Tobacco leaves</b>		
Mangoes	571	05790	Tobacco unmanfcted	826	12100
Avocados	572	05790			
Pineapples	574	05790			

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## A.2. ATPSM FAO commodity concordance (continued)

Name	FAO code	ATPSM code	Name	FAO code	ATPSM code
<b>Tobacco, processed</b>			Oil of poppyseed	297	42000
Cigarettes	828	12200	Vegetable tallow	306	42000
Cigars cheroots	829	12200	Stillingia oil	307	42000
Tobacco prs nes	831	12200	Oil of kapok	313	42000
			Oil of ctseed	331	42000
<b>Oilseeds, temperate</b>			Oil of linseed	334	42000
Soybeans	236	22200	Oil of hempseed	337	42000
Sunflower seed	267	22200			
Rapeseed	270	22200	<b>Hides &amp; skins</b>		
Jajoba seeds	277	22200	Hides fresh cattle	919	21100
Safflower seed	280	22200	Hides wet salted cattle	920	21100
Sesame seed	289	22200	Hidesdry s.cattle	921	21100
Mustard seed	292	22200	Hides nes cattle	922	21100
Poppy seed	296	22200	Skins wet salted calves	928	21100
Linseed	333	22200	Skinsdry s.calves	929	21100
Hempseed	336	22200	Skins nes calves	930	21100
			Hides wet salted buffaloes	958	21100
<b>Oilseeds, tropical</b>			Hides drysalt buf	959	21100
Groundnuts in shell	242	22300	Skins fresh sheep	995	21100
Groundnut shelled	243	22300	Skinswet salted sheep	996	21100
Coconuts	249	22300	Skinsdry sltsheep	997	21100
Coconuts desic	250	22300	Skins nes sheep	998	21100
Copra	251	22300	Skins with wool sheep	999	21100
Oil palm fruit	254	22300	Karakul skins	1002	21100
Palmnuts kernels	256	22300	Skins wet salted goats	1026	21100
Karite nuts (sheanuts)	263	22300	Skinsdry slt goat	1027	21100
Castor beans	265	22300	Skins nes goats	1028	21100
Tung nuts	275	22300	Skins fresh pigs	1044	21100
Melonseed	299	22300	Skinswet sltdpigs	1045	21100
Tallowtree seeds	305	22300	Skinsdry sltdpigs	1046	21100
Kapok fruit	310	22300	Skins nes pigs	1047	21100
Kapokseed shell	311	22300	Hides wet salted horses	1103	21100
Kapokseed shled	312	22300	Hides dry slt horses	1104	21100
Seed cotton	328	22300	Hides unsp horse	1105	21100
Cottonseed	329	22300	Hides wet salted camels	1134	21100
			Hidesdry slt cam	1135	21100
<b>Vegetable oils</b>			Hides unsp camels	1136	21100
Oil of soybeans	237	42000	Skins of rabbits	1146	21100
Oil groundnuts	244	42000	Hides wet salted nes	1214	21100
Oil of coconuts	252	42000	Hides dry slt nes	1215	21100
Oil of palm	257	42000	Hides nes	1216	21100
Oil palm kernel	258	42000			
Butter of karite nuts	264	42000	<b>Cotton</b>		
Oil of castor beans	266	42000	Cotton lint	767	26300
Oil of sunflower seed	268	42000	Cotton carded, combed	768	26300
Oil of rapeseed	271	42000	Cotton waste	769	26300
Oil of tung nuts	276	42000	Cotton linter	770	26300
Jajoba oil	278	42000			
Oil of safflower seed	281	42000	<b>Rubber</b>		
Oil of sesame seed	290	42000	Rubber nat latex	836	23200
Oil of mustard seed	293	42000	Rubber nat dry	837	23200



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