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Productivity Commission

An Integrated Tariff Analysis System: *Software and Database*

Productivity
Commission
Staff Working Paper

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Foreword

The Productivity Commission and its predecessor organisations have had a long-standing involvement in the quantitative analysis of trade and assistance regimes. In the context of market access negotiations in the Doha Development Round, various systematic approaches and formulas have been proposed to reduce tariffs. The Integrated Tariff Analysis System (ITAS) has been developed by Commission staff to assist researchers in analysing proposals to reduce tariffs in non-agricultural markets.

As a model, ITAS involves some simplification. It incorporates a framework to address data limitations that otherwise pose serious obstacles to analysing possible tariff reduction scenarios. Until those data limitations are addressed in a definitive way, an accurate representation of tariff structures is not possible, and the assumptions that are incorporated in models such as this one are required to assess different proposals. ITAS is designed, therefore, primarily for use by trade analysts and researchers, but also by negotiators who require an accessible way to assess the effects of different proposals.

A CD-ROM accompanies this paper. It contains data and the suite of programs that were used in the implementation of ITAS that is described in the paper. For a selection of countries and customs territories, the data consist mainly of disaggregated bilateral tariffs estimated at the 6-digit level of the harmonised system of classification, which can readily be used in further analysis.

Although the ITAS framework was initially developed to facilitate the analysis of tariff reduction schemes in selected non-agricultural markets, it might be used to expand the analysis to tariffs that affect agricultural trade and to include other countries or customs territories. This paper and the companion CD-ROM provide guidance on how this might be done.

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Abbreviations

ABS	Australian Bureau of Statistics
AMAD	Agricultural Market Access Database
AVE	Ad valorem equivalent
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales (Centre for International Prospective Studies)
CGE	Computable General Equilibrium
COMTRADE	Commodity Trade Database
CTS	Consolidated Tariff Schedule
GTAP	Global Trade Analysis Project
HS	Harmonised system
IDB	Integrated Database
ITAS	Integrated Tariff Analysis System
ITC	International Trade Centre
LDCs	Least-developed countries
MAcMap	Market Access Map
MFN	Most-favoured nation
NGMA	Negotiating Group on Market Access
NTBs	Non-tariff barriers
PC-IDB	Personal Computer Integrated Database
PUR	Post-Uruguay Round
SITC	Standard International Trade Classification
TRAINS	Trade Analysis Information System
UNCTAD	United Nations Conference on Trade and Development
UNSD	United Nations Statistical Division
WCO	World Customs Organisation
WITS	World Integrated Trade Solution
WTO	World Trade Organisation

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Glossary

Applied tariff rate	Estimate of the tariff rate paid by importers of a product. Estimated by dividing customs duty paid by import value. Applied tariff rates are estimated for each bilateral trade flow included in ITAS.
Average tariff rate	A simple (usually unweighted) average of the tariff rates on a group of items.
Base tariff rate	Tariff rate used as a basis for calculating a new rate.
Bound tariff rate	The maximum tariff on an import to which a member commits. This rate is legally binding under the WTO and applies on a most favoured nation (MFN) basis. WTO negotiations have been conducted on the basis of bound rates.
Compression	Reductions in tariffs where high tariffs are reduced by a greater proportion than low tariffs. Compression results in a decrease in tariff dispersion and the tariff average.
Consolidated Tariff Schedule (CTS)	Database maintained by the WTO Secretariat, which contains, among other things, members' commitments to reduce bound rates. Commitments negotiated under the Uruguay Round are expected to be largely implemented by 1 July 2005.
Developing economies	In ITAS, mostly middle income countries (as defined by the World Bank), and least-developed countries. Includes countries in Asia (excluding Japan); Central and Eastern Europe; the Middle East and Latin America and Africa. See table A.2 for those included as importing countries in ITAS.
Dispersion	The spread of tariffs in a tariff structure.
Estimated most-favoured-nation rate	In ITAS, estimated as the maximum rate applied across source countries at the 6-digit level.

Final database	In the current implementation, a collection of 38 files (one for each country and set of formulas) containing initial and final tariffs on bilateral imports under each tariff reduction scenario. The final database forms the basis for the summaries and detailed analysis of the effects of formulas.
Final tariff rate	Tariff rate derived from an initial tariff by using a formula.
Formula	A mathematical relationship between initial and final tariffs. A formula frequently contains one or more parameters, each of which must be given a numerical value in order to use the formula.
Harmonisation	Term used to describe the reduction in levels and dispersion of tariffs (see compression). Also used in submissions by WTO members to refer to the convergence of tariffs to a low level within a sector.
Harmonised system (HS)	Harmonised Commodity Description and Coding System. A coded classification of traded products, managed by the World Customs Organisation.
High tariff items	In ITAS, items with initial applied rates greater than 15 per cent.
Industrial products	All products other than those classified as agricultural products in Annex 1 of the WTO Agriculture Agreement. Mostly classified in chapters 25 and above of the harmonised system (HS) of commodity classification. Industrial products include: manufactured products; mining products; timber and timber products; and fish and fish products. Excludes food processing (except fish processing). Also referred to as non-agricultural products.
Industrialised economies	WTO members that do not self-select their development status as a developing country. Typically they are economies with high per capita incomes, including most OECD countries. See table A.2 for the industrialised economies included as importers in ITAS.

Initial database	In the current implementation, a collection of 19 files (one for each country in the analysis) containing initial bound and applied ad valorem (or equivalent) tariffs on imports from each of their trading partners. For each country, tariffs are aggregated to the 6-digit level and bindings are estimated for unbound items. The estimated tariffs in the initial database form the basis for the tariff reduction scenarios.
Initial tariff rate	The rate from which the new (final) rate is derived using a formula. Also called the base rate.
Integrated Database (IDB)	Database maintained by the WTO Secretariat detailing, among other things, tariffs applied by members and corresponding import volumes and values. The data are typically kept at a disaggregated commodity level and report bilateral flows.
Least-developed countries (LDCs)	Countries that the United Nations has identified as suffering from disadvantages that have hindered their economic development.
Members	Countries or customs territories that are members of the WTO.
Most-favoured-nation (MFN)	WTO principle that a measure applied by a member affecting trade in a good (or service) should offer, and be applied in a way that offers, the same competitive opportunities to all other members.
MFN rate	The rate of duty for a product originating from an MFN supplier. A product originating from non-MFN suppliers may be subject to a different rate of duty from the MFN rate, depending on whether suppliers are from a territory outside of the WTO (may be higher), or covered by a GSP or GSTP scheme (often lower) or a customs union or free trade area (a final rate of zero for covered products). MFN rates are imposed at the line item level, which may be more disaggregated than the 6-digit level. In these cases, a corresponding rate for the 6-digit level is estimated. See estimated most-favoured-nation rate.

Prohibitive tariff	Tariff at a level that discourages the import of a product in any quantity.
Parameter	A component of a formula. The parameters in a formula must be given numerical values to derive a final tariff from an initial tariff.
Post-Uruguay Round bound rate	Final bound rate committed to by a WTO member either under the Uruguay Round agreements or under a more recent tariff concession in relation to the product concerned, whichever is later. Most commitments are binding by 1 July 2005, but some may be implemented as late as 2015.
Preferential rate	Tariff rate below the MFN rate. Under WTO rules, such preferential treatment can exist, for example, between countries that are part of a free-trade area or as part of the Generalised System of Preferences.
SAS	Statistical Analysis System. An integrated system of software products for data management, processing and analysis.
Unbound item	Item in relation to which a WTO member has not entered into a binding commitment.

1 Introduction

Part of the Productivity Commission's mandate is to monitor trends in trade and assistance. This, along with its ongoing interest in multilateral liberalisation, has led the Commission to develop a tool to analyse patterns of tariffs and the possible effects of different approaches to reducing tariffs.

Different tariffs apply to bilateral flows of thousands of commodities that are traded between hundreds of countries. Although tariff negotiations are conducted in terms of bound rates, the economic effects of reducing tariffs are a function of changes in applied rates, which may be most-favoured-nation (MFN) or preferential rates. There are therefore many tariff rates, and analysing their structure and the possible effects of different approaches to reducing them is made difficult by the size of the datasets. Much of the data are not provided in a consistent format across countries, adding to the difficulties of analysing such data.

Aside from any limited distribution software that might be used by individual countries to support their trade negotiators, there are few publicly available means to handle the large amounts of bilateral trade and tariff data in a consistent way. The software systems that are publicly available, such as the World Integrated Trade Solution (WITS) and Market Access Map (MAcMap), are limited in their ability to produce summaries and scenario analyses. Moreover, many analyses are based on MFN rates only and do not account for the effects of preferential rates.¹

To fill this gap, the Productivity Commission has developed an Integrated Tariff Analysis System (ITAS) to provide an analytical framework with which to:

- analyse current tariff structures;
- calculate effects on tariffs and prices of formula-based changes in tariffs;
- calculate shocks in tariffs to simulate trade liberalisation scenarios (for example, with the Global Trade Analysis Project (GTAP) model);
- calculate effects of tariff reductions on indicators of market access, such as average tariffs and prices; and
- calculate the effects of tariff reductions on customs revenues.

¹ For example, the Global Trade Analysis Project (GTAP) database version 5 contains only MFN rates.

ITAS incorporates a systematic system for dealing with the data limitations that limit researchers' ability to analyse possible tariff reduction scenarios in a multi-country, multi-product setting. Until the data limitations are addressed, a fully accurate representation of tariffs will not be possible, and researcher will have to rely on assumptions such as those incorporated in ITAS and similar systems.

The current implementation of ITAS covers:

- 19 importing countries (table A.1). Together these countries' imports represent 56 per cent of world trade; and
- industrial products, which represent 93 per cent of commodity trade for these countries.

The ITAS framework consists of a suite of SAS programs that convert raw tariff data into a consistent form for analysis. The system also includes a facility to calculate the effects of various tariff reduction scenarios by using formulas to derive new tariffs from existing tariffs. Thus, subject to data availability, ITAS can be used to analyse the current structure of bound and applied tariffs and the possible effects of different tariff reduction schemes on these structures.²

The ITAS framework

ITAS relies on the World Trade Organisation's (WTO's) Integrated Database (IDB) and Consolidated Tariff Schedule (CTS).³ To the extent that these primary data sources are up to date, ITAS can be used to analyse current tariff structures. It is worth noting, however, that in many countries, tariffs do not change very quickly and, therefore, a tariff database a few years old can be a reasonable representation of current tariffs.⁴

The ITAS converts raw tariff data into three main forms (figure 1.1):

- standardised data, consisting of tariffs for each bilateral trade flow of each commodity in a consistent form (initial database);
- derived data, consisting of new tariff rates calculated from a variety of tariff reduction formulas (final database); and

² ITAS is not designed to forecast actual outcomes of tariff negotiations. This is because the level of applied rates is at the government's discretion, subject to the final bound rate.

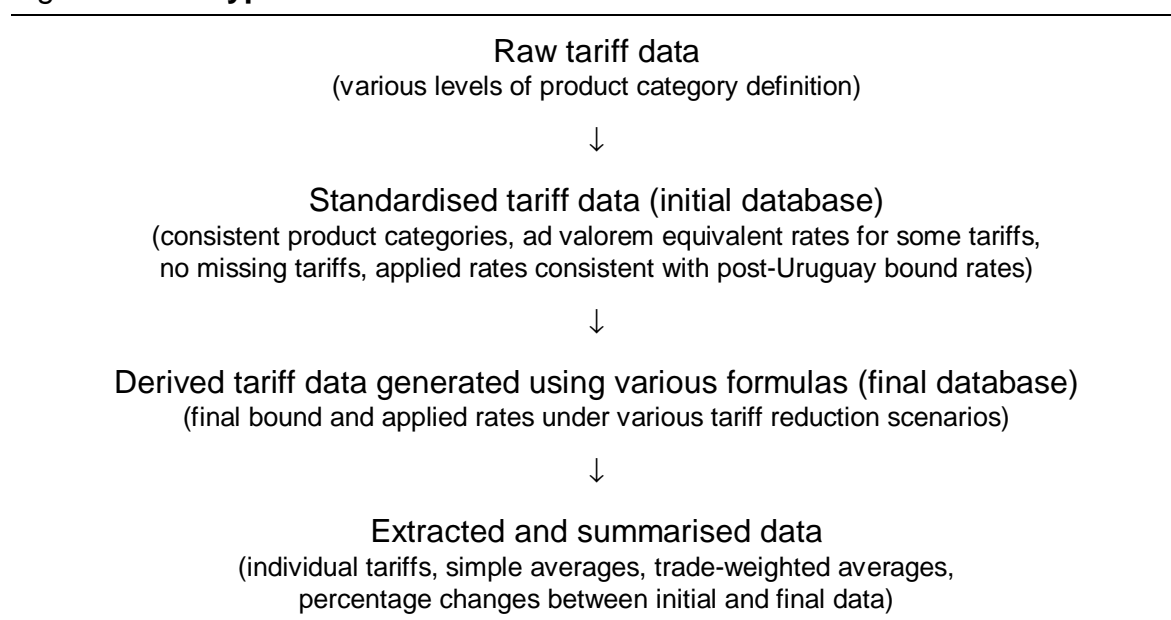
³ WTO copyright of the original data is gratefully acknowledged.

⁴ Post-Uruguay bound rates are available in ITAS but trade and applied tariff data are available in most cases for 1999 or earlier.

-
- extracted/summarised data, consisting of various datasets that contain sections of the standardised and derived data (for example, for particular countries or commodity sectors) or aggregations of the data for subsequent analysis.

The datasets produced by the ITAS satisfy most data requirements for standard tariff analysis using MS Excel, with no need for additional SAS programming. However, SAS is still required to run ITAS.⁵ Researchers experienced in the use of SAS might wish to produce other summaries and analyses. The structure of the program suite, described in appendix D, should enable these researchers to identify where they might wish to intervene. The entire system can be run from a batch file called COMBB.BAT.

Figure 1.1 Types of tariff data available from ITAS^a



^a The processes that convert the raw data into standardised data, derived datasets and extracted or summarised datasets are accomplished using SAS programs. The structure of the programming system is set out in appendix D.

Source: Productivity Commission.

The ITAS' detailed and disaggregated database preserves the maximum information for users who need to find out the tariff rates on a commodity exported from one country to another. In addition to the detailed data, ITAS generates standard supplementary datasets that extract and summarise the data in several ways. Examples include: tariffs on a country's exports to specific destinations, for each commodity; average tariffs faced by a country's exports; and tariffs averaged across

⁵ The basic program structure in appendix D could be implemented with another programming language. However, the size of the database may limit the choice of platform.

a country's entire tariff schedule or across a group of commodities.⁶ ITAS was developed for analysis of tariffs on non-agricultural products, but can be extended to allow analysis of tariffs on agricultural products and trade flows.

Other tariff analysis software

As a result of the differing needs of users, several software applications for tariff analysis have been developed. Other systems for analysing tariffs include the World Bank's World Integrated Trade Solution (WITS); the International Trade Centre (ITC) and Centre d'Etudes Prospectives et d'Informations Internationales' (CEPII) MAcMap; and the WTO's Personal Computer Integrated Database (PC-IDB).

Each of these systems complements the others by including core information (bilateral tariff data at HS6 level) and providing capabilities that are not available elsewhere.⁷ No single system combines all the information and analytical capabilities offered by these systems.

WITS

WITS is a windows-based software system for trade and tariff analysis. It currently allows users to combine trade and tariff data from the Commodity Trade Database (COMTRADE) compiled by the United Nations Statistical Division (UNSD); the Trade Analysis Information System (TRAINS) compiled by the United Nations Conference on Trade and Development (UNCTAD); and the IDB and CTS compiled by the WTO.⁸

WITS has been designed as a user-friendly way to access trade and tariff data and to examine the effects of various tariff reduction scenarios. WITS contains detailed, comprehensive tariff and trade data for over 80 countries. For many of these countries, annual data are available for 1995–2001 inclusive. Users can extract and

⁶ Export destinations for a given country are limited to the remaining importing countries currently included in ITAS.

⁷ For ease of exposition, we refer to the disaggregated level (which typically refers to tariff line items) as HSx. Many countries use an HS8 classification while others use an HS10 classification. Very few use an HS12 or more detailed classification. The lower levels of aggregation are based on classification systems that are peculiar to each country or customs territory concerned. Only the HS6 classification is consistent across countries.

⁸ And other protection databases, like the Agricultural Market Access Database (AMAD) for agriculture. Access to these databases is restricted and WITS users must register to use them. However, any WITS user can analyse aggregated WTO data at the 6-digit level. See WITS website for conditions of use.

summarise the data by submitting data queries over the Internet and simulate the effect on bound and applied rates of various proposals made during the Doha round. Product and country groupings can be customised to suit the user's purposes via a range of product and country classifications and concordances. Both weighted and unweighted aggregates are available.

WITS provides comprehensive tariff information for many countries in a user-friendly manner. However, several limitations currently restrict its usefulness for analysing tariff reduction scenarios.

The tariff simulation facility in WITS allows users to analyse the effects on tariffs of formulas specified in the main Doha proposals (US, EU, Korea, China, India, Girard), but users are not currently able to add new formulas or change how the formulas are implemented (for example, changing parameter values or the treatment of missing values).

Final bound and applied rates are available bilaterally for each tariff item but the system does not calculate percentage changes in tariffs and in duty-paid prices.⁹

Comparing the effects of different formulas requires running the simulator for each formula separately. The results must then be exported and combined using another application.

Although WITS provides initial and final tariff data at the line item level and corresponding average tariffs for groups of items, other applications such as Excel are still required to chart results, or to perform additional statistical analysis, including the production of changes in average rates and other summaries.

MAcMap

MAcMap (Bouët et al. 2004) is a joint product of CEPII and ITC (UNCTAD-WTO). It combines detailed trade and protection data for 137 importing countries (and 223 exporting partners). Data sources are: TRAINS (UNCTAD) source files; national sources; AMAD; and notifications from WTO Member Countries regarding their anti-dumping regimes. Protection data include applied tariffs, prohibitions, tariff quotas and anti-dumping duties at a detailed level. For each line item, importing country and partner, protection data are combined into an import-weighted ad valorem equivalent tariff for which trade weights are based on a reference group of countries.

⁹ As indicated by changes in the power of the tariff $(1+t)$.

MAcMap is designed to provide a detailed picture of the current state of protection. It is not designed to calculate the effects of formulas on the current state of protection because it does not include bound rates and does not include a facility to implement tariff reduction schemes.

PC-IDB

PC-IDB (WTO 2002d) combines detailed tariff and trade data for an individual reporting country from the CTS and IDB. Users can examine the latest available bound and applied tariff structures across all imported products for each WTO Member country.

PC-IDB is designed to allow users to query current and historical bound and applied tariffs at the line item level. The detailed nature of the data mean that the use of PC-IDB is restricted to WTO authorised users. Currently there is no facility for using tariff reduction formulas.

ITAS complements other systems of analysis

ITAS is designed to analyse disaggregated tariffs at various levels of sectoral aggregation and whole schedules. It complements other systems for analysing trade barriers.

ITAS includes data on both applied and bound tariffs, allowing users to gauge the relative economic significance of changes in tariffs.

A number of tariff reduction formulas are included in ITAS, allowing users to analyse effects on bound and applied rates under various scenarios. The ability to change the SAS programs means that ITAS is flexible and can be adapted to examining formula-based tariff reductions and other modality issues. For example, users can change the tariff reduction formulas, change the treatment of unbound items, add countries, include non-ad valorem tariffs or include agricultural border measures in their analysis.

As a tariff analysis system, ITAS is transparent. Users can examine the programming structure and code and see exactly how the raw data are processed, how formulas are implemented and how the effects of tariff reduction formulas are summarised.

Even with the limited number of countries in the current implementation, ITAS produces detailed tariff analysis at the bilateral level.

The current implementation of ITAS caters for three types of user: those wanting ready-to-use data and results; those wanting to examine the effects of a different set of tariff reduction formulas; and those wanting to change the more fundamental aspects of the system.

Most users will be interested in either using existing results or in changing the formulas and re-running ITAS. For these users we have included: the initial database at the HS6 level; the programs required for implementing formulas and generating a full set of output; and a set of ready-to-use output files for each analysis module.

Some users may wish to modify the more fundamental aspects of the system, for example, adding importing countries, updating the data or changing how post-Uruguay applied rates are estimated. For these users, there is a supplementary CD-ROM containing the raw data required to run ITAS from the beginning. To comply with WTO restrictions on the data, this supplementary CD-ROM is only available to authorised users of WTO data.

Structure of the paper

This paper forms part of the documentation of the ITAS framework. A CD-ROM contains the SAS programs, an initial database on which the programs are based and the output files. Information is also available on the Productivity Commission web site at www.pc.gov.au.

The remainder of this paper provides an overview of ITAS and how it converts raw data into the data required for analysis and presentation. Chapter 2 describes the raw data on tariffs and explains how these data are converted into a form suitable for multi-country analysis of tariffs. Chapter 3 contains an explanation of how formulas are used to calculate final tariff rates from initial rates. Chapter 4 describes the resulting tariff data created by ITAS and the available data summaries. Chapter 5 outlines some ways in which ITAS could be extended.

Appendix A outlines the primary data sources, describes the data and explains some of the data issues that had to be addressed in order for ITAS to produce a consistent analysis. Appendix B provides a detailed explanation of the formulas currently included in ITAS. Appendix C contains estimates of the differences between results based on calculations at the HS6 level and at the line item level. Appendix D shows the structure of ITAS, provides instructions for running the system and contains a list of ITAS input and output files. Appendix E provides answers to some frequently asked questions.

2 Preparing tariff and trade data for analysis

This chapter describes the raw tariff data available from the WTO and the procedures used in ITAS to convert the data into a consistent form that is suitable for multi-country analysis of tariffs.

Each member country is required to provide the WTO with tariff and trade data for its imports of thousands of types of commodity from about 200 trading partners.¹

In ITAS, these tariff data are used to examine the level and structure of existing tariffs, and to calculate new tariffs that are likely to result from particular approaches to reducing them. Further, tariffs affecting exports can be compared.

Variations between countries in data format impede inter-country comparisons and detailed analysis. A variety of other data issues (such as dealing with missing values) must also be addressed prior to any analysis.

Applied and bound tariffs

Data are available for applied and bound tariffs. An applied tariff is the actual duty on a commodity paid by an importer. An importing country can impose different tariff rates on a commodity, according to the source country: in addition to the MFN rate, there are various preferential rates that might stem from bilateral or unilateral preferential agreements or concession arrangements.

For some products, tariffs are set at a level that is high enough to discourage users in a particular country from importing that product from another country. Since the available data only cover traded products for each country, these *prohibitive tariffs* are not captured in the data and thus represent a limitation of ITAS.

A bound tariff is a commitment to a ceiling on the applied tariff for that item during a specified period. That is, the bound tariff is the maximum tariff that may be

¹ Some WTO members do not provide bilateral trade data. Non-members do not provide trade or tariff data to the WTO, nor are they required to.

imposed on imports of a particular commodity over the period of time for which the commitment has been made. In some countries, the applied tariff for a particular commodity can be significantly lower than the corresponding bound tariff.

Tariffs become bound when binding commitments are introduced. Commitments might arise, for example, as part of a round of multilateral trade negotiations between WTO members, or as part of the accession process by which countries become members of the WTO.

Many items have bound tariffs. However, there are still some items for which no binding commitment has been made. Tariffs on these items are referred to as *unbound tariffs*.

Tariff negotiations are conducted on the basis of bound tariffs. This allows some flexibility in applied rates imposed by countries while providing some certainty in trading arrangements. Negotiations include unbound items by imposing a binding that typically coincides with the current MFN applied tariff, allowing tariff reductions to be calculated for all products. ITAS adopts a similar treatment by estimating a bound rate for unbound items as the maximum applied rate for the product across all trading partners.²

Although approaches to tariff reduction focus on bound tariffs, the economic effects of tariff reductions depend on changes in prices that result from changes in applied tariff rates. That is, consumers and firms respond to the changes in duty-paid prices that occur as a result of changes in applied tariffs. For this reason, examining an approach to tariff reduction requires an analysis of effects on bound and applied rates and on prices. Further, trade flow data are required to gauge the relative economic significance of changes in tariff rates on individual items.

Raw data

Detailed, comprehensive tariff data are required to conduct tariff analysis at a disaggregated level, for example when comparing the effects of a tariff reduction formula on the structure of tariffs for different countries. The WTO's Integrated Database (IDB) and Consolidated Tariff Schedule (CTS) provide such data for most member countries.³ Although the data are provided in a similar format for each country, some processing is required before the data are used for multi-country tariff comparisons.

² In general. However, the implications of the Girard proposal to use twice the MFN rate were also modelled. Any other rule can be implemented in the SAS program.

³ WTO (1999, 2001).

The IDB contains detailed data on bilateral trade flows for a particular year. These data are provided from the importing side of the trade flow. That is, each member country submits data to the WTO on its imports of each type of commodity from each trading partner.⁴ Each commodity–partner combination is referred to as an item and has an import value and various tariffs associated with it. These data are then consolidated and included in the IDB, which consists of one set of files for each importing country.

The CTS contains bound tariffs (where they exist) for each type of commodity imported by each WTO member country (source country). These bound rates include those applicable before the Uruguay Round agreements came into effect (referred to as pre-Uruguay bound rates) and those that have been agreed to be put in place (mostly before 2005) as part of the Uruguay Round agreements (referred to as post-Uruguay bound rates).

Commodity definitions

All member countries classify commodities based on the 6-digit Harmonised System (HS6) (World Customs Organisation (WCO) 1996). However, most countries provide data at a more disaggregated level, which reflects the details of their individual tariff schedules. For example, Australian data follow an 8-digit classification that adds more detail to the HS6 classification. Korean data are classified at an even more detailed (10-digit) level. Nevertheless, classifications beyond the 6-digit level are not necessarily comparable across countries.

These variations between countries in the level of commodity detail mean that the raw data must be aggregated to the HS6 classification for multi-country comparisons.⁵ At the conclusion of negotiations, a formula will be agreed upon and used at the line item level to determine a final bound rate for each item. However, in ITAS tariff rates are aggregated to the HS6 level for ease of processing.^{6,7} This aggregation is achieved by taking the simple average of tariffs on items within each

⁴ In most cases. However, Bangladesh does not provide any export partner disaggregation.

⁵ In general, the order of processing is as follows: deal with missing data; estimate ad valorem equivalents (Australia only); estimate post-Uruguay applied rates; and then aggregate to HS6 level. However, Australia, Bangladesh, Japan and Thailand provide the WTO with applied tariff data at a more detailed level than their bound tariff data. For these four countries, applied tariffs are aggregated to match their HS6 bound tariff classification prior to performing other processing tasks.

⁶ ITAS estimates of tariff levels and binding overhang are based on aggregated data. Re-calculating these estimates at the line item level may result in different answers.

⁷ Other tariff analysis systems, such as WITS, impose formulas at the line item level.

HS6 commodity group.⁸ Results from analysis using either HS6 aggregated data or disaggregated line item data may differ (box 2.1).

Tariffs are not always expressed in ad valorem terms (that is, as a percentage of import value). Non-ad valorem tariffs typically include at least one component that relates the amount of duty to some physical aspect of the imported product, such as the number of units, volume or weight.⁹ Such non-ad valorem tariffs must be standardised to allow these tariffs to be aggregated.

Box 2.1 The cost of aggregation — average tariff levels and dispersion

In ITAS, tariff analysis is conducted at the HS6 level rather than at the more disaggregated line item level. Conducting the analysis at different aggregation levels may result in different pictures of what a tariff schedule looks like. Detailed analysis of the cost of aggregation, that is, how the aggregation affects estimates of bound and applied rates, is contained in appendix C.

Analysis at the HS6 level may introduce a bias into measures of levels and dispersion in a tariff schedule. This bias increases with the extent of disaggregation and the amount of dispersion within an HS6 category. This bias is systematic and is separate from any bias introduced by other data problems (such as old data, missing values and non-ad valorem tariffs). Appendix C describes how this systematic bias can be corrected for without knowing the line item tariff levels.

For most countries, there is little or no difference between average tariffs calculated at the HS6 level or at the line item level. For the few countries for which the averages differ by more than 5 per cent, the average tariff calculated from HSx-level data tends to be higher than the corresponding average calculated from HS6-level data. In many cases the difference occurs mainly because some HS6 categories include line items that are not subject to tariffs.

For most countries in ITAS, less than 10 per cent of estimated HS6 tariffs are affected by this bias. In the case of South African bound tariffs, this proportion is 35 per cent. In HS6 categories that include dispersed HSx tariff levels, most of the HSx tariffs are within 20 per cent of the HS6 estimates.

Source: Productivity Commission.

⁸ In building rates for input into economic models, the initial HS6 rates are calculated as import-weighted averages of line item rates. Corresponding final applied rates are then calculated in the usual manner.

⁹ The various forms of non-ad valorem tariffs are further explained in chapter 5.

Converting raw data into standardised data

ITAS combines import and tariff data from the IDB and the CTS in a single consistent database of bilateral tariffs and trade flows that can be used to analyse both bound and applied rates. Standardisation ensures formulas are used in the same way for all countries. Since ITAS is designed to show how formulas work using realistic tariff data, the loss of some information as a result of standardisation does not detract from the usefulness of ITAS as a tool for examining formulas.

Table 2.1 Raw data and standardised data for conducting multi-country tariff analysis

<i>Raw data</i>	<i>Standardised data</i>
Post-Uruguay bound tariffs by importing country and commodity (ad valorem and non-ad valorem) ^a	Post-Uruguay bound rates by importing country, exporting partner and HS6 commodity (ad valorem rates only)
Applied tariffs (including preferential tariffs) (typically 1999) by importing country, exporting partner and commodity (ad valorem and non-ad valorem) ^a	Post-Uruguay (estimate) of applied rates (MFN or preferential) by importing country, exporting partner and HS6 commodity (ad valorem rates only)
Value of imports (typically 1999) by importing country, exporting partner and commodity ^a	Post-Uruguay (estimate) of value of imports for each HS6 commodity by importing country and exporting partner

^a Member countries are required to provide tariff data for imported items according to the HS6 classification system. However, most countries provide such data at a more disaggregated level using 8, 9 or 10-digit codes to identify commodities. As a result, levels of detail for raw data vary between countries.

Source: Productivity Commission.

Table 2.1 compares the raw tariff data with the standardised data that are required to conduct detailed multi-country analysis of post-Uruguay tariffs.¹⁰ Table 2.2 identifies primary data issues and the solutions adopted in ITAS.

¹⁰ Post-Uruguay applied tariffs are estimated using available data (typically for 1999). Post-Uruguay import values are proxied using available data (typically 1999).

Table 2.2 Primary data issues, solutions and comments

<i>Primary data issue</i>	<i>Solution adopted</i>	<i>Comments</i>
Item subject to specific or mixed tariff	Ad valorem equivalent (AVE) rate used if available, otherwise deleted	Analysis limited to items subject to ad valorem tariffs or for which AVE tariff data are available
Bound ad valorem tariff but specific or mixed applied tariff	Applied rate estimated as the bound rate	Applied rate likely to be converted to ad valorem rate after Uruguay round
Missing bound tariff ^a	Use maximum applied rate for the imported commodity across affected country's trading partners	
Missing applied tariff ^a	Use bound rate for commodity if available. Otherwise delete commodity for affected trading partners	
Trade and tariff data available for different levels of commodity disaggregation (vary from HS6 to HS10)	Aggregate to HS6	Maximum level of disaggregation available for analysis is HS6
No import value data	Item deleted	Limits analysis of prohibitive tariffs
Trade and tariff data not available for the same year	Use IDB for a different year	Trade values may not be consistent with tariff data (China, Indonesia and Malaysia affected)
No bilateral data available	Data not processed on a partner basis	Occurs for Bangladesh. Bilateral import analysis not possible.

^a All other indications are that there is a tariff but the tariff is missing.

Source: Productivity Commission.

Missing ad valorem tariff data

Where possible, missing bound tariffs for an item are replaced with the maximum applied rate across all trading partners for that item. If applied rates are not available, the item is excluded from the initial database and subsequent tariff analysis. Items with missing applied tariffs are likewise excluded.

Conversion to ad valorem tariff rates

Most tariffs are expressed in ad valorem terms (that is, import duty as a percentage of import value). However, tariffs on some items are recorded in non-ad valorem terms, such as dollars per unit (tables 2.3 and 2.4 show the incidence of non-ad valorem bound and applied (MFN) tariffs).¹¹ For some of these items, ad valorem equivalent (AVE) tariffs are also available in the IDB. When AVE tariff rates are available, ITAS includes these items.

Table 2.3 Ad valorem, non-ad valorem and AVE bound tariffs, by country
Industrial products^a

<i>Country</i>	<i>Number of items (original aggregation, HSx)^b</i>	<i>Number of items subject to ad valorem tariffs</i>	<i>Number of items subject to non-ad valorem tariffs</i>	
Australia	(HS6)	4289	4284	5
Bangladesh	(HS6)	141	141	0
Brazil	(HS8)	8404	8404	0
Canada ^c	(HS8)	6880	6834	21
China	(HS8)	6099	6099	0
EU	(HS8)	8307	8263	44
India	(HS6)	3104	2835	269
Indonesia	(HS9)	5913	5913	0
Japan	(HS6)	4425	4421	4
Korea	(HS10)	8607	8586	21
Malaysia	(HS9)	6025	6017	8
Mexico	(HS8)	10224	10223	1
New Zealand ^c	(HS8)	6286	6047	236
Philippines	(HS8)	2858	2858	0
Singapore	(HS9)	3288	3288	0
South Africa	(HS8)	11570	11570	0
Taiwan	(HS8)	7260	7174	86
Thailand	(HS6)	3243	2509	734
US	(HS8)	8447	8090	357

^a Industrial products are listed in table A.3. ^b Number of items subject to binding commitments. ^c Numbers for Canada and New Zealand do not add up due to missing tariffs for some items in the CTS.

Source: Productivity Commission based on WTO (2001).

Non-ad valorem tariffs must be converted to equivalent ad valorem rates prior to analysis. Although in many cases the required information is available to convert specific tariffs to AVE tariffs, this process is expensive. Currently, ITAS does not include items for which no ad valorem (or AVE) tariffs are available or easily proxied — both the tariff and trade value are excluded from analysis. Excluding

¹¹ For some countries (for example, Switzerland), most tariffs are specific tariffs.

these items will affect summaries based on the initial and final tariffs and will affect the trade-weighted averages that are calculated for input into economic modelling. Further analysis would be required to assess how the results would vary if these data were not excluded from the analysis modules.

Table 2.4 Ad valorem, non-ad valorem and AVE MFN tariffs, by country
Industrial products^{a,b}

<i>Country</i>		<i>Number of imported items (original aggregation, HSx)</i>	<i>Number of items subject to ad valorem tariffs</i>	<i>Number of items subject to non-ad valorem tariffs</i>	<i>Number of items for which AVE tariffs are available</i>
Australia	(HS8)	5203	5195	8	0 ^c
Bangladesh	(HS8)	5319	5311	8	0
Brazil	(HS8)	8470	8470	0	0
Canada	(HS8)	6820	6802	18	0
China	(HS8)	6280	6280	0	0
EU	(HS8)	8307	8263	44	40
India	(HS6)	4444	4436	8	0
Indonesia	(HS9)	6285	6285	0	0
Japan	(HS9)	7292	6993	299	0
Korea	(HS10)	9611	9590	21	0
Malaysia	(HS9)	9237	8870	367	0
Mexico	(HS8)	10260	10243	3	0
New Zealand	(HS8)	6262	6033	229	0
Philippines	(HS8)	4835	4835	0	0
Singapore	(HS9)	5007	5007	0	0
South Africa	(HS8)	6980	5161	1819	0
Taiwan	(HS8)	7194	7080	114	0
Thailand	(HS10)	5844	4895	949	0
US	(HS8)	8444	7901	543	538

^a Industrial products are listed in table A.3. ^b The number of imported items typically differs from the number of items subject to binding commitments reported in table 2.3. There are three main reasons for these differences: bound and applied rates are reported at different levels of aggregation, some imported items have unbound tariffs, or some items subject to binding commitments are not imported during the year for which applied tariff data are available. ^c IDB data for Australia in 1999 does not contain ad valorem equivalent tariffs. However, ad valorem equivalent applied tariffs are calculated in ITAS using ABS data.

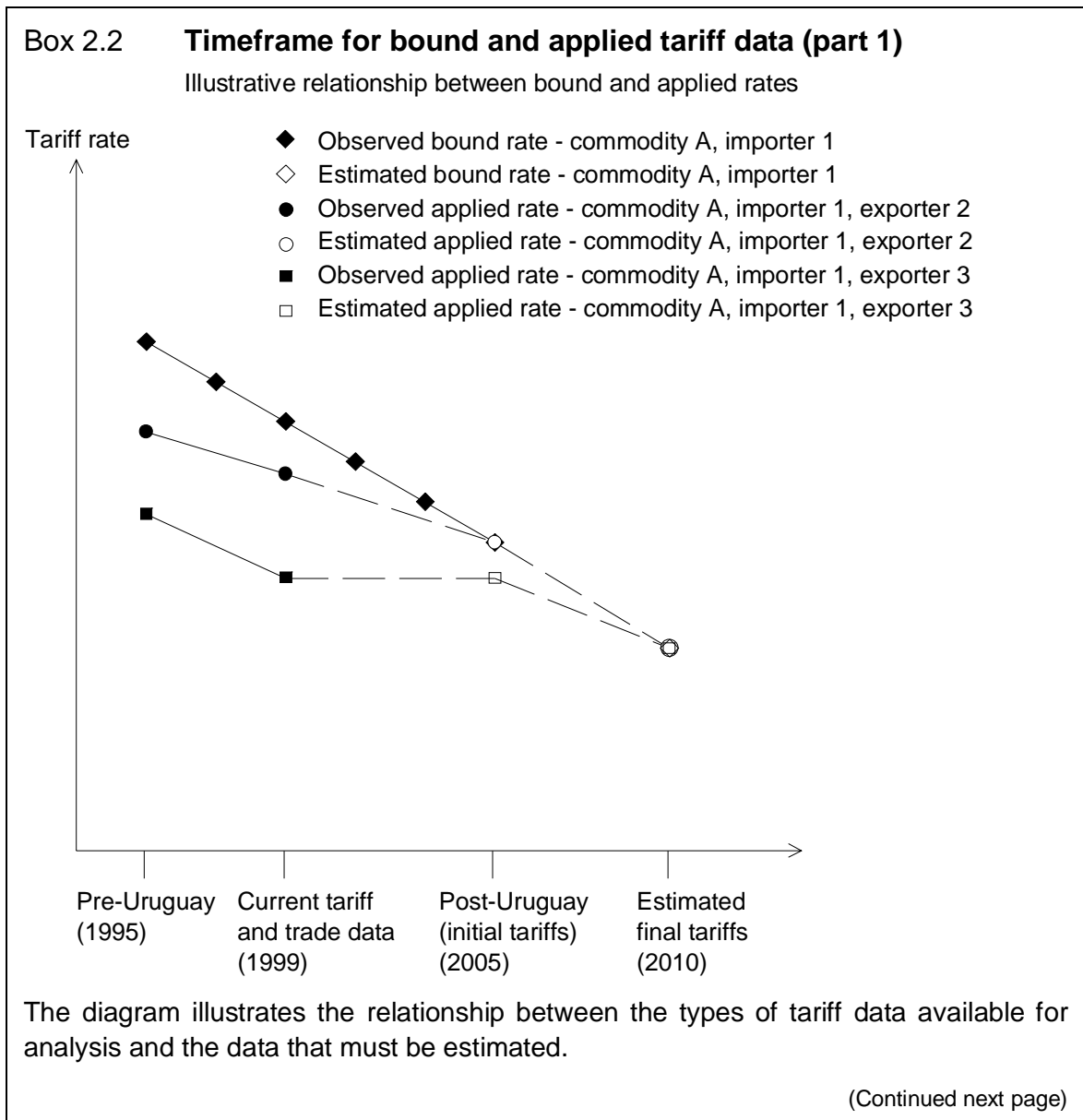
Source: Productivity Commission based on WTO (1999) (provisional data for China).

Estimating post-Uruguay Round rates

ITAS is designed to analyse the effects of formulas in reducing post-Uruguay Round rates. As part of Uruguay Round trade agreements, each bound rate is reduced to an agreed level over time according to a staging process, which will typically be completed by 2005. That is, rather than reduce bound rates to a new level in one step, they are reduced in several steps over the implementation period

until the final post-Uruguay Round level is reached (box 2.2). These post-Uruguay bound rates come from the CTS and are used in ITAS because further negotiations are based on these rates.

An applied rate cannot exceed the corresponding bound rate that is in force at the time of measurement of the applied rate. However, it is possible for a current applied rate (typically measured in 1999 in ITAS) to exceed the post-Uruguay bound rate, which will apply in 2005.



Box 2.2 (continued)

Bound rates

Bound rates decline to known post-Uruguay levels according to a staging process that was agreed in the Uruguay Round. As a result, we know at what levels bound rates will be in 2005. Direct application of formulas to these post-Uruguay bound rates provides estimates of what the final level of bound rates are likely to be when agreements are reached and implemented as part of the Doha round. These final bound rates are only estimates, as the calculations are not conducted at the line item level.

Applied rates

Unlike with bound rates, there is no agreed target or staging process for applied rates. Thus future applied rates are estimated based on estimated bound rates. The only constraint on applied rates at any point in time is that they be lower than the bound rate in force at that time — in fact, applied rates may be set anywhere below this level.

In ITAS, post-Uruguay applied rates are estimated conservatively — they are only reduced from current levels by the minimum required to ensure that they are below post-Uruguay bound rates. That is, if a current applied rate is lower than the post-Uruguay bound rate then it is assumed that there will be no change in the applied rate. If the current applied rate is higher than the post-Uruguay bound rate then the applied rate is reduced to the level of the post-Uruguay bound rate. In this case the post-Uruguay applied and bound rates are assumed to be equal.

The same process is then used to estimate final applied rates corresponding to final bound rates — formulas are not used directly on applied rates to derive final applied rates. Again, these final applied rates are only estimates and are based on calculations at the HS6 level.

Source: Productivity Commission.

Data on post-Uruguay applied rates are not available, and are estimated on the basis of current applied rates and commitments (bound rates) recorded in the CTS.¹² If the current applied rate is greater than the post-Uruguay bound rate, the estimate of the post-Uruguay applied rate is the post-Uruguay bound rate (box 2.3). Calculating post-Uruguay applied rates in this manner implies that they represent an upper estimate of what these rates are likely to be in 2005 (post-Uruguay).

¹² In the current implementation, CTS and IDB data were downloaded from the WTO in July 2004 for Brazil and Mexico, and in August 2002 for the other countries.

Box 2.3 Timeframe for bound and applied tariff data (part 2)

Bound rates

These tariff rates are agreed at WTO negotiations. Negotiated reductions in bound rates are implemented according to a 'staging process'. Some tariffs are not bound.

Post-Uruguay bound rates are the maximum tariff levels committed to under the Uruguay Round agreements. They will be in force when Uruguay Round agreements have been fully implemented (that is, at the end of the staging process). Most commitments are binding by 1 July 2005 (for example, the Agreement on Textiles and Clothing).

The WTO Consolidated Tariff Schedule (CTS) lists commitments. If a rate is not bound, it is usually estimated in ITAS as the maximum corresponding applied rate across all trading partners (usually the MFN rate).

Applied rates

Conceptually, applied tariff rates represent the customs duty actually paid on imports.

The applied tariff rate is calculated as the ratio of duty paid to the value of the item traded. This method of calculation accounts for preferential rates and concessions. For many economies, 1999 data are used in ITAS.

By definition, applied rates are equal to, or below, the corresponding bound rates. However, given the difference in timing between applied rates based on 1999 information (or prior) and post-Uruguay bound rates, the relationship may not always hold in the raw data.

The maximum applied rate is assumed to be the MFN rate. This is correct if at least one bilateral trade flow is subject to the MFN tariff. Other (lower) rates are possible on other bilateral flows, reflecting preferential agreements or tariff concessions (for example on imports of inputs into production). The resulting rate is a simple average of the rates applied to the corresponding bilateral trade flow.

Source: Productivity Commission.

Master database

As a result of the treatment described in this chapter, ITAS produces a consistent set of trade flows and bound and applied rates, at the HS6 level, bilaterally for 19 members of the WTO.^{13,14} This *initial database* provides a consistent basis to

¹³ Bilateral data in the current implementation of ITAS refers to 19 importers and more than 200 exporters but the system can be adapted to include any number of importing countries for which data are available in the CTS and IDB.

apply various approaches to reducing tariffs. Although the ITAS is currently set up to analyse tariffs on industrial products, it is also possible to use the same framework to analyse tariffs on agricultural products (but not domestic assistance or export subsidy commitments).

¹⁴ The master (initial) database includes over 80,000 initial bound rates (importing country x HS6 product) and over 1.2 million initial applied rates (importing country x HS6 product x exporting partner). It consists of 19 files and occupies 566 Mb of disk space.

3 Tariff reduction scenarios

This chapter outlines the formulas included in ITAS and explains how the system measures the effects of each tariff reduction scenario.

Many formulas on which to base tariff reduction scenarios were proposed in late 2002 and early 2003.¹ The ITAS provides a tool for evaluating the effects of formulas on HS6 tariffs and tariff summaries and duty-paid prices (assuming no change in quantities).

ITAS is a model that contains some simplifying assumptions that are necessary to produce a sensible database from disparate data and to manage the analysis. For example, the initial rates are estimates of post-Uruguay Round rates and are consistent with the detailed commitments made by members, as recorded in the CTS. In addition, ITAS does not assume any demand responses. Finally, calculations are not implemented at the line item level but at the HS6 level. Box 3.1 explains how applying formulas to aggregated data might affect results.

The ITAS is set up to run 10 scenarios, each based on a particular formula approach to tariff reduction.² Under each scenario, final bound and applied tariffs are calculated for each commodity, importing country and exporting partner.³

¹ Formulas used in the current implantation of ITAS are further explained in appendix B. Many other formulas were considered.

² Although other tariff analysis systems such as WITS are also set up to examine the effects of several tariff reduction formulas, these systems currently only show the results of one scenario at a time. ITAS output files include the results for all scenarios to allow direct comparison.

³ The final tariff rate is the new tariff rate calculated from applying the formula to the initial tariff rate (for bound rates) or from applying the decision rule to the initial rate (for applied rates). The final bound rate represents the (estimated) end point in the scenario, as distinguished from any intermediate rates that apply during the staging process.

Box 3.1 **The cost of aggregation — effects on final rates**

In ITAS, tariff reductions are simulated using aggregated data at the HS6 level. However, in practice, tariff reductions are made at the line item level. Conducting the analysis at a different aggregation level may result in ITAS estimates being different from those produced when using more disaggregated rates. A detailed analysis of the cost of aggregation is contained in appendix C.

Applying formulas at the HS6 level (rather than applying formulas at the line item level and then aggregating to HS6) may result in some differences in estimates for some items and some countries. For the countries included in the current implementation of ITAS, average final tariffs estimated at the line item level and at the HS6 level differ by less than 5.2 per cent for bound rates and less than 3.2 per cent for applied rates.

For New Zealand, when applying a Swiss8 formula, the final average bound rate estimated at the HS6 level is 3.0 per cent. The final bound rate calculated at the HSx level and then aggregated to HS6 is 2.9 per cent.

The average final applied rates estimated using the two approaches for Canada are 1.6 per cent when estimated with HS6 data and 1.5 per cent with the line item (HS8) data.

Source: Productivity Commission.

Tariff reduction scenarios in ITAS

Each tariff reduction scenario uses a rule (formula) to derive a final tariff rate from an initial rate. The effects of a specific approach to tariff reduction are then summarised by examining or by aggregating the effects on individual tariffs.

In most of the ITAS, tariff averages are not weighted by trade flows. This provides a better indication of barriers to market access than averages weighted by trade flows (box 3.2). However, these averages are not consistent with duty collection and cannot be used to estimate the effects of reducing tariffs on government revenues.

Box 3.2 **Weighted and unweighted averages**

Simple average tariff rates are used as indicators of tariff barriers, or the extent of market access. The average rate is calculated as the simple (unweighted) average of the rates for traded commodities (including those with zero tariffs). The use of simple averages means that high tariffs are given the same weight as low tariffs.

Trade-weighted average tariff rates, where individual tariffs are weighted by their corresponding import values, may be less appropriate than the simple average rates to measure market access. High tariffs, which inhibit market access and reduce the volume of trade in the products that they are applied to, are typically under-represented in a trade-weighted measure. At the extreme, commodities with prohibitive tariffs (and therefore not traded) are excluded from the calculation.

Prohibitive tariffs are not included in the current implementation of ITAS and estimates of the average tariff may under-estimate the overall measure of the barrier to market access.

On the other hand, trade-weighted averages account for the relative importance of trade flows. They are also consistent with tariff revenue collections. For these reasons, trade-weighted tariffs are used for the economic modelling input outlined in appendix D.

Source: Productivity Commission.

Table 3.1 lists the tariff reduction scenarios included in the current implementation of ITAS. The choice of formulas illustrates the ability of ITAS to handle a variety of options, including:

- different formulas;
- different parameter values;
- different treatments for specific products and sectors;
- the implementation of tariff ceilings and floors;
- different treatments for tariffs on unbound items; and
- different parameter values for selected countries.

It is relatively easy to modify the existing scenarios to suit the user's specifications. For the Swiss and Chinese formulas, several scenarios are included and tariff reductions using a variety of parameter values for each formula can be compared. Appendix E details how alternative formulas may be included in ITAS.

Table 3.1 ITAS tariff reduction scenarios
Specific to the current implementation of ITAS

<i>Scenario</i>	<i>Explanation</i>
<i>First 5 scenarios</i>	
1. Girard1b	Girard formula with a parameter of 1; and selected sectoral elimination
2. Girard1c	Girard formula with a parameter of 1; Girard treatment of unbound items ^a
3. Girard1d	Girard formula with a parameter of 1; ceiling and floor imposed ^b
4. Girard1a	Girard formula with a parameter of 1
5. Girard2a	Girard formula with a parameter of 2
<i>Second 5 scenarios</i>	
6. Chinese3	Maximum tariff equal to 3 times the average base tariff
7. Chinese1	Maximum tariff equal to the average base tariff
8. Combined Chinese	Chinese1 for industrialised economies and Chinese3 for developing economies and LDCs
9. Swiss8	Maximum possible final tariff of 8 per cent
10. Swiss16	Maximum possible final tariff of 16 per cent

^a Unbound rates estimated at twice the MFN rate. ^b Ceiling at 25 and floor at 16 for developing countries.

Note: Formulas used in these scenarios are further explained in appendix B.

Source: ITAS.

Measuring the effects of each scenario

For each scenario, the effects of tariff reduction are captured in terms of new rates and in terms of percentage changes relative to the initial rates (table 3.2). Results are calculated at the most disaggregated level at which the analysis is conducted (HS6 commodity imported into country A from country B).

Table 3.2 Result variables created under each tariff reduction scenario

<i>Variable</i>	<i>Explanation</i>
Final bound rate	New bound rate after application of formula
Final applied rate	New applied rate consistent with new bound rate
Percentage change in bound rate	Final relative to initial bound rate
Percentage change in applied rate	Final relative to initial applied rate
Percentage change in price ^a	Final relative to initial power of applied rate

^a Percentage change in the duty-paid price, measured by the change in the power of the tariff. Data for price levels are not directly available. However, calculations using tariff data can indicate the initial percentage changes in prices, since the proportional change in the power of the (applied) tariff indicates the proportional change in the duty-paid price before any market responses have occurred. Refining this estimate of price change by including market responses, and therefore, changes in market price and trade flows, requires knowledge of various elasticities and a model of demand responses (of which GTAP is one example).

Source: ITAS.

Levels of final disaggregated tariffs show the new structure of a schedule. Further, simple analysis of these data identifies final average or maximum tariffs across a range of items. Percentage changes in tariffs show the proportional change in final tariffs from their initial levels and indicate changes in market access due to estimated tariff reductions. Percentage changes in prices are a first measure of the likely economic effects of tariff reduction assuming no market response.

The remainder of this section outlines each variable and how it is calculated.

Final bound rates and percentage changes

For each scenario, ITAS converts the initial bound rates at the HS6 level into final bound rates using a specific tariff reduction formula and particular parameter values.⁴ Percentage changes in bound rates can be interpreted as an indicator of negotiation performance, but are often not related to economically-significant changes since there can be big differences between bound and applied rates (binding overhang).

The simplest summary of a change in a tariff structure is the change in the average tariff (see box 3.3). The World Bank (2003, p. 92) advocates targeting the change in the average rather than the average change, because ‘the fundamental problem with the average cut approach is that it provides no reward for cutting a high tariff rather than a low one, and hence allows policymakers to avoid the agreed goal of achieving substantial improvements in market access’.⁵

⁴ Calculating final bound rates at the line item level and then aggregating to HS6 may result in some differences in final bound rates from those calculated in ITAS.

⁵ Although ITAS provides both measures, the change in the average is more likely to be useful in economic analysis.

Box 3.3 Average change and change in the average

The relationship between the average of the changes and the change in the average is determined by the distribution of the changes in individual tariffs. Since the formulas included in ITAS produce larger tariff reductions for high tariffs than for low tariffs, the change in the average is larger than the corresponding average change (as in scenario B in the table below). This is illustrated for two hypothetical scenarios in the table below.

Change in the average tariff and average change in tariffs

Scenario A: 50 per cent change in low tariff

Scenario B: 50 per cent change in high tariff

	Tariffs			Average change
	Base	Final	Change	
Scenario A				
Low tariff item	2	1	-50%	-25%
High tariff item	100	100	0%	
Average tariff	51	50.5	-1%	
Scenario B				
Low tariff item	2	2	0%	-25%
High tariff item	100	50	-50%	
Average tariff	51	26	-49%	

If the reductions in low tariffs are large and reductions in high tariffs small or zero, the average of the individual reductions is much larger than the change in the average reduction (scenario A in the table). This results in a slight increase in the dispersion of the tariffs.

When the reductions in low tariffs are small and reductions in high tariffs large, as is the case for the formulas included in ITAS, the average of the individual reductions is smaller than the reduction in the average (scenario B in the table). This results in a large decrease in the dispersion of the tariffs (see also World Bank 2003, p. 92).

Source: Productivity Commission.

Final applied rates and percentage changes

In order to estimate the effects of tariff reduction scenarios on applied rates, final applied rates are estimated using initial applied rates and final bound rates.⁶ There are two main points affecting the method of estimation.

⁶ Calculating final applied rates at the line item level and then aggregating to HS6 may result in some differences in final applied rates from those calculated in ITAS.

First, trade negotiations do not typically lead to agreements on applied rates and thus the only constraint on future applied rates is that they do not exceed corresponding bound rates at the same point in time. Second, there is no reason to assume that a country would reduce applied rates according to the same formula approach that was used to reduce its bound rates in trade negotiations.

Consistent with these two points, a conservative estimate of a final applied rate is given by the minimum of the final bound rate and the initial applied rate for that item (box 3.4).⁷ This estimate is consistent with the minimum possible reduction in applied rates required to comply with the final bound rate. However, if the initial applied rate is below the final bound rate for a product, there is nothing to stop a country from increasing the applied rate up to the level of the final bound rate for that product. This would result in a smaller overall reduction in applied rates than is given by ITAS.

An applied rate reduced to meet the final bound rate is not reduced further than this level in ITAS (that is, the final bound and final applied rates coincide). One implication of this assumption is that final applied rates projected by ITAS represent the upper limit for estimates of final applied rates under each scenario for items that require a reduction in applied tariffs.

Since applied rates are interpreted as the measure of the effective barrier to market access, percentage changes in applied rates are interpreted as a measure of the change in market access.

⁷ Final applied rates are estimated for each bilateral import. Each estimate includes the effect of preferences if applicable to the trade route and product.

Box 3.4 Estimating changes in applied tariff rates

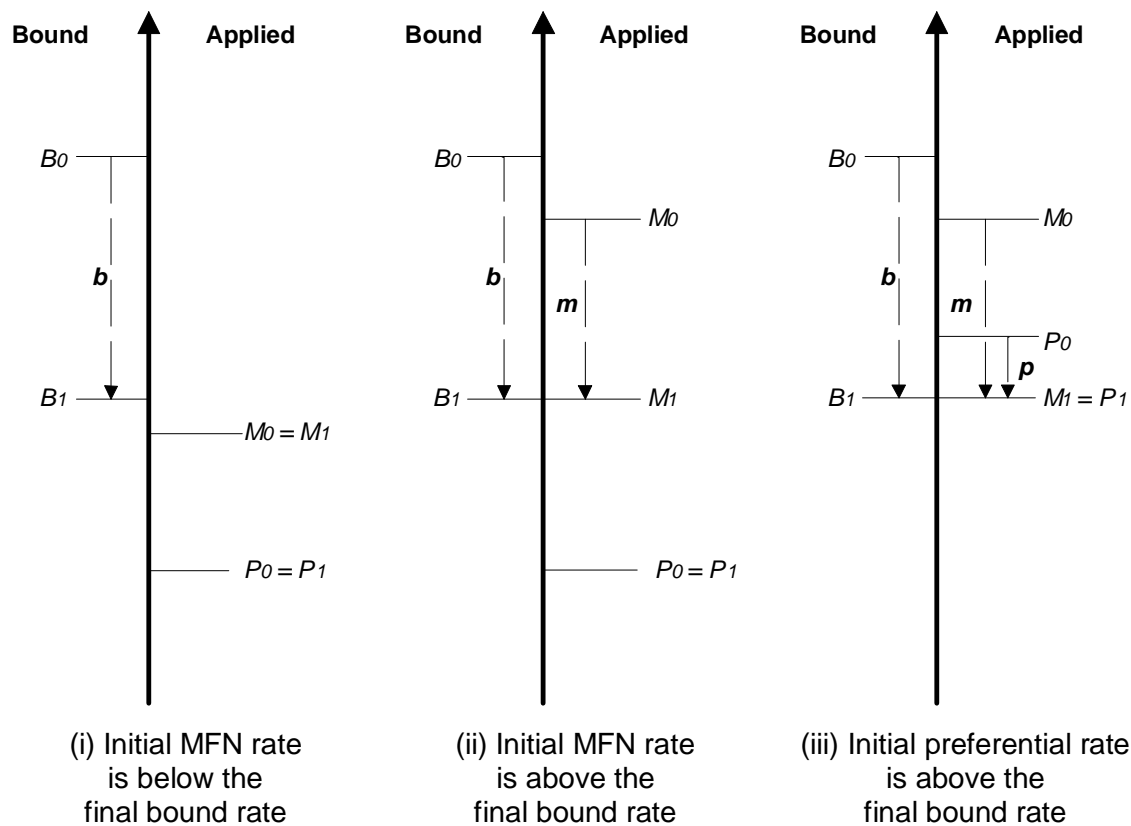
The estimated change in an applied tariff is based on the initial applied rate and the effects of changes in the corresponding bound rate. The diagrams below illustrate this for three cases. In each case, the effects on an MFN and a preferential rate are shown.

In panel (i), the bound rate is reduced from B_0 to B_1 but the initial MFN and preferential rates are still below the final bound rate. The MFN and preferential rates remain unchanged ($M_0 = M_1$; $P_0 = P_1$) and no change in these applied rates is recorded.

In panel (ii), the bound rate is reduced to B_1 , below the initial MFN rate (M_0) but above the initial preferential rate (P_0). The MFN rate is reduced to the level of the final bound rate, but the preferential rate remains unchanged ($B_1 = M_1$; $P_0 = P_1$).

In panel (iii), the bound rate is reduced by b to below both the initial MFN (M_0) and initial preferential (P_0) rates. The MFN and preferential rates are reduced (by m and p , respectively) to the same level as the final bound rate ($B_1 = M_1 = P_1$).

Thus, if initial applied and bound rates are the same, applying a formula will produce the same reduction in the applied rate as in the bound rate. However, if an initial bound rate exceeds the initial applied rate, as in the diagrams, a formula will produce a smaller reduction in the applied rate on a bilateral import (m or p) than in the bound rate (b).



(Continued next page)

Box 3.4 (continued)

The following numerical example illustrates further how a change in the MFN rate is estimated. With a bound rate of 30 per cent and an MFN rate of 20 per cent, a one-third reduction in the bound rate takes it down to 20 per cent and leaves the MFN rate unchanged. A 50 per cent reduction in the bound rate takes both the bound and MFN rates down to 15 per cent. In this case, the reduction in the MFN rate is 25 per cent.

Some members may reduce applied rates below the final bound rates. In this case, the approach in ITAS overestimates the final applied rates and underestimates the reduction in applied rates.

If there has been a reduction in the applied rate since the last date of measurement, it is possible that the existing applied rate has been overestimated. In this case, reductions reported here might be overestimated, although the prediction of the final applied rate may still be correct. This problem will be alleviated by maintaining an up-to-date Integrated Database.

Source: Productivity Commission.

Percentage changes in duty-paid prices

Direct and market effects

It is important to measure the effect of tariff reduction scenarios on prices, since economic agents respond to changes in commodity prices rather than the changes in tariffs. Changes in applied tariffs change the purchase price of commodities in two ways — directly and through market adjustments.

Changes in tariffs affect prices directly by changing the duty-paid price (before taking account of any market responses). Further responses by users of the commodity and in other related markets lead to further changes in duty-paid prices.

For each scenario, ITAS only includes the direct effects of reductions in applied tariffs on duty-paid prices. Further market effects are not included in ITAS, as these calculations require knowledge of various elasticities (including own- and cross-price elasticities with competing or complementary products). These market effects may be estimated using a model that allows demand responses, such as the GTAP model of world trade.

Measuring direct effects

Detailed data are not available for commodity price levels. However, changes in prices (direct effects) can be estimated from changes in the power of the tariff. If demand for the relevant import is inelastic (vertical), then the direct effect is the total effect on the duty-paid price of the import.

The power of the tariff is calculated as one *plus* the applied tariff rate, where this tariff rate is expressed as a decimal. For example, a tariff of 5 per cent has a power of 1.05 and directly increases the price paid by the purchaser by 5 per cent.

The percentage change in price directly associated with the change in tariff is calculated as the percentage change in the power of the final applied tariff from the power of the initial tariff. For example, if the initial rate is 10 per cent and the final rate is 5 per cent, (a 50 per cent reduction) the price changes by $(1.05/1.10 - 1) \cdot 100$ or declines 4.5 per cent. If the initial rate is 50 per cent and the final rate is 25 per cent, the price changes by $(1.25/1.50 - 1) \cdot 100$, or declines 16.7 per cent. These two examples illustrate the difference to users between the effects of a 50 per cent cut in a small rate and a large rate.⁸

This chapter has described the estimation of new bound and applied rates and the estimation of corresponding changes in the tariffs and duty-paid prices. Chapter 4 reviews the main types of summaries produced in the ITAS to date.

⁸ Additional market effects can be gauged by using the effects of tariff scenarios in a partial equilibrium, sectoral model or a global trade model.

4 Tariff analysis – detailed and summary outputs

To illustrate how the analytical tools are produced and can be used for analysis, this chapter includes examples of scenarios applied to sample tariff schedules. The specific scenarios used are:

- the Swiss formula with a parameter of 8;
- the Girard formula with a parameter of 1; and
- a Combined Swiss formula which consists of the Swiss formula with a parameter of 8 for industrialised countries and a parameter of 16 for developing countries.

The structure of the ITAS output is detailed in appendix D, along with the entire structure of the ITAS suite of programs and the input requirements. Variable names in this chapter refer to those used in the ITAS programs and relevant input and output files.

Analysing tariff change scenarios

In addition to standardising initial bound and applied tariff data at the HS6 level for bilateral trade flows, ITAS produces projections and summaries of the effects of formulas combined with specific parameter values. Tariff change scenarios can be analysed by:

- using changes in bound and applied tariffs that apply to trade between an importer and an exporter at the HS6 level (usually presented in tables);
- using changes in the average bound and applied tariffs, interpreted as an importer's overall barriers to trade (usually presented in tables, for average applied rates that account for preferences);
- using changes in the average bound and applied tariffs for a sector, interpreted as an importer's barriers to trade on this sector (usually presented in tables, for average applied rates that account for preferences);

-
- comparing the frequency distribution of tariff structures to assess the effects of a scenario on the dispersion of tariffs (usually in frequency diagrams, for MFN rates¹); and
 - comparing the structure of initial and final bound and applied rates (usually in line diagrams, for MFN rates).

This chapter provides an overview of these different analytical tools. Although the ITAS produces weighted and unweighted summaries, the remainder of the discussion in this chapter concentrates on unweighted averages.

Detailed results

Commodity detail results can be obtained at the HS6 level, and within a specific HS6 code, for tariffs that apply to imports from different exporting partners. These results are available in the master database. These results are most useful in very detailed negotiations about individual line items. However, they are a simplified representation of the underlying line item rates. The master database is the basis for the different summaries that are produced in an ITAS analysis.

Detailed results are provided for the variables described in table 4.1, for almost 5000 HS6 commodities imported by each country, and disaggregated by exporting partner. Table 4.2 provides a sample of the entries in the master database for Australia.

¹ MFN rates are estimated as the maximum rate applied to an import across exporting partners. The estimated MFN rate for an HS6 item is likely to be the average MFN rate that applies to the corresponding tariff line items. However, this may not be the case for several reasons. For example, a line item might actually be imported under preferential rates, either because all suppliers of the product benefit from preferential arrangements or because the MFN rate is effectively prohibitive.

Table 4.1 Result variables included in ITAS

<i>Description</i>	<i>SAS variable</i>	
	<i>Unweighted</i>	<i>Weighted</i>
<i>Levels</i>		
Initial bound rate (post Uruguay bound rate)	tu_bound	t_bound
Final bound rate after application of formulas 1 and 6 ^a	tu_bnd1	t_bnd1
Final bound rate after application of formulas 2 and 7	tu_bnd2	t_bnd2
Final bound rate after application of formulas 3 and 8	tu_bnd3	t_bnd3
Final bound rate after application of formulas 4 and 9	tu_bnd4	t_bnd4
Final bound rate after application of formulas 5 and 10	tu_bdfs1	t_bdfs1
Current applied rate (typically 1999)	tu_appb	t_appb
Initial applied rate (estimate of post Uruguay applied rate)	tu_app	t_app
Final applied rate consistent with final bound rate — formulas 1 and 6	tu_app1	t_app1
Final applied rate consistent with final bound rate — formulas 2 and 7	tu_app2	t_app2
Final applied rate consistent with final bound rate — formulas 3 and 8	tu_app3	t_app3
Final applied rate consistent with final bound rate — formulas 4 and 9	tu_app4	t_app4
Final applied rate consistent with final bound rate — formulas 5 and 10	tu_apfs1	t_apfs1
<i>Percentage changes (final relative to initial levels)^b</i>		
Percentage change in bound rate — formulas 1 and 6	dtubnd1	dtbnd1
Percentage change in bound rate — formulas 2 and 7	dtubnd2	dtbnd2
Percentage change in bound rate — formulas 3 and 8	dtubnd3	dtbnd3
Percentage change in bound rate — formulas 4 and 9	dtubnd4	dtbnd4
Percentage change in bound rate — formulas 5 and 10	dtubfs1	dtbfs1
Percentage change in applied rate — formulas 1 and 6	dtuapp1	dtapp1
Percentage change in applied rate — formulas 2 and 7	dtuapp2	dtapp2
Percentage change in applied rate — formulas 3 and 8	dtuapp3	dtapp3
Percentage change in applied rate — formulas 4 and 9	dtuapp4	dtapp4
Percentage change in applied rate — formulas 5 and 10	dtuafs1	dtafs1
Percentage change in price — formulas 1 and 6	dpuapp1	dpapp1
Percentage change in price — formulas 2 and 7	dpuapp2	dpapp2
Percentage change in price — formulas 3 and 8	dpuapp3	dpapp3
Percentage change in price — formulas 4 and 9	dpuapp4	dpapp4
Percentage change in price — formulas 5 and 10	dpuafs1	dpafs1

^a ITAS includes the code for all the formulas listed in appendix B. A typical run of ITAS is for 10 scenarios. See table 3.1 to identify which variable corresponds to which formula in the current implementation of ITAS.

^b Percentage change variables at the disaggregated level are used to calculate average changes (see box 3.3). They are most relevant for the calculation of average changes in duty-paid prices.

Source: ITAS.

Table 4.2 Detailed results, extract from the master database

Selected HS6 imports into Australia, from various partners^a

HS6 code ^b	Exporting partner	Initial bound	Final bound (Swiss)	Initial applied	Final applied (Swiss)
		<i>tu_bound</i>	<i>tu_bnd4</i>	<i>tu_app</i>	<i>tu_app4</i>
252620	China	10.00	4.44	4.00	4.00
252620	Japan	10.00	4.44	5.00	4.44
252620	Norway	10.00	4.44	5.00	4.44
252620	Singapore	10.00	4.44	5.00	4.44
252620	US	10.00	4.44	5.00	4.44
...
271500	Canada	10.00	4.44	0.00	0.00
271500	Malaysia	10.00	4.44	3.86	3.86
271500	New Zealand	10.00	4.44	0.67	0.67
271500	Saudi Arabia	10.00	4.44	4.01	4.01
271500	South Africa	10.00	4.44	5.00	4.44
271500	US	10.00	4.44	4.98	4.44
...
370244	Chinese Taipei	10.00	4.44	0.05	0.05
370244	Hong Kong, China	10.00	4.44	0.47	0.47
370244	Japan	10.00	4.44	2.90	2.90
370244	Korea	10.00	4.44	0.00	0.00
370244	Malaysia	10.00	4.44	5.00	4.44
370244	Mexico	10.00	4.44	3.00	3.00
370244	New Zealand	10.00	4.44	3.00	3.00
370244	Switzerland	10.00	4.44	3.02	3.02
370244	US	10.00	4.44	1.86	1.86
...
870324	Canada	27.5	6.20	7.50	6.20
870324	Hong Kong, China	27.5	6.20	15.00	6.20
870324	Japan	27.5	6.20	7.14	2.62
870324	Korea	27.5	6.20	5.00	5.00
870324	New Zealand	27.5	6.20	5.03	4.79
870324	Singapore	27.5	6.20	15.00	6.20
870324	South Africa	27.5	6.20	9.41	6.20
870324	US	27.5	6.20	3.51	3.22

^a Extracted from file AUSTM3D.SD2. ^b Descriptions for the HS6 codes included in the table are as follows. **252620**: Natural steatite and talc, crushed or powdered; **271500**: Bituminous mixtures based on natural asphalt, on natural bitumen, on petroleum bitumen, on mineral tar or mineral tar pitch (for example, bituminous mastics, cut-backs); **370244**: Photographic film nes in rolls, without sprocket holes, width exceeding 105 mm but not exceeding 610 mm, sensitised and unexposed; **870324**: Motor cars and vehicles designed for the transport of persons (excl. for ten or more persons, snow, golf or similar vehicles) with spark-ignition internal combustion reciprocating piston engine with a cylinder capacity exceeding 3000cc.

Source: ITAS.

Summaries

Data extracts at the HS6 level are difficult to analyse, given the number of individual items. These detailed data are, however, relevant to negotiations. The ITAS produces several summary measures to analyse the initial and final tariff structures and the changes that result from 10 scenarios.² The summary measures can be used either:

- to analyse the effects of different formulas on tariffs and duty-paid prices; or
- to identify commodities whose tariff characteristics warrant further analysis.

Summary 1: tariff averages

Table 4.3 lists the variables required to produce the illustrative tariff averages and changes reported in table 4.4. Tariff averages and changes in averages are the most tractable indicators of the effects of a scenario. The averages are designed to provide an indication of the overall access to a country's markets.³ Therefore they:

- include zero tariffs; and
- are calculated as simple, unweighted averages.

² ITAS is set up to run 10 scenarios. Programs can be changed and re-run for more or different scenarios.

³ Similar averages can be calculated for specific markets, that is, groups of commodities (for example, automotive products or chemical products). See appendix A.

Table 4.3 Selected summary averages generated by ITAS

<i>Summary variable</i> ^{a,b}	<i>Detailed HS6 information that is summarised</i>	<i>SAS summary variable name</i>
Number of HS6 products imported ^c	number of HS6 codes that apply to a country's imports	_FREQ_
Average bound rate, initial and final ^d	bound rate for each HS6 code	TU_BND_AA
Average applied rate, initial and final	applied rate for each HS6 code ^e	TU_APP
Average change in bound rates (per cent changes) ^f	for each HS6 code, change in the average bound rate	DTUBND_AA
Average change in applied rates (per cent changes)	for each HS6 code, change in average applied rate (averaged across export partners)	DTUAPP
Average change in power of the tariff (per cent changes)	for each HS6 code, change in the power of the tariff (averaged across export partners)	DPUAPP

^a Variables included in output file WTOMCMB1.xls and WTOMCMB2.xls. All averages unweighted and based on industrial products only. ^b Variables contain values for initial and final values for the 10 formulas. ^c The denominator used to calculate the averages in the rest of the table. ^d Estimate of average initial and final bound rates across HS6 codes. ^e Applied rate for each HS6 product group is averaged across partners. ^f Average of the changes in bound rates for each HS6 code.

Source: ITAS.

Table 4.4 **Effect of the Swiss, Girard and Combined Swiss formulas on average applied tariffs, selected countries**

Per cent and percentage changes^{a,b}

	<i>Initial average tariff</i>	<i>Swiss^c</i>		<i>Girard^d</i>		<i>Combined Swiss^e</i>	
		<i>Average tariff</i>	<i>Change</i>	<i>Average tariff</i>	<i>Change</i>	<i>Average tariff</i>	<i>Change</i>
<i>All items</i>							
US	3	1	-51	1	-68	1	-51
EU	4	2	-45	2	-61	2	-45
Japan	2	1	-40	0	-70	1	-40
Australia	4	2	-40	2	-33	2	-40
Brazil	15	6	-61	13	-17	9	-38
China	9	4	-58	4	-55	5	-42
India	34	6	-82	18	-48	11	-69
Indonesia	8	4	-46	8	-6	6	-25
Thailand	13	5	-63	8	-41	7	-46
Malaysia	9	3	-71	3	-64	4	-56
Mexico	17	6	-65	14	-18	10	-42
<i>High tariff items^f</i>							
US	21	6	-72	3	-85	6	-72
EU	20	6	-71	3	-83	6	-71
Japan	21	6	-73	2	-90	6	-73
Australia	24	7	-73	9	-65	7	-73
Brazil	20	6	-68	15	-23	11	-46
China	20	6	-72	6	-69	9	-57
India	37	7	-82	19	-49	11	-69
Indonesia	21	7	-69	18	-16	11	-48
Thailand	25	6	-75	12	-54	10	-60
Malaysia	25	6	-75	8	-69	10	-60
Mexico	22	7	-71	17	-23	11	-51

^a Tariff figures have been rounded. ^b Average tariff levels from WTOMCMB1.XLS (all items) and WTOMCMB2.XLS (high tariff items). Percentage changes calculated from data presented in output spreadsheets. ^c Swiss formula with a parameter of 8. ^d Girard formula with a parameter of 1. ^e Swiss formula with a parameter of 8 for industrialised countries and 16 for developing countries. ^f High tariff items are defined as those with initial applied tariffs greater than 15 per cent.

Source: ITAS.

Summary 2: frequency distributions

The main features of proposed formulas are that they:

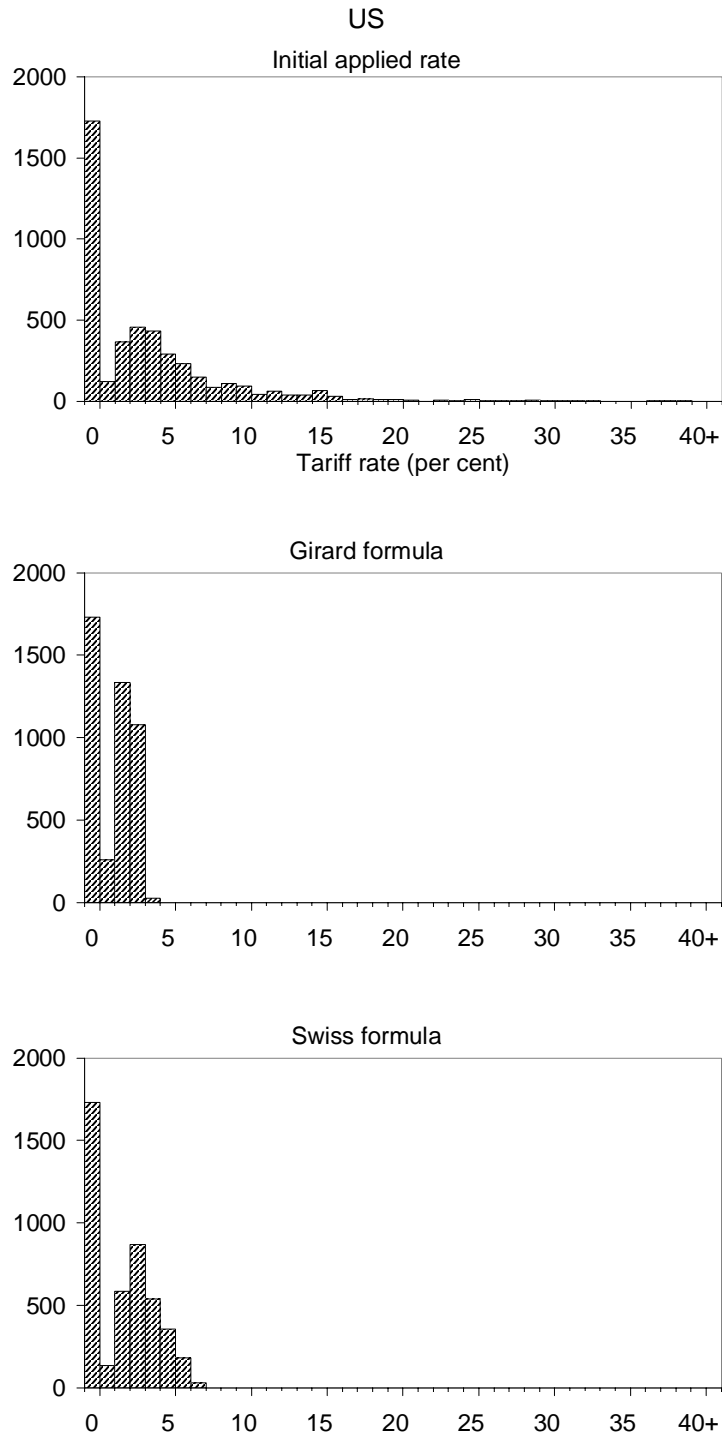
1. reduce all tariffs within a schedule; and
2. reduce the dispersion of tariffs within a schedule.

An aggregate measure of the first effect is the change in the average tariff provided in summary 1. A frequency distribution of a tariff schedule before and after implementing a scenario provides a summary of the effect of the scenario. Figure 4.1 illustrates this for the initial US MFN rates and for projections under the Girard and Swiss formulas.

In figure 4.1, the first panel represents the distribution of initial MFN tariffs. The first column represents the number of HS6 items imported duty-free. Unless the Girard and Swiss formulas are augmented by a rule that reduces ‘nuisance’ tariffs to zero, this number does not change. The second column represents the number of HS6 items with average MFN rates between 0 and 1 per cent (very few). These low average rates result from a combination of some line items that are subject to low tariffs and others that are imported duty-free within an HS6 item. The initial distribution includes a few high tariffs, including the 37.5 per cent tariff on footwear. The average tariff is around 3 per cent.

The Girard formula panel shows that all tariffs are reduced below the initial average bound rate of 3.4 per cent. Under this scenario, most tariffs are concentrated between 1 and 3 per cent. In the Swiss formula panel, tariffs are all reduced below 8 per cent. The Swiss scenario has a smaller effect than the Girard scenario on the dispersion of tariffs in industrialised countries because initial tariff averages in industrialised countries are less than 8 per cent.

Figure 4.1 Initial tariff distribution and effects of selected formulas, estimated MFN rates, US^{a,b}



^a Vertical axis shows the numbers of imported products in each class. Tariff levels grouped in 1 per cent classes along the horizontal axis (except class labelled 0, which represents items imported tariff free). Class labelled 5 includes items subject to tariffs between 4 and 5 per cent. ^b Estimated MFN tariffs from WTOMCMAX2.XLS (Girard) and WTOMAMAX2.XLS (Swiss). Distribution graphs produced using the histogram facility in MS Excel.

Source: Productivity Commission estimates.

Summary 3: charts of tariff structures

A graphical representation of the entire tariff structure provides an overview and detailed information for analysis. Figure 4.2 summarises a country's entire initial tariff structure. Figure 4.3 summarises how a country's structure is changed by implementing the Swiss and Girard formulas. In both figures, HS6 items are ordered along the horizontal axis in decreasing order of initial MFN rates. Tariff rates are measured along the vertical axis.

Figure 4.2 indicates that about 2700 HS6 items are subject to some tariff, and 1700 are imported duty free. To a large extent, MFN rates correspond to bound rates in the US tariff schedule. In figure 4.2, this results in the line representing the applied rate and the line representing the bound rate coinciding to a large extent. The spikes represent binding overhangs, that is, HS6 items for which the binding exceeds the MFN rate. The overview provided by the figure enables the analyst to quickly identify individual commodities that might be of particular interest by searching the detailed results file for a combination of applied and bound rates, or by ordering the data by applied rates.

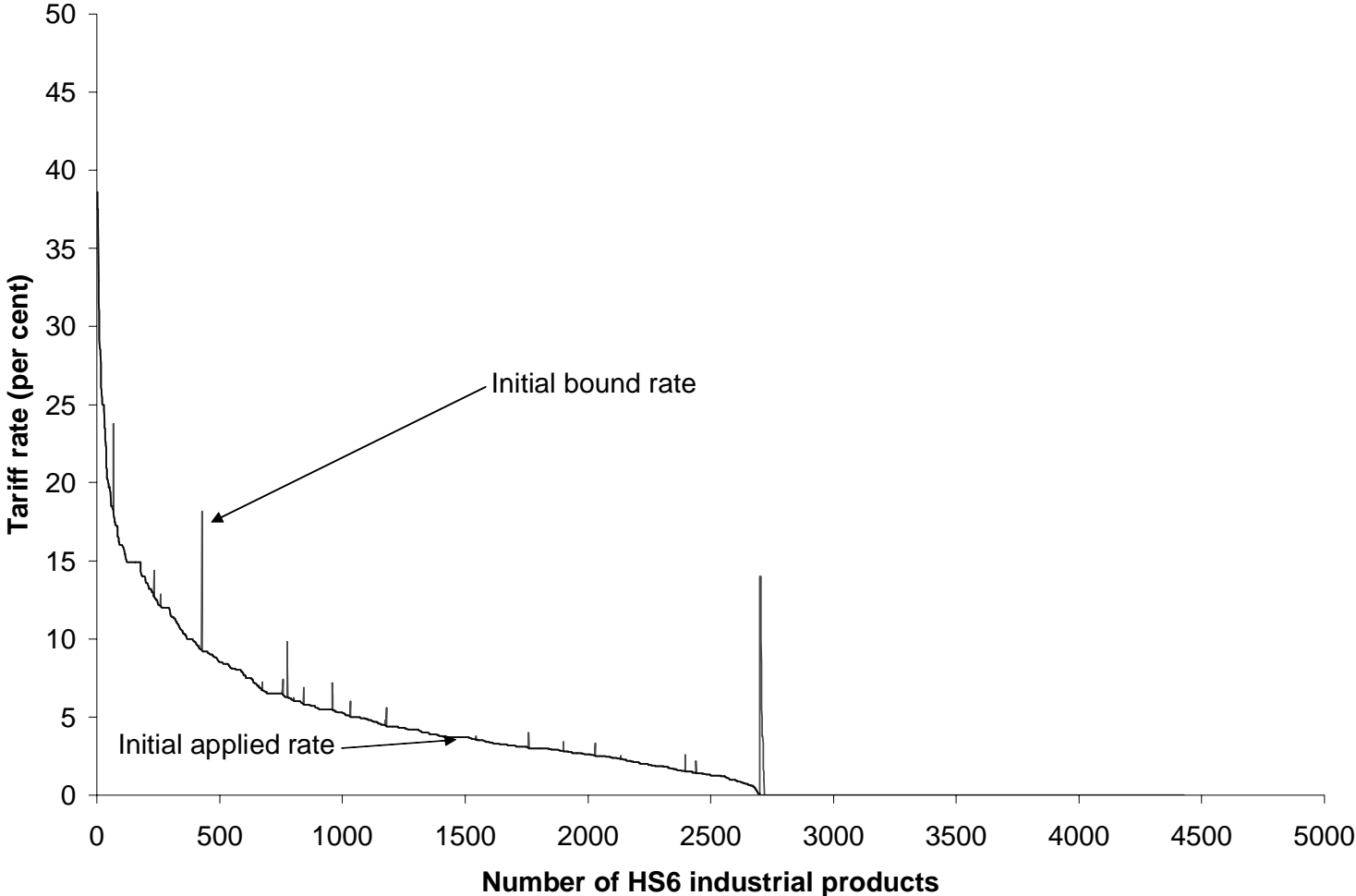
The effect of formulas on a tariff structure is illustrated in figure 4.3, where, as in figure 4.2, HS6 items are ordered by decreasing order of applied rates. In addition to the tariff rates, the figure identifies the main HS chapter headings that comprise groups of HS6 items. The initial schedule of MFN rates is reproduced from figure 4.2.

The main feature of figure 4.3 is that, since there is little binding overhang in the US tariff schedule, applying a formula to the bound rates is reflected to a large extent in reductions in MFN rates. This is not always the case. For example, figure 4.4 for Australia and figure 4.5 for Indonesia indicate that large binding overhangs:

- show up in the pattern of new applied rates; and
- can mean that formulas used on bound rates are ineffective in reducing applied rates.

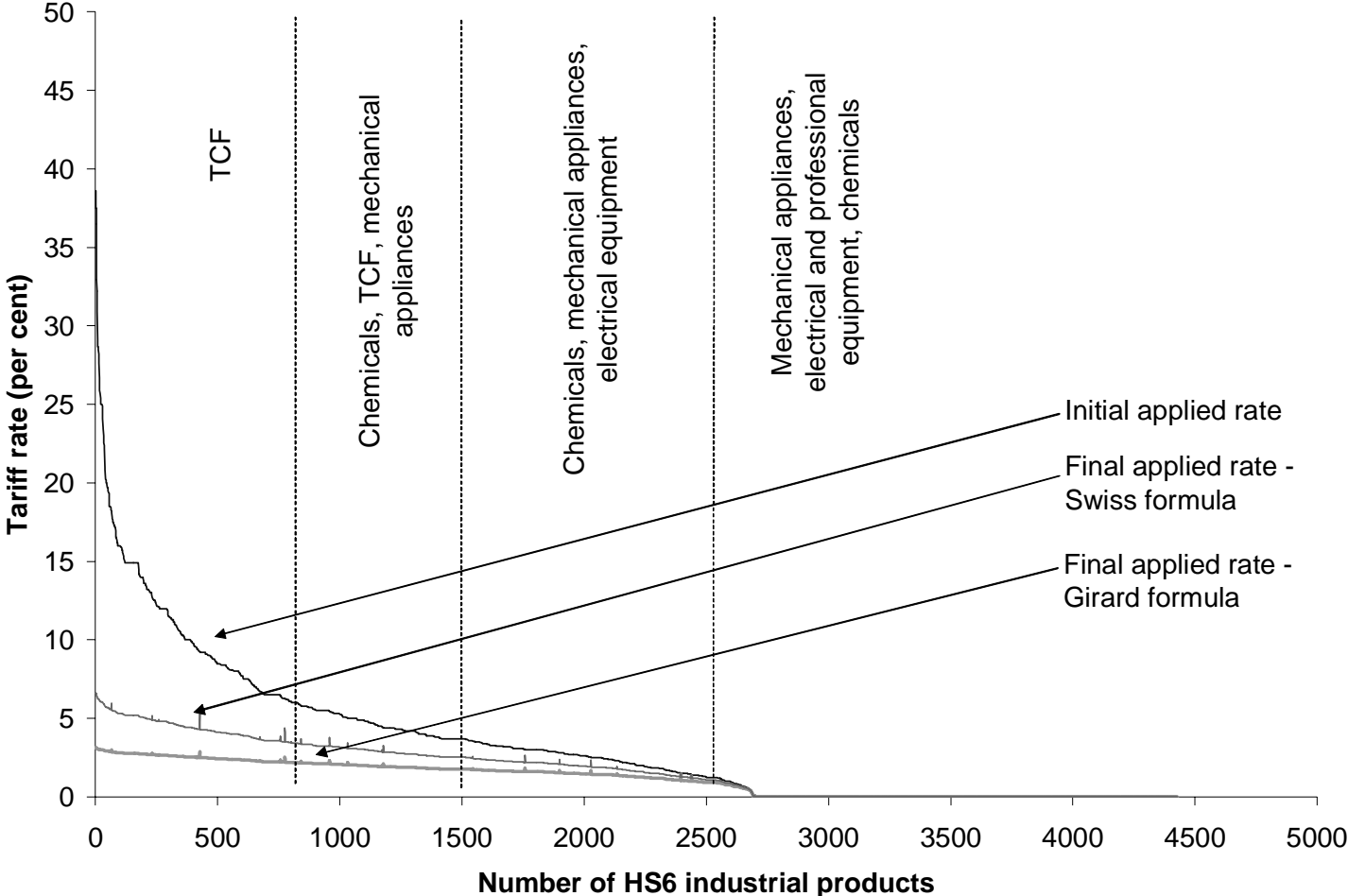
The combination of the figures with the initial bound and applied rates and the projections under different scenarios provides an overview of the effects of formulas on an entire tariff schedule. The analyst can quickly identify areas of interest from the figures and identify in the master dataset the relevant HS6 items and detailed tariff information that is relevant to a negotiation or to analysing effects at a detailed level.

Figure 4.2 Initial bound and applied (MFN) tariffs on industrial products, by HS6 item, US



Source: Productivity Commission estimates.

Figure 4.3 Effects of selected formulas on tariffs on industrial products, by HS6 item, US

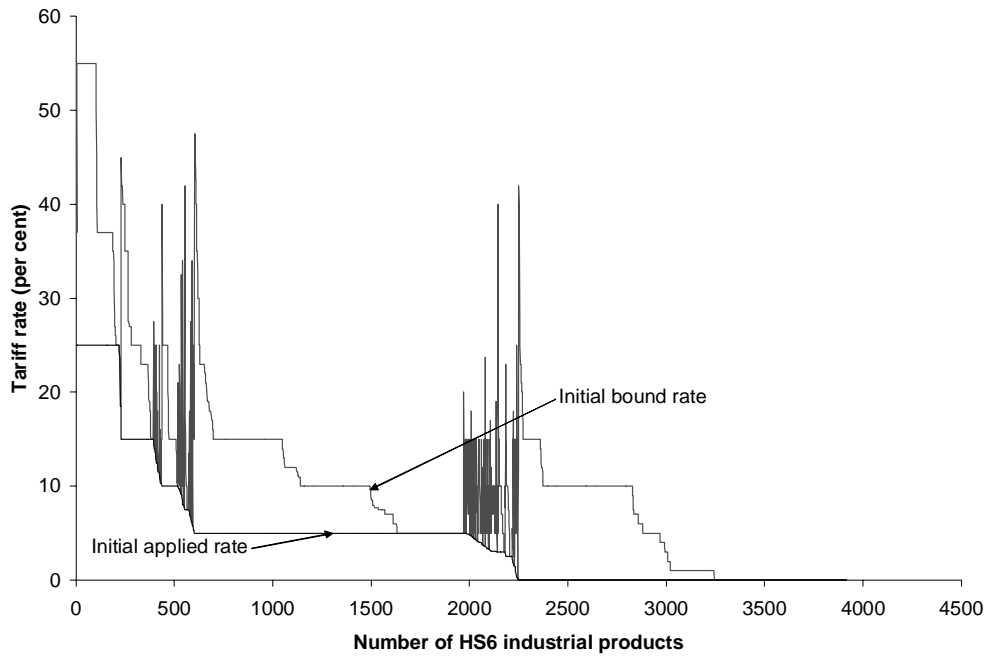


Note: HS chapters indicated on the chart account for the largest number of HS6 products in the designated range.

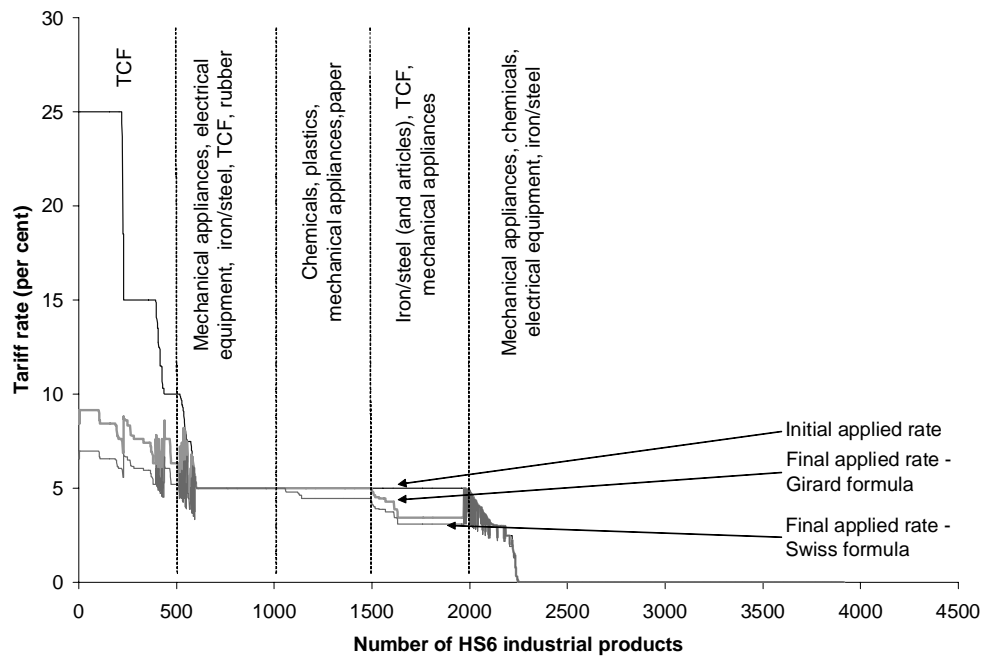
Source: Productivity Commission estimates.

Figure 4.4 **Bound and applied tariffs on industrial products and effects of selected formulas on applied rates, Australia**

(a) Initial bound and applied tariff rates



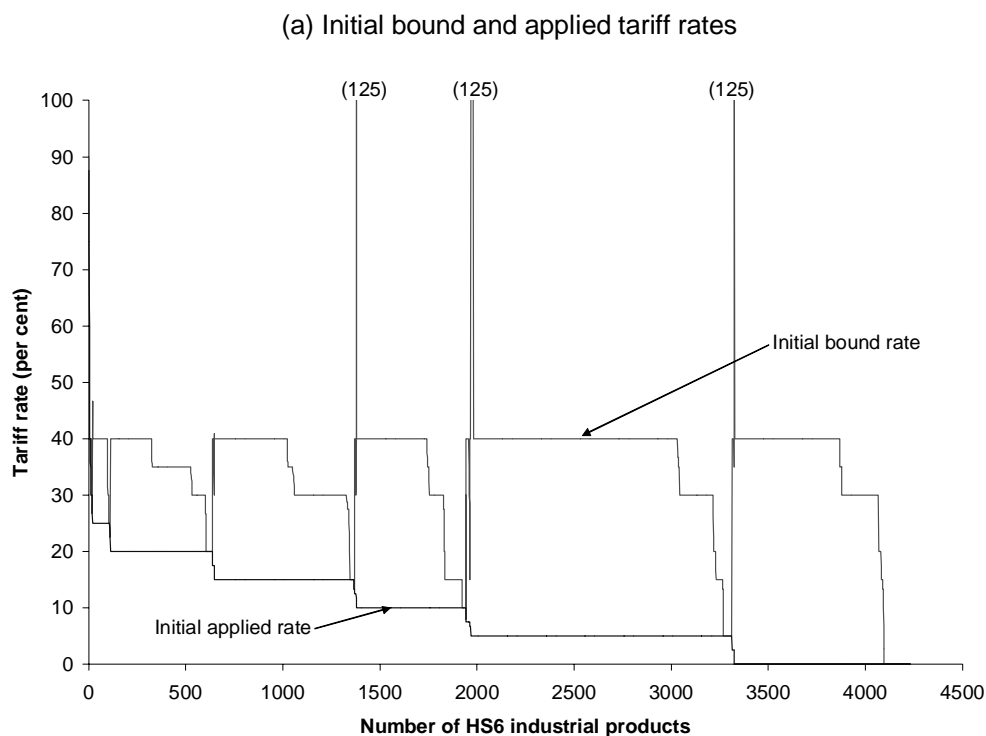
(b) Applied rates before and after application of selected formulas



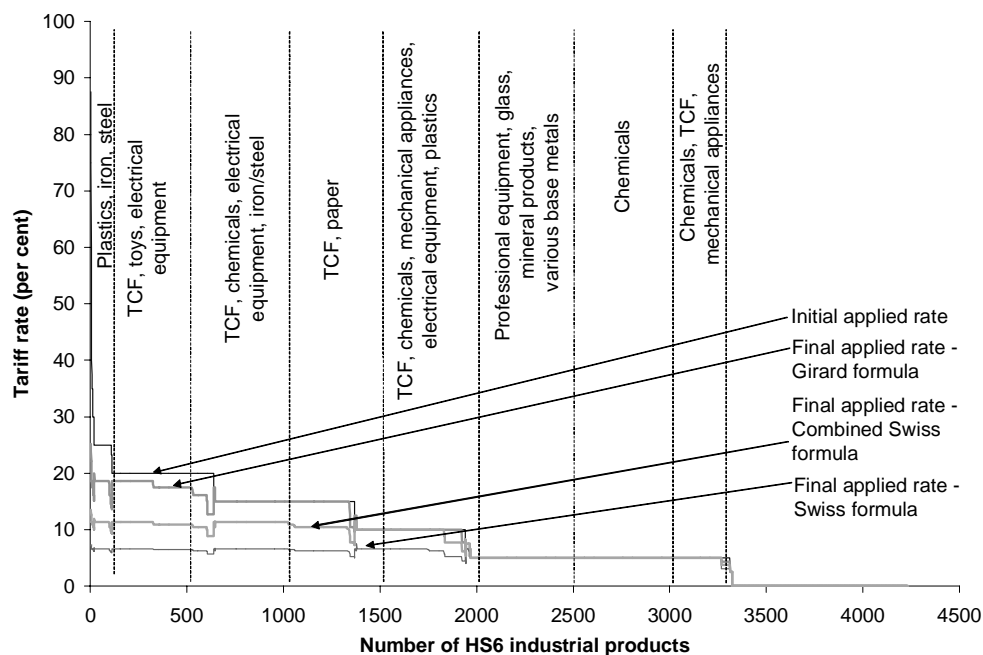
Note: HS chapters indicated on the chart account for the largest number of HS6 products in the designated range.

Source: Productivity Commission estimates.

Figure 4.5 Bound and applied tariffs on industrial products and effects of selected formulas on applied rates, Indonesia



(b) Applied rates before and after application of selected formulas



Note: HS chapters indicated on the chart account for the largest number of HS6 products in the designated range.

Source: Productivity Commission estimates.

5 Extensions

This chapter sets out a variety of ways in which ITAS could be usefully extended and describes how these extensions might be implemented.

Incorporating planned tariff changes

Governments sometimes announce planned changes in tariffs to allow businesses and workers time to adapt and to provide opportunities for improving competitiveness within a manageable timeframe. In particular, businesses in the more highly-protected industries may require especially large adjustments in work practices and resource allocation to remain competitive. Announcing planned tariff reductions in advance can help to reduce and spread out the costs of making these adjustments.

Planned tariff changes would not affect bound rates but would affect post-Uruguay applied rates. To incorporate this type of information, current applied rates would be changed to reflect tariff announcements and post-Uruguay applied rates would then be estimated in the usual way using this new applied rate in place of the current applied rate.¹ When examining data on planned tariff changes, the likelihood of these changes being implemented should be assessed prior to adjustments being made to the ITAS database.

Incorporating planned tariff changes would enhance ITAS analysis by improving the accuracy of estimates of future (post-Uruguay) applied rates for countries affected by the announcements. For example, the Australian Government has announced that automotive tariffs will remain at 10 per cent until January 2010. These tariffs will then be reduced to 5 per cent and remain at this level until (at least) 2015 (PC 2002). The Australian Government has also introduced legislation to reduce tariffs on apparel and certain finished textiles, footwear and fabrics to 17.5, 10 and 7.5 per cent, respectively, in January 2005 (PC 2002).²

¹ Box 3.3 contains an explanation of how post-Uruguay applied rates are estimated in ITAS.

² These planned tariff reductions could be incorporated in ITAS by adapting the program MECAUS3B.SAS.

Non-ad valorem tariffs

Some tariffs are expressed in non-ad valorem terms:

- a *specific* tariff relates customs duty to a quantity measure, such as weight (for example, \$10 per tonne);
- a *compound* tariff combines an ad valorem tariff and a specific tariff (for example, 5 per cent plus £2.00 per litre, 10 per cent minus €0.50 per kg);
- a *mixed* tariff specifies more than one tariff from which the rate yielding a minimum or maximum amount of duty is chosen (for example, 5 per cent or ¥0.04 per barrel, whichever is greater);
- a *technical* tariff relates duty collection to other characteristics of the product and may be expressed using specific and/or ad valorem components (for example, 6 per cent plus \$30 per litre of alcohol, calculated on that alcohol content by which the percentage by volume of alcohol of the goods exceeds 1.15).

These non-ad valorem tariffs represent about 17 per cent of agricultural tariff lines and about 4 per cent of industrial tariff lines (table 5.2).

Examining the effects of tariff reduction formulas requires tariff information in an ad valorem format. Only tariffs expressed in ad valorem terms (that is, duty as a percentage of import value) are currently included in ITAS. With appropriate additional information any of these non-ad valorem tariffs can be converted to an ad valorem equivalent and thus included in the tariff analysis in ITAS.³

³ However, the CTS and IDB do not currently provide the additional information required to convert technical duties to ad valorem equivalents.

Table 5.1 Incidence of non-ad valorem (NAV) bound tariffs for agricultural and industrial products

By country

Country	Level of HS classification	Agricultural products			Industrial products		
		Number of line items ^a	Number of line items subject to NAV tariffs	Share of tariffs expressed in NAV terms	Number of line items ^a	Number of line items subject to NAV tariffs	Share of tariffs expressed in NAV terms
Australia	HS6	669	8	1.2	4289	5	0.1
Bangladesh	HS6	669	0	0.0	141	0	0.0
Brazil	HS8	929	0	0.0	8404	0	0.0
Canada	HS8	1327	402	30.3	6880	21	0.3
China	HS8	963	0	0.0	6099	0	0.0
EU	HS8	2121	949	44.7	8307	44	0.5
India	HS6	669	2	0.3	3104	269	8.7
Indonesia	HS9	980	0	0.0	5913	0	0.0
Japan	HS6	669	69	10.3	4425	4	0.1
Korea	HS10	1477	68	4.6	8607	21	0.2
Malaysia	HS9	1293	342	26.5	6025	8	0.1
Mexico	HS8	1060	80	7.5	10224	1	0.0
New Zealand	HS8	967	10	1.0	6286	236	3.8
Philippines	HS8	800	0	0.0	2858	0	0.0
Singapore	HS9	832	55	6.6	3288	0	0.0
South Africa	HS8	467	0	0.0	11570	0	0.0
Taiwan	HS8	1334	88	6.6	7260	86	1.2
Thailand	HS6	734	322	43.9	3243	734	22.6
US	HS8	1729	746	43.1	8447	357	4.2
Average ^b	n/a	n/a	n/a	11.9	n/a	n/a	2.2

^a Number of items subject to binding commitments. ^b Average for the 19 countries listed.

Source: ITAS.

Table 5.2 Incidence of non-ad valorem (NAV) MFN tariffs for agricultural and industrial products

By country

Country	Level of HS classification	Agricultural products			Industrial products		
		Number of line items imported	Number of line items subject to NAV tariffs	Share of tariffs expressed in NAV terms	Number of line items imported	Number of line items imported subject to NAV tariffs	Share of tariffs expressed in NAV terms
Australia	HS8	706	7	1.0	5203	8	0.2
Bangladesh	HS8	786	0	0.0	5319	8	0.2
Brazil	HS8	934	0	0.0	8470	0	0.0
Canada	HS8	1352	374	27.7	6820	18	0.3
China	HS8	1036	0	0.0	6280	0	0.0
EU	HS8	2121	1011	47.7	8307	44	0.5
India	HS6	669	2	0.3	4444	8	0.2
Indonesia	HS9	981	0	0.0	6285	0	0.0
Japan	HS9	1756	300	17.1	7292	299	4.1
Korea	HS10	1485	32	2.2	9611	21	0.2
Malaysia	HS9	1152	113	9.8	9237	367	4.0
Mexico	HS8	1059	52	4.9	10260	3	0.0
New Zealand	HS8	967	4	0.4	6262	229	3.7
Philippines	HS8	803	0	0.0	4835	0	0.0
Singapore	HS9	836	4	0.5	5007	0	0.0
South Africa	HS8	845	122	14.4	6980	1819	26.1
Taiwan	HS8	1205	41	3.4	7194	114	1.6
Thailand	HS10	990	554	56.0	5844	949	16.2
US	HS8	1729	772	44.7	8444	543	6.4
Average ^a	n/a	n/a	n/a	12.1	n/a	n/a	3.3

^a Average for the 19 countries listed.

Source: ITAS.

Converting a non-ad valorem tariff to an ad valorem equivalent (AVE)

WTO (2003c) outlines two methods by which each of the types of tariff expressions listed above may be converted to an AVE rate. Essentially, these calculations involve using the non-ad valorem tariff, import value and quantity information contained in the IDB to:

- estimate the total duty collected relative to the total import value (revenue method); or
- estimate the duty collected per unit relative to the import value per unit (unit value method).

Assuming that the bilateral import values and quantities are representative for the post-Uruguay period, the same information and process may be used to convert non-ad valorem bound rates from the CTS into AVEs.

Currently there is no agreement on which method is more appropriate to use. Further, significant additional work is required to convert existing information from text strings into appropriate variables prior to calculations being performed.

MAcMap uses the unit value method to calculate AVE rates for applied tariffs. Although this might be used as a supplementary data source, ad valorem equivalents for bound rates are not available and would have to be calculated using CTS tariff data and IDB import data.

Many assumptions are involved in estimating AVE tariffs and should be borne in mind when conducting tariff analysis based on such estimates. Bouët et al. (2004) outline a new methodology for calculating more robust estimates of AVE tariffs in MAcMap.

Prohibitive tariffs

A tariff is prohibitive if it is sufficiently high to discourage a country from importing the associated product. ITAS includes data for traded commodities by importing country and exporting partner. Thus, it does not currently contain data on commodities subject to prohibitive tariffs. As a result, ITAS underestimates trade barriers and, therefore, overestimates the level of access to markets in each importing country.

With appropriate additional information it would be possible to extend the ITAS framework to include prohibitive tariffs. However, estimating the effect of prohibitive tariffs is labour intensive, due to the necessity of also considering the effects of geographical impediments like transport costs.

Non-tariff barriers

Non-tariff barriers (NTBs) include prohibitions, tariff quotas, anti-dumping duties and sanitary, environmental and technical norms. Each type of NTB reduces market access for imports. The ITAS framework does not include an analysis of NTBs and thus underestimates barriers to market access.

In future, some NTBs may be tariffied (formally converted into a tariff). When this happens, ITAS will be able to incorporate their effects on market access and tariff reduction calculations.

ITAS could be extended by supplementing IDB data on applied rates with MAcMap and/or TRAINS data to gauge the overall level of (current) market access. Bouët et al. (2004) contains a detailed explanation of how each of these instruments of protection is translated into a common metric (ad valorem equivalent) in MAcMap.

Agricultural products

The source data on which ITAS is based uses the 1996 HS classification. In total, there are 5734 HS6 items, of which 4938 (86 per cent) are classified as industrial products. Agricultural products represent about 7 per cent of trade (table 5.3).⁴

ITAS could be extended to include the effects of tariff reduction formulas on agricultural tariffs. However, the issue of converting non-ad valorem tariffs to AVE tariffs becomes more important when agricultural products are to be included, as these products tend to have a much higher incidence of specific tariffs applied to them than for industrial products (see tables 5.1 and 5.2). Further, the existence of tariff quotas and preferential access into highly-protected markets complicates the calculation of ad valorem equivalents.

⁴ Average across 19 countries included in ITAS.

Table 5.3 Total commodity trade and trade in industrial products, by country

Country	Value of trade ^a		Share of industrial products in total commodity trade
	All commodities	Industrial products	
	(US\$m)	(US\$m)	(%)
Australia	62 739	59 822	95.35
Bangladesh	7 018	6 282	89.51
Brazil	57 725	54 217	93.92
Canada	209 730	197 845	94.33
China	161 559	153 285	94.88
EU	701 406	649 907	92.66
India	39 131	34 794	88.92
Indonesia	41 680	37 137	89.10
Japan	309 613	269 550	87.06
Korea	119 752	112 475	93.92
Malaysia	77 952	72 092	92.48
Mexico	174 473	160 407	91.94
New Zealand	13 847	12 776	92.26
Philippines	32 568	29 831	91.60
Singapore	111 005	105 392	94.94
South Africa	26 754	23 228	86.82
Taiwan	109 661	102 275	93.27
Thailand	49 586	46 960	94.71
US	970 724	930 617	95.87
Total ^b	3 276 924	3 058 892	93.35

^a Includes items subject to ad valorem tariffs, specific tariffs and tariff-free items. ^b Total across the 19 countries in ITAS.

Source: WTO (1999); UN (2000) for Bangladesh.

Variations in scenarios

Using the existing programs and structure as a guide, it is possible to increase the number of tariff reduction scenarios included in ITAS. However, it is significantly easier to replace the existing scenarios with up to 10 new scenarios than to increase the dimensions of the final database and many of the output files.

Other formulas are in the code but disabled in the current implementation (table 5.4).

Table 5.4 Other formulas used by ITAS

<i>Scenario</i>	<i>Explanation</i>
Linear66	Two-thirds proportional reduction in all tariffs
Swiss25	Maximum possible final tariff of 25 per cent
European	EU compression formula with parameters for 3 intervals, each interval defined by the following lower base/final and upper base/final tariffs: zero/zero and 15/10; 15/10 and 50/25, and 50/25 and a cap at 25 per cent
Flexible Swiss ^a	Modification of the Swiss8 formula, which allows a 15 per cent maximum tariff and targets the average tariff for each member, based on the prior application of Swiss8
Korean	Each new rate is 0.8 of the base rate less 0.7 of the excess of the initial rate above a specified level

^a Based on a formula proposed by Francois and Martin (2003). See appendix B for this implementation.

Source: Productivity Commission.

Updating ITAS after the Doha Round

ITAS is currently set up to examine the effects on post-Uruguay tariffs of formulas proposed in the Doha round of negotiations. Given appropriate data, it will be possible to update the master data in ITAS to examine the effects of new formulas on post-Doha tariffs.

Including additional importing countries

ITAS currently includes 19 importing countries and their bilateral trade with all other countries of the world.⁵ This coverage currently represents some 56 per cent of world commodity trade. The CTS and IDB include trade and tariff data for more than 100 importing countries and customs unions. In principle, each of these countries/unions could be included as an importer in ITAS. Such inclusions would allow better analysis of the effects of tariff reduction formulas on market access for each country's exports and on trade among developing countries.

⁵ Importing countries included in ITAS are listed in table A.1 in appendix A.

A Data

Trade and tariff data form the core of ITAS. These data are required in order to examine commodity tariffs on bilateral trade flows for a variety of countries and partners. Primary data come from two sources:

1. the WTO's Integrated Database (IDB), which describes trade flows and detailed applied tariff structures for most member countries (latest year: 1999 for most economies).¹
2. the WTO's Consolidated Tariff Schedule (CTS), which describes tariff commitments (or bound tariff rates) of all member countries, made under various trade agreements including the Uruguay Round (most will be in place by 1 July 2005).

These two sources are supplemented by a third source, namely, *International Trade Australia* (ABS Cat. No. 5465.0), which describes Australia's trade flows and tariff collection at the HS8 level (latest year: 2001-02). This supplementary data source serves two purposes.

First, the Australian Bureau of Statistics (ABS) data contain more recent tariff data for Australian imports than the IDB. Second, these data identify Australian exports to Bangladesh and allow identification of tariffs imposed by Bangladesh on Australian exports (as IDB data for Bangladesh contain commodity tariffs but no partner information).

Although data are available in the IDB and CTS for most member countries, only 19 are included in ITAS.² Table A.1 presents key features of the primary data used for each of these countries.³

¹ Some data are not currently available for some member countries, for example trade data for Bangladesh.

² Exporting partners for each of these countries are comprehensive. That is, they are not limited to the remaining 18 countries.

³ Although IDB data could be used for Australian import values and applied tariff data, more recent ABS data are used in ITAS. As a result, for Australia the excise component of duty collections for petrol products is removed prior to calculating ad valorem tariffs and import values are converted from A\$'000 to US\$ for consistency with all other importing economies included in the system.

Table A.1 Features of primary trade and tariff data for industrial products
By country^a

<i>Country</i>	<i>Number of HS6 products imported^b</i>	<i>Number of trading partners^c</i>	<i>Share of unbound items</i>	<i>Import valuation</i>	<i>Year of import data</i>	<i>Year of applied tariff data</i>
Australia ^d	3911	132	3.4	FOB	2001-02	2001-02
Bangladesh ^e	4444	n/a	96.9	n/a	n/a	1999
Brazil	4233	196	1.0	CIF	2001	2001
Canada	4427	228	23.9	FOB	1999	1999
China	4378	176	1.5	CIF	1999	2001 ^f
EU	4442	203	0.0	CIF	1999	1999
India	3736	138	26.3	CIF	1996	1996
Indonesia	4298	126	7.5	CIF	1997	1999
Japan	4330	212	0.3	CIF	1999	1999
Korea	4349	210	9.7	CIF	1999	1999
Malaysia	4284	188	35.5	CIF	1997	1999
Mexico	4374	203	1.1	FOB	2000	2000
New Zealand	4110	163	0.8	CIF	1999	1999
Philippines	4053	155	40.5	CIF	1999	1999
Singapore	4306	140	33.3	CIF	1999	1999
South Africa	4313	218	31.2	FOB	2000	2000
Taiwan	4289	189	1.6	CIF	1999	1999
Thailand	4262	197	28.6	CIF	1999	1999
US	4428	221	0.0	FOB	1999	1999

^a Data extracted in July 2004 for Brazil and Mexico, and in August 2002 for the other countries. The 19 importing countries included in ITAS are Australia and Australia's main trading partners plus Brazil and Mexico. ^b Total number of HS6 codes for industrial products is 4938. ^c Trading partners that form the EU are counted separately. ^d Australian data collected from ABS imports file, 2002. ^e For Bangladesh applied tariff rates are available. However, there is no information on partners or import values. ^f Applied tariffs for China were extracted from the provisional IDB data for 2002.

Sources: ABS (2002) (Australia only); WTO (1999) (provisional data for China).

Table A.2 **Importing economies included in ITAS and their program abbreviations^a**

<i>Industrialised economies</i>	<i>Abbreviation</i>	<i>Developing economies</i>	<i>Abbreviation</i>	<i>Least developed countries</i>	<i>Abbreviation</i>
Australia	AUS	Brazil	BRA, BRAZ	Bangladesh	BGD, BADE
Canada	CAN	China	CHN, CHIN		
EU	EU, EEC	Hong Kong ^b	HKG, HONG		
Japan	JAP, JPN	India	IND, INIA		
New Zealand	NZ, NZL	Indonesia	IDN, INDO		
Switzerland ^b	CHE, SWIT	Korea	KOR, RKOR		
US	US, USA	Malaysia	MYS, MLAY		
		Mexico	MEX, MEXI		
		Philippines	PHL, PHIL		
		Singapore	SGP, SING		
		South Africa	ZAF, SAFR		
		Taiwan	CHT, TAIW		
		Thailand	THA, THAI		

^a Primary data from the IDB and CTS are available for many other member countries and ITAS could be extended to include them. ^b Hong Kong and Switzerland are included in the master data preparation module in ITAS. However, Hong Kong is excluded from the tariff analysis modules as all of its imports are tariff-free. Switzerland is currently excluded due to the high incidence of non-ad valorem tariffs on its imports. Note: For some countries there are two abbreviations used in ITAS.

Source: Productivity Commission.

Product classifications

This section contains detailed tables defining various sets of industrial products included in ITAS. Table A.3 lists the full set of industrial products. These industrial products are then subdivided into the following sectors:

- textiles, clothing and footwear (table A.4);
- automotive products (table A.5);
- chemical products (table A.6);
- fish products (table A.7);
- timber products (table A.8);
- leather products (table A.9);
- gems products (table A.10); and
- electrical products (table A.11).

The Girard proposal identifies these sectors as containing products ‘of particular export interest to developing and least-developed [member] countries’

(WTO 2003a, p.3). It is suggested that tariffs on products in these sectors be eliminated as part of the Doha round (although the product coverage for each sector still needs to be agreed). Product coverage for each sector is specified in the tables below to allow modelling of a sectoral elimination scenario and to allow tariff analysis within each of these sectors.

Table A.3 Industrial product coverage

<i>HS Section</i>	<i>Inclusions</i>
1. Live animals, animal products	Ch. 3, 0509
2. Vegetable products	nil
3. Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	1504
4. Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes	1603–05, 2301
5. Mineral products	Ch. 25–27
6. Products of the chemical or allied industries	Ch. 28–38 (except 290543, 290544, 3301, 3501–3505, 380910, 382360)
7. Plastics and articles thereof; rubber and articles thereof	Ch. 39–40
8. Raw hides and skins, leather, furskins and articles thereof; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	Ch. 41–43 (except 4101–03, 4301)
9. Wood and articles of wood; wood charcoal; cork and articles of cork; manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork	Ch. 44–46
10. Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard; paper and paperboard and articles thereof	Ch. 47–49
11. Textiles and textile articles	Ch. 50–63 (except 5001–03, 5101–03, 5201–03, 5301, 5302)
12. Footwear, headgear, umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops, and parts thereof; prepared feathers and articles made therewith; artificial flowers; articles of human hair	Ch. 64–67
13. Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware	Ch. 68–70
14. Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin	Ch. 71
15. Base metals and articles of base metal	Ch. 72–83
16. Machinery and mechanical appliances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	Ch. 84–85
17. Vehicles, aircraft, vessels and associated transport equipment	Ch. 86–89
18. Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments; parts and accessories thereof	Ch. 90–92
19. Arms and ammunition; parts and accessories thereof	Ch. 93
20. Miscellaneous manufactured articles	Ch. 94–96
21. Works of art, collectors' pieces and antiques	Ch. 97

Source: WTO (1994).

Table A.4 Textile, clothing and footwear products

<i>HS Section</i>	<i>TCF inclusions</i>
7. Plastics and articles thereof; rubber and articles thereof	392620
8. Raw hides and skins, leather, furskins and articles thereof; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	Ch. 43 (except 4301)
11. Textiles and textile articles	Ch. 50–63 (except 5001–03, 5101–03, 5201–03, 5301, 5302, 530310, 530410, 591190)
12. Footwear, headgear, umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops, and parts thereof; prepared feathers and articles made therewith; artificial flowers; articles of human hair	Ch. 64–65

Source: Productivity Commission.

Table A.5 Automotive products

<i>General description of products</i>	<i>PMV inclusions (HS6)</i>
Plastic or rubber tubes, pipes, hoses; plastic fittings for furniture; transmission belts; tyres; other plastic or rubber articles (nes)	391721, 391722, 391723, 391729, 391731, 391732, 391733, 391739, 392630, 392690, 400910, 400920, 400930, 400940, 400950, 401021, 401022, 401029, 401110, 401120, 401210, 401220, 401691, 401693, 401699
Articles of leather used in machinery, mechanical appliances	420400
Textile products and articles for technical uses (nes)	591190
Heat/sound absorbing/insulating mineral materials; articles of asbestos; brake linings/pads; safety glass; rear-view mirrors; signalling glassware	680690, 681290, 681310, 681390, 700711, 700721, 700910, 701400
Screws/bolts; iron/steel springs; radiators; articles of iron/steel; locks; hinges; mountings	731815, 732010, 732020, 732090, 732211, 732619, 732690, 830120, 830210, 830230
Engines and parts; fuel, lubricating or cooling pumps; fans; air conditioners and parts; filters; hydraulic jacks; valves; bearings; gears; gaskets; electric motors and parts; electric accumulators; spark plugs; starter motors; electrical ignitions and wiring; lighting, signals and lamps; windscreen wipers; cassette players; radios; burglar alarms; electrical switches	840733, 840734, 840790, 840820, 840991, 840999, 841330, 841459, 841520, 841590, 841950, 842123, 842131, 842199, 842489, 842490, 842542, 842549, 848110, 848130, 848140, 848210, 848220, 848240, 848291, 848299, 848310, 848320, 848330, 848340, 848350, 848360, 848390, 848410, 848490, 850110, 850300, 850710, 850790, 851110, 851130, 851140, 851150, 851180, 851190, 851220, 851230, 851240, 851290, 851992, 851993, 851999, 852721, 852729, 853110, 853650, 853910, 854430
Motor vehicles and parts for transport of passengers or goods	870321, 870322, 870323, 870324, 870331, 870332, 870333, 870390, 870421, 870431, 870490, 870600, 870710, 870790, 870810, 870821, 870829, 870831, 870839, 870840, 870850, 870860, 870870, 870880, 870891, 870892, 870893, 870894, 870899
Instruments for measuring flow/level/pressure; revolution counters; speed indicators; automatic regulating or controlling instruments	902610, 902620, 902680, 902910, 902920, 902990, 903289
Motor vehicle seats and parts; cigarette lighters	940120, 940190, 961380

Source: DIST (Department of Industry, Science and Technology), pers. comm., *Review of Automotive Assistance*, Report No. 25, 30 August 2002.

Table A.6 Chemical products

<i>HS Chapter</i>	<i>Chemicals inclusions</i>
28. Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	Ch. 28
29. Organic chemicals	Ch. 29 (except 290543, 290544)
30. Pharmaceutical products	Ch. 30
31. Fertilisers	Ch. 31
32. Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; Inks	Ch. 32
33. Essential oils and resinoids; perfumery, cosmetic or toilet preparations	Ch. 33 (except 3301)
34. Soap; organic surface-active agents, washing preparations lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles, modelling pastes, dental preparations with a basis of plaster	Ch. 34
35. Albuminoidal substances; modified starches; glues; enzymes	Ch. 35 (except 3501–3505)
36. Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	Ch. 36
37. Photographic or cinematographic goods	Ch. 37
38. Miscellaneous chemical products	Ch. 38 (except 380910, 382360)
39. Plastics and articles thereof	Ch. 39 (except 391721, 391722, 391723, 391729, 391731, 391732, 391733, 391739, 392630, 392690) ^a

^a Items in chapter 39 that are included in automotive products are excluded from the chemicals sector.

Source: Productivity Commission.

Table A.7 Fish products

<i>HS Chapter</i>	<i>Fish inclusions</i>
3. Fish and crustaceans, molluscs and other aquatic invertebrates	All items in Ch. 3
5. Products of animal origin, not elsewhere specified or included	0509
15. Animal and vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	1504
16. Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	1603–05
23. Residues and waste from the food industries; prepared animal fodder	2301

Source: Productivity Commission based on WTO (1994).

Table A.8 Timber products

<i>HS Chapter</i>	<i>Timber inclusions</i>
44. Wood and articles of wood; wood charcoal	All items in Ch. 44

Source: Productivity Commission.

Table A.9 Leather products

<i>HS Chapter</i>	<i>Leather inclusions</i>
41. Raw hides and skins (other than furskins) and leather	Ch. 41 (except 4101–03)
42. Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	Ch. 42 (except 420400) ^a

^a Item 420400 (Articles of leather or composition leather, used in machinery, mechanical appliances and similar uses) in chapter 42 is included in automotive products and excluded from the leather products sector.

Source: Productivity Commission.

Table A.10 Gems products

<i>HS Chapter</i>	<i>Gems inclusions</i>
71. Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin	7102–7116

Source: Productivity Commission.

Table A.11 Electrical products

<i>HS Chapter</i>	<i>Electrical inclusions</i>
85. Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	Ch. 85 (except 850110, 850300, 850710, 850790, 851110, 851130, 851140, 851150, 851180, 851190, 851220, 851230, 851240, 851290, 851992, 851993, 851999, 852721, 852729, 853110, 853650, 853910, 854430) ^a

^a Items in chapter 85 that are included in automotive products are excluded from the electrical sector.

Source: Productivity Commission.

B Tariff reduction formulas in ITAS

This appendix provides a detailed discussion of the formulas included in ITAS and how they can be used to achieve tariff reduction goals, including:

- compression (reducing higher tariffs by a larger proportion than lower tariffs);
- targeting the maximum tariff to reduce or eliminate peak tariffs;
- targeting a tariff average; and
- allowing for special and differential treatment for developing and least-developed economies.

These goals can be achieved by combining a formula's mathematical properties and parameter values. For example, compression is achieved by some formulas through their mathematical form, which automatically reduces higher tariffs by a greater proportion than lower tariffs. Other formulas compress tariffs only when combined with appropriate parameter values.

The ability to target a maximum tariff and a tariff average simultaneously requires a formula with at least two parameters. If a formula has only one parameter, it can be used to target either the maximum or the final tariff average, but not both. For example, if the average final tariff is set as the target, then this value in combination with the algebraic expression of the formula, the parameters and the initial tariff distribution determines the maximum.

The simple Swiss formula, the Chinese formula and the Girard formula are each defined by a single parameter that can be interpreted. In the Swiss formula, the parameter represents the maximum possible final tariff. Applying the Swiss formula with a given parameter produces a final tariff structure with a final average tariff. In the Chinese formula and the Girard formula, the parameter relates the maximum final tariff to the base average tariff.

The formulas considered in this appendix are the proportional reduction formula, the European formula, the Korean formula, the Swiss formula, the Flexible Swiss formula, the Chinese formula, and the Girard formula (see Francois and Martin 2003; WTO 2002a, 2002b, 2002c, 2003a, 2003b, 2003d, 2003e).

A summary of how each formula can be used to pursue tariff reduction goals is provided in table B.1.

Proportional reduction formula

The proportional reduction formula reduces all tariffs by the same proportion. Its mathematical form is:

$$T_1 = a_{PR}T_0$$

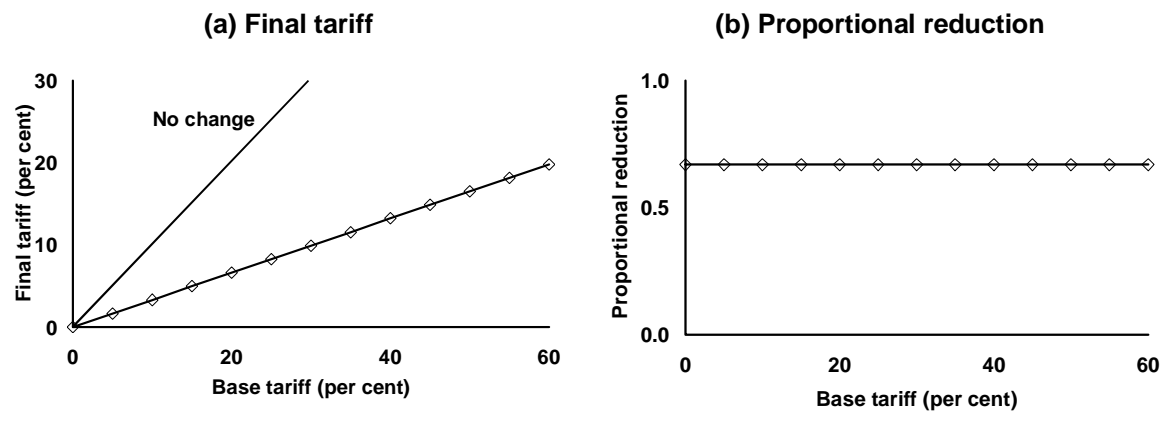
where: T_0 is the base tariff;

T_1 is the final tariff; and

a_{PR} is a parameter between 0 and 1 and is the proportion of the final to the base tariff.

The proportion by which tariffs are reduced is $(1 - a_{PR})$. Thus, if a_{PR} has a value of one third, then all tariffs will be reduced by two thirds.

Figure B.1 **Final tariffs and reductions with proportional reduction formula**
Two thirds reduction



Source: Productivity Commission.

Table B.1 Pursuing tariff reduction goals with each formula

<i>Tariff reduction formula</i>	<i>Compression</i>	<i>Targeting maximum tariff</i>	<i>Targeting tariff average</i>	<i>Special and differential treatment</i>
Proportional reduction	Tariff compression not achieved, but prices compressed.	One parameter. Need to calculate value required to achieve desired maximum.	One parameter. Value of this parameter determines percentage reduction in average tariff.	Explicit treatment required.
European	Partially achieved through constraints on parameter values.	Several parameters. Some can be used to achieve desired maximum.	Several parameters whose value can be constrained to achieve a desired average tariff. Some flexibility in parameter values possible.	Explicit treatment required.
Korean	Partially achieved.	Several parameters. Need to calculate value required to achieve desired maximum. Some flexibility in of parameter values possible.	Several parameters. Need to calculate values required to achieve desired tariff average. Some flexibility in parameter values possible.	Implicit treatment in some cases depending on value of simple base tariff average. Explicit treatment required for members with high base tariff average.
Swiss	Achieved.	One parameter determines the maximum allowable tariff.	One parameter. Need to calculate value required to achieve desired average tariff.	Explicit treatment required.
Flexible Swiss	Achieved.	Two parameters. One can be used to target maximum allowable tariff.	Two parameters. One can be used to target average level of tariffs.	Explicit treatment required.
Chinese	Achieved.	One parameter. Maximum allowable tariff is the product of this parameter and the base tariff average.	One parameter. Need to calculate value required to achieve desired tariff average.	Implicit treatment depends on value of simple base tariff average.
Girard	Achieved.	One parameter. Maximum allowable tariff is the product of this parameter and the base tariff average.	One parameter. Need to calculate value required to achieve desired tariff average.	Implicit treatment depends on value of simple base tariff average.

Source: Productivity Commission.

Compression

As all tariffs are reduced by the same proportion, this formula does not compress tariffs (figure B.1(b)). However, the proportional reduction does reduce duty-paid prices on higher tariff items by a greater proportion than duty-paid prices on low tariff items.

Targeting a maximum tariff

A maximum tariff can be set by determining the proportional reduction required to reduce the highest base tariff to the desired maximum final tariff.

Targeting a tariff average

As all tariffs are reduced by the same proportion, the tariff average is also reduced by this proportion. A specific final tariff average can be targeted by choosing the appropriate parameter value.

Special and differential treatment

To provide for special and differential treatment, different parameter values must be applied to different tariff schedules.

European formula

With the European formula, the base tariff structure is divided into a number of brackets. Tariffs within each bracket are reduced according to a proportional or a linear formula. All base tariffs above a certain level are reduced to a cap (figure B.2(a)).

The European formula is expressed as:

$$T_{1i} = T_1^{Li} + (T_{0i} - T_0^{Li}) [(T_1^{Ui} - T_1^{Li}) / (T_0^{Ui} - T_0^{Li})]$$

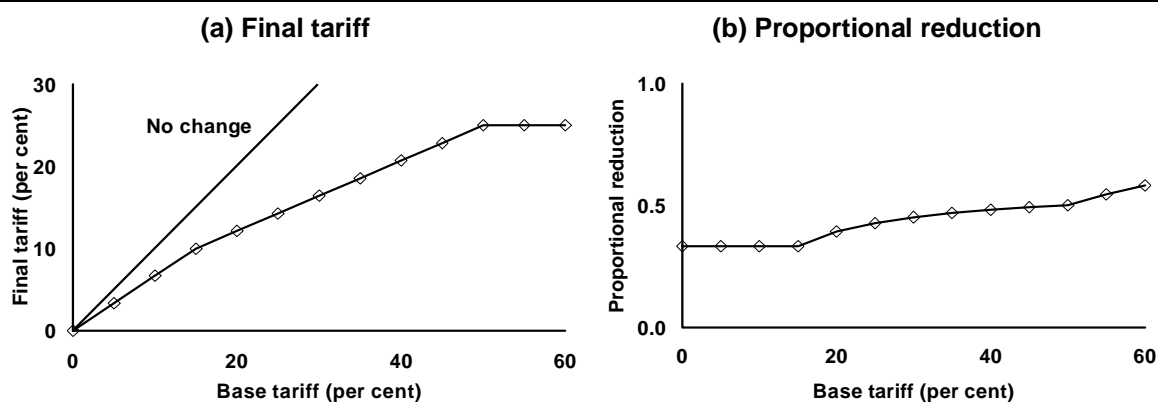
where: T_{0i} and T_{1i} are the base and final tariffs for each product in bracket i ;

T_0^{Ui} and T_0^{Li} are the upper and lower bounds for bracket i in the base tariff structure; and

T_1^{Ui} and T_1^{Li} are the upper and lower bounds for bracket i in the final tariff structure.

Figure B.2 Final tariffs and reductions with European formula

Base tariff brackets 0-15; 15-50 and 50-60. Final tariff brackets 0-10; 10-25; 25



Source: Productivity Commission.

The European formula is very flexible and can be used to approximate other formulas, usually at the cost of an increased number of parameters. The parameters include the number of brackets and the upper and lower bounds of each bracket in the base and final tariff structure. Each bracket adds two additional parameters. The parameters should be chosen to produce a continuous conversion schedule without gaps.¹ The values of the parameters determine the extent to which the tariff reduction goals of compression, targeting a maximum tariff or tariff average, and providing special and differential treatment are achieved.

Compression

With this formula the proportional reduction of a base tariff depends on the reduction of the tariff within its bracket and the position of that bracket in relation to the other brackets (figure B.2(b)). The reduction of a tariff within its bracket is determined by the slope of the schedule.

To ensure that higher base tariffs are reduced by a greater proportion than lower base tariffs, the slopes in each bracket must decrease as base tariffs increase.

Targeting maximum tariff

The maximum allowable tariff is the cap that applies to the last bracket in the final tariff structure. In figure B.2(a), the upper bound of the highest bracket in the final

¹ The formula cannot be used to calculate a final rate from base rates that correspond with a gap in the conversion schedule.

tariff structure is set at 25 per cent, which is the maximum tariff in the final tariff structure.

Targeting tariff average

The tariff average can be targeted by choosing the bracket bounds. This is specific to the base tariff distribution. To achieve a common average, different sets of parameters must be applied to each tariff structure. However, for each structure, many sets of parameters are compatible with the same final average. This flexibility can make it difficult to achieve an agreement in the Doha negotiation context characterised by numerous items for negotiation and a large number of parties.

Special and differential treatment

Special and differential treatment can be accommodated explicitly by allowing different members to set different maximum allowable tariffs or to target different tariff averages.

Korean formula

The Korean formula applies two proportional reductions to different parts of a tariff schedule. It is similar to the European formula with two brackets, and no cap on the final tariff.

First stage

The first reduction is a proportional reduction that is applied to all tariffs:

$$T_1 = a_K T_0$$

where: a_K has a value between 0 and 1.

The proportion by which tariffs are reduced is $(1 - a_K)$. Thus, if a_K is set to 0.8 all tariffs are reduced by 20 per cent.

Second stage

To apply the second reduction, members are divided into two groups and a different formula is used for each group. Which group a member belongs to depends on the following parameters:

A the base tariff average,

c_K a multiple of each member's base tariff average; and

T_m a maximum base tariff above which the second reduction is applied.

One group comprises members with relatively low tariff averages as determined by: $c_K A \leq T_m$. The other group comprises members with relatively high tariff averages determined by $c_K A > T_m$. For example, if $c_K = 2$ and $T_m = 25$, then all members with a tariff average less than or equal to 12.5 per cent belong in the low tariff average group, and all members with a tariff average greater than 12.5 per cent belong in the high tariff average group.

Low tariff average group

For members in the low tariff average group, the formula for the second reduction is:

$$T_1 = a_K T_0 - b_K (T_0 - c_K A)$$

where: b_K is between 0 and 1.

This reduction is only applied to tariffs greater than $c_K A$ (figure B.3(a)). Tariffs affected by this reduction are reduced by a proportion b_K of the difference between the base tariff and $c_K A$. With a_K , b_K and c_K set at 0.8, 0.7 and 2 respectively, a base tariff of 15 per cent in a tariff structure with a tariff average of 5 per cent would be reduced to $0.8 \cdot 15 - 0.7 (15 - 2 \cdot 5) = 8.5$ per cent.

The tariff level at which the second reduction is applied in this group depends on the base tariff average. For example, with $c_K = 2$, the second reduction is applied to base tariffs greater than twice the tariff average. Thus the base tariffs that are affected by the second reduction for members in the low tariff average group depend on each member's base tariff average.

High tariff average group

For members in the high tariff average group, the formula for the second reduction is:

$$T_1 = a_K T_0 - b_K (T_0 - T_m).$$

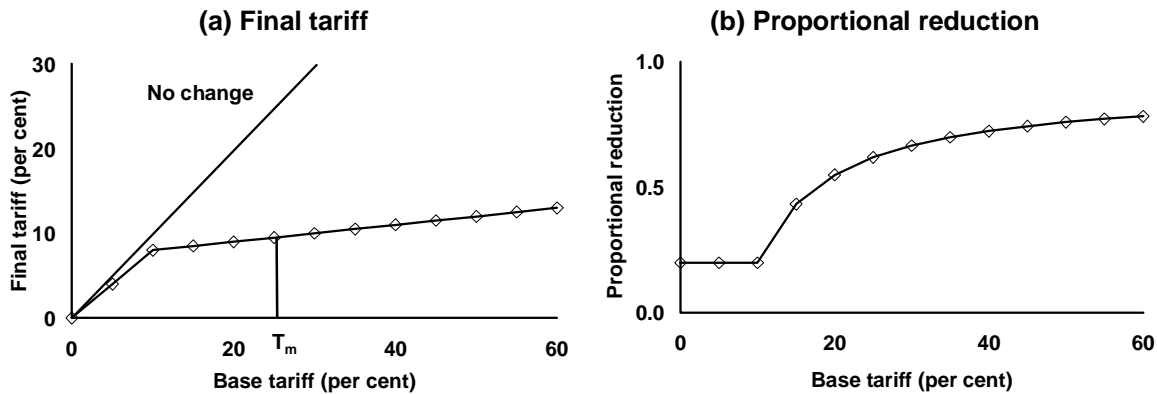
This reduction is only applied to base tariffs that are greater than T_m (figure B.3(c)). Tariffs affected by this reduction are reduced by a proportion b_K of the difference

between the base tariff and T_m . With a_K , b_K and T_m set at 0.8, 0.7 and 25 per cent respectively, a base tariff of 30 per cent is reduced to $0.8 \cdot 30 - 0.7(30 - 25) = 20.5$ per cent.

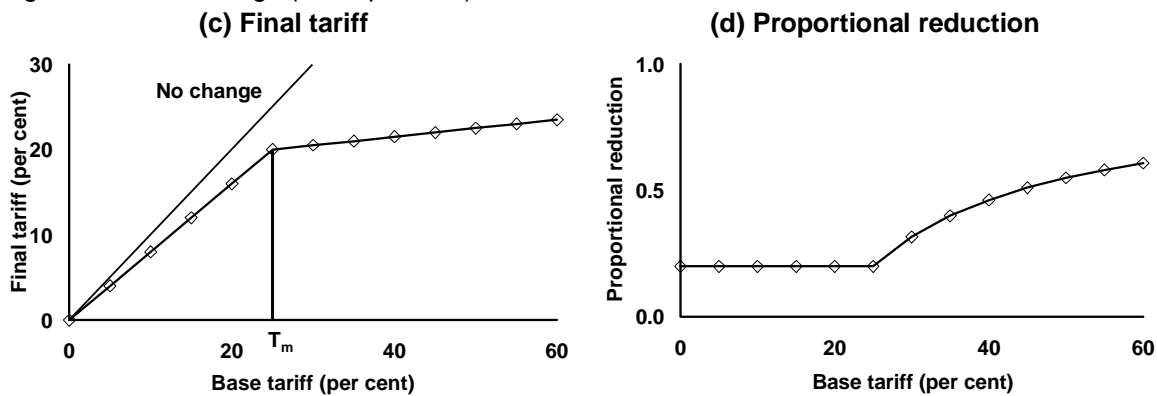
Figure B.3 Final tariffs and reductions with Korean formula

$$a_K = 0.8; b_K = 0.7; c_K = 2; T_m = 25$$

Low base tariff average ($A=5$ per cent)



High base tariff average ($A=35$ per cent)



Source: Productivity Commission.

The tariff level at which the second reduction is applied in this group does not depend on the base average. All tariffs greater than T_m are reduced by the same proportion for all members of this group.

Negative final tariffs

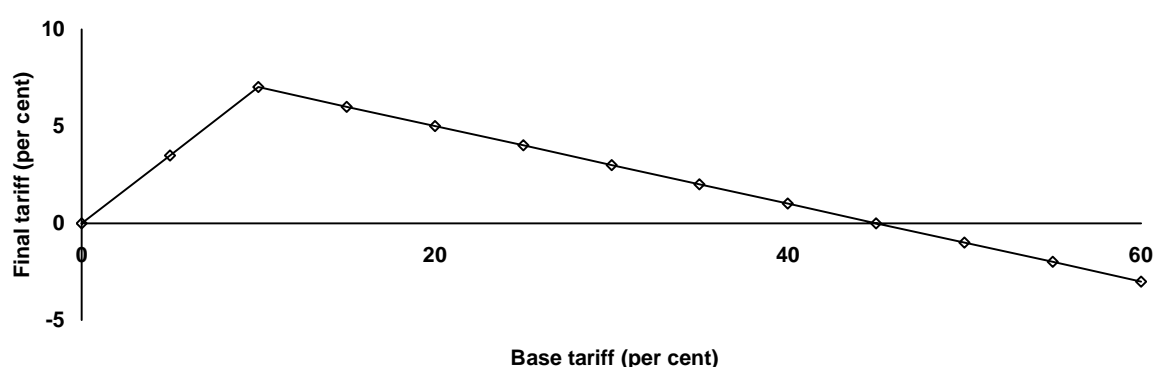
In some circumstances this formula can produce a negative final tariff for some high base tariffs. This occurs if the proportional reduction in the second stage (b_K) is greater than the proportional reduction in the first stage (a_K) and the base tariff is greater than $-b_K c_K A / (a_K - b_K)$ or $-b_K T_m / (a_K - b_K)$ (figure B.4). In the current implementation of ITAS, there are five countries for which the Korean formula using illustrative parameter values of $a_K = 0.7$, $b_K = 0.9$ and $c_K = 2$ will result in

negative final tariffs for some items.² Although these negative final tariffs represent a small proportion of tariffs for these countries, this problem reduces the credibility of the Korean formula as a tool for tariff reduction.

One way to avoid negative final tariffs using the Korean formula is to ensure that $b_K < a_K$, that is, the proportional reduction in the second stage is smaller than the proportional reduction in the first stage. Another solution is to reset any negative final tariffs to zero.

Figure B.4 Korean formula producing negative final tariffs

$a_K = 0.7$; $b_K = 0.9$; $c_K = 2$; average base tariff of 5 per cent



Source: Productivity Commission.

Compression

Tariffs that are only affected by the first reduction are reduced by the same proportion $(1 - a_K)$ and there is no compression. Tariffs affected by both reductions are compressed (figure B.3(b) and figure B.3(d)). Thus, the Korean formula reduces tariff dispersion.

Targeting a maximum tariff

A maximum tariff can be set by determining the reduction required in the highest base tariff to achieve this desired maximum final tariff. The parameters can then be set to achieve this desired reduction. A different value is required to achieve a common target across different tariff schedules. A range of parameter values can be used to achieve a desired reduction.

² Countries affected are EU, Japan, Malaysia, Taiwan and US.

Targeting a tariff average

A tariff average can be targeted by choosing appropriate parameter values. Different sets of parameters are required to target a common average across various tariff schedules.

Special and differential treatment

Separating members into two different groups according to the average of their respective tariff schedules allows for some differential treatment. As tariff averages in industrialised economies tend to be lower than in developing economies, this might be used for special and differential treatment. For example, with a_K set at 2 and a member with a 5 per cent average tariff, the second stage is applied to tariffs greater than 10 per cent; for a member with a 10 per cent average tariff, the second stage is applied to tariffs over 20 per cent. The proportional reduction in tariffs subjected to the second reduction is smaller for members with a high tariff average (figure B.3(b) and figure B.3(d)).

For the high tariff group, the second stage reductions do not depend on the base average. Therefore, within the group, all members are treated similarly, and all reductions follow the same pattern. In the low tariff group, reductions depend on the base average. However, at low average tariffs, there is less scope for variation. For this reason, results are also similar across members in this group.

Swiss formula

The Swiss formula is expressed as:

$$T_1 = (a_s T_0) / (a_s + T_0)$$

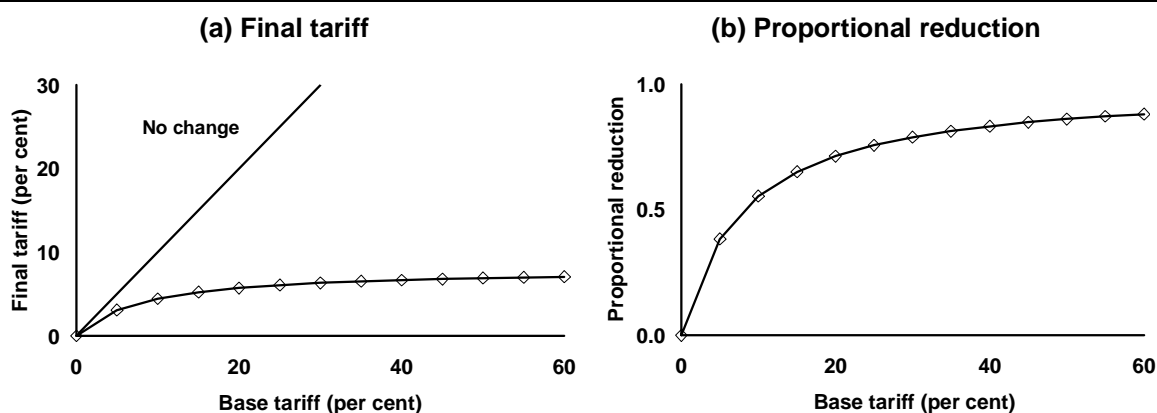
where: a_s is the maximum allowable final tariff (expressed in the same terms as the base and final tariffs).

Compression

This formula reduces high tariffs by a greater proportion than low tariffs (figure B.5(b)).

Figure B.5 **Final tariffs and reductions with the Swiss formula**

Maximum allowable tariff of 8 per cent.



Source: Productivity Commission.

Targeting a maximum tariff

The parameter for this formula sets the maximum allowable final tariff (as the asymptote) (figure B.5(a)). The actual maximum final tariff is less than this value.

Targeting a tariff average

A tariff average can be targeted by calculating the unique value of the parameter needed to achieve the desired tariff average for a base structure. Different base structures require different values of the parameter to achieve the same final tariff average, even if they have the same base tariff average.

Special and differential treatment

Different parameter values are required for different tariff schedules to provide special and differential treatment.

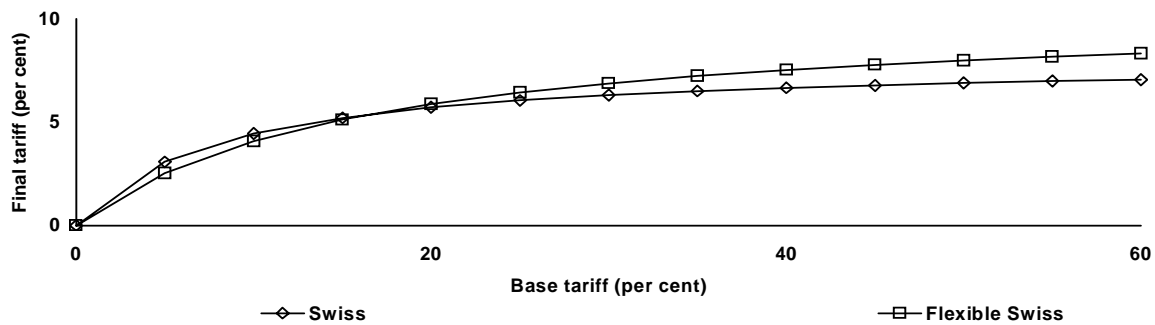
Flexible Swiss formula

Francois and Martin (2003) proposed the Flexible Swiss formula. It is derived from the original Swiss formula by including an extra parameter (the ‘flexibility parameter’) to modify the rate of tariff reduction across a schedule, relative to what would have occurred under the original Swiss formula. Compared with the reductions with the Swiss formula, when both formulas are targeting the same final

tariff average, the Flexible Swiss reduces high tariffs by a smaller amount and low tariffs by a greater amount (figure B.6).

Figure B.6 Comparing final tariffs with Swiss and Flexible Swiss formulas

Final tariff average of 5 per cent; maximum allowable tariff with Swiss formula of 8 per cent; Flexible Swiss parameters, $a_{FS} = 11$, $b_{FS} = 1.5$.



Source: Productivity Commission.

The Flexible Swiss formula is expressed as:

$$T_1 = (a_{FS} T_0) / (a_{FS} b_{FS} + T_0)$$

where: a_{FS} is the asymptote of the formula; and

b_{FS} is the flexibility parameter, with $b_{FS} \geq 1$.

In the Swiss formula, the parameter a_S is interpreted as the maximum allowable tariff. In the Flexible Swiss formula, the parameter a_{FS} can be much larger than the maximum final tariff. With $a_{FS} = a_S$ and $b_{FS} = 1$, the Flexible Swiss formula becomes the original Swiss formula.

If $b_{FS} > 1$, the Flexible Swiss formula produces greater tariff reductions than the original Swiss formula (figure B.7(a)); the difference in the reductions are greater for low tariffs than for high tariffs (figure B.7(b)). If $b_{FS} < 1$, some low base tariffs can be increased rather than reduced.

Compression

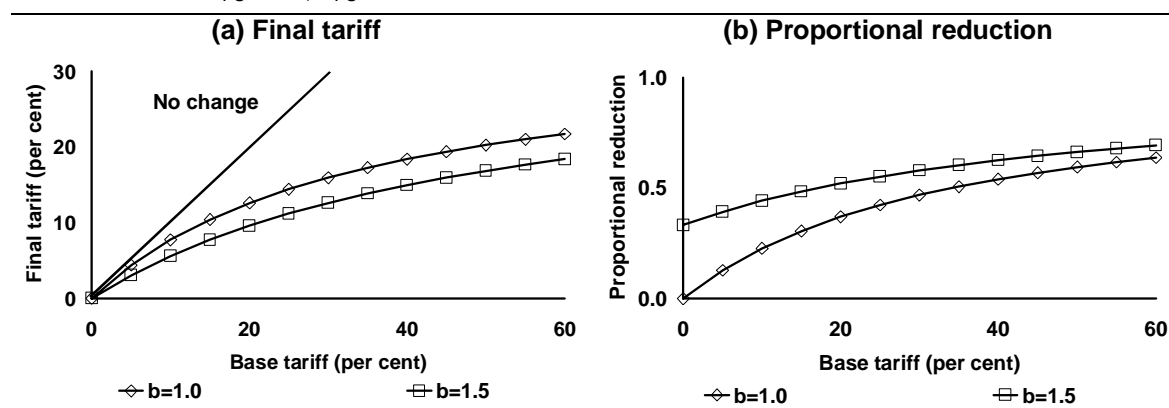
The formula reduces high tariffs by a greater proportion than low tariffs but this effect is less pronounced than in the original Swiss formula (figure B.7(b)).

Special and differential treatment

To provide special and differential treatment, this formula needs to be explicitly applied with different parameter values to different groups of members.

Figure B.7 **Final tariffs and reductions with the Flexible Swiss formula**

$a_{FS} = 34$; $b_{FS} = 1.0^a$ and 1.5



^a With $b_{FS} = 1$, the Flexible Swiss formula reduces to the original Swiss formula, where $a_S = a_{FS}$.

Source: Productivity Commission.

Targeting maximum tariff and tariff average

As this formula has two parameters it can be used to target both a maximum final tariff and a final tariff average.

In this appendix, parameter values for a Flexible Swiss scenario are calculated based on the Swiss8 scenario. For each member, this process involves specifying a maximum tariff (15 per cent where possible, but this is modified for some tariff structures for which a 15 per cent target was incompatible), calculating a target for the average tariff and subsequently deriving parameter values for the Flexible Swiss scenario that are consistent with the target. Note that for most members the value of a_{FS} required to meet these targets is much larger than the specified maximum bound tariff (table B.2).

File FSsolvers.xls can be used to derive other values for a_{FS} and b_{FS} for other countries or other targets. The solutions are calculated using the Excel Solver function, as explained in the file and outlined in appendix E.

Table B.2 **Values for a_{FS} , b_{FS} , maximum bound tariff and target average tariffs in Flexible Swiss scenario**

Country	Target for average bound tariff ^a	Target for maximum bound tariff ^b	a_{FS}	b_{FS}
Australia	3.62	15.0	53	2.63
Bangladesh	5.27	15.0	19	2.75
Brazil	6.12	15.0	62	4.29
Canada	2.45	11.0	116	2.06
China	3.83	15.0	40	2.08
EU	2.18	15.0	25	1.53
India	6.27	15.0	27	4.36
Indonesia	6.26	15.0	32	4.39
Japan	1.30	15.0	225	1.77
Korea	3.81	13.0	132	2.55
Malaysia	3.22	15.0	17	2.15
Mexico	6.48	9.0	81	4.94
New Zealand	3.12	12.0	105	3.32
Philippines	4.81	14.0	248	3.37
Singapore	1.97	4.4	8	1.00
South Africa	3.06	15.0	84	3.28
Taiwan	2.36	15.0	26	1.65
Thailand	5.20	15.0	38	3.20
US	1.76	15.0	47	1.75

^a Under the Flexible Swiss scenario, the target for the average bound tariff is the average bound rate that results from the Swiss8 scenario for each member. ^b The target maximum bound tariff for the Flexible Swiss scenario is typically 15 per cent. Targets for Canada, Korea, Mexico, New Zealand, Philippines and Singapore were kept lower to restrict the parameters for those countries to sensible values in the solution process.

Note: final applied rates for the Flexible Swiss scenario are calculated in the same manner as applied rates for other scenarios.

Source: Productivity Commission estimates.

Chinese formula

The Chinese formula is:

$$T_1 = ((A + b_C p)T_0) / (A + p^2 + T_0)$$

where: A is a simple average of the base tariffs;

p is termed the 'peak factor' and is equal to T_0/A ; and

b_C is an 'adjusting coefficient', with $b_C \geq 1$.

Substituting in the term T_0/A for p produces the expression:

$$T_1 = [(A + b_C (T_0/A))T_0] / [A + (T_0/A)^2 + T_0].$$

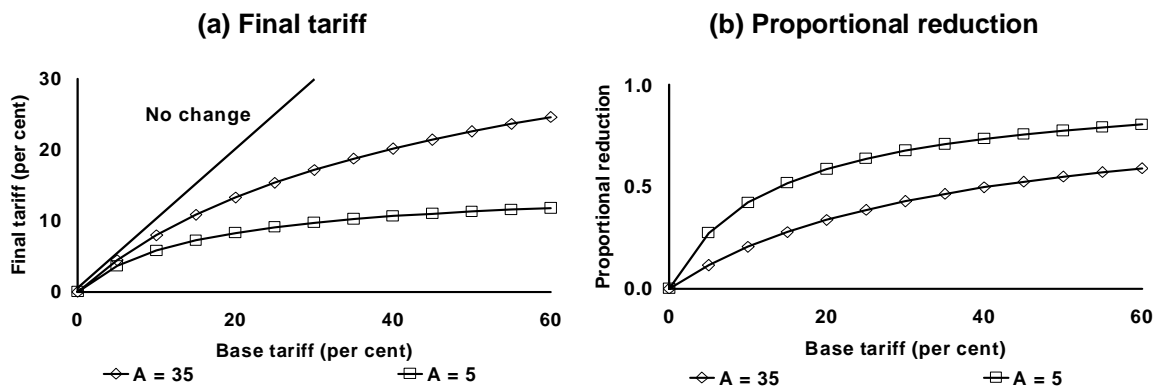
In the Chinese formula, only b_C needs to be agreed by members as A is determined by the existing tariff structure.

The effect of inserting A in the formula is that the reduction of a base tariff depends on the member's average tariff. As a result:

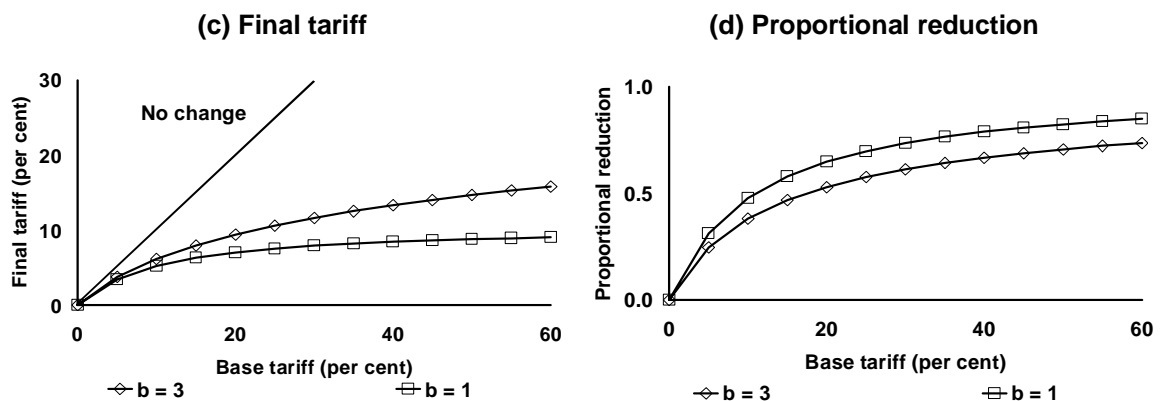
- a base tariff has a large proportional reduction if it is in a tariff structure with a low average tariff (figure B.8(b));
- a high value of b_C produces a small proportional reduction in the base tariff (figure B.8(d)); and
- the maximum possible final tariff is given by $A \cdot b_C$. Thus, if b_C is set at three, then the maximum possible tariff is three times the average base tariff.

Figure B.8 Final tariffs and reductions with the Chinese formula

Effect of different averages (A) in the base tariff structure ($b_C = 3$, both examples)



Effect of different values for b_C ($A = 10$ per cent in both examples)



Source: Productivity Commission.

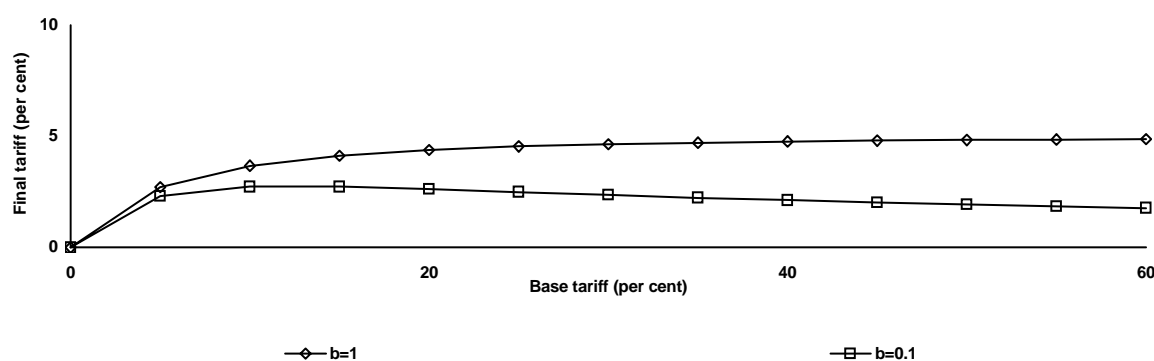
Preserving the ranking of base tariffs

The adjusting coefficient should be set equal to one or greater. Values less than one may result in some high base tariffs being reduced below the final level of some low base tariffs (figure B.9). This causes the ranking of final tariffs to differ from the initial ranking of base tariff. For example, when applying the Chinese formula with b_C set at 0.1 to a tariff structure with a tariff average of 5 per cent, a base tariff of 10 per cent is reduced to 3, and a base tariff of 30 per cent is reduced to 2.

If the ranking of base tariffs is to be maintained in the final tariff structure, the Chinese formula may not be able to achieve some target average final tariffs. This is more likely to occur for low final tariff average targets or large targeted reductions in the tariff average.

Figure B.9 Final tariffs with an adjusting coefficient less than one

A = 5 per cent



Source: Productivity Commission.

Low tariffs in low average base tariff structures

In some cases, applying the Chinese formula results in an increase in the final tariff rather than a reduction. This occurs for base tariffs less than $b_C A - A^2$. For example, if $b_C = 3$ and $A = 1$, then base tariffs between 0 and 2 per cent are increased rather than decreased. However, if $b_C = 1$, then all base tariffs are reduced (figure B.10).

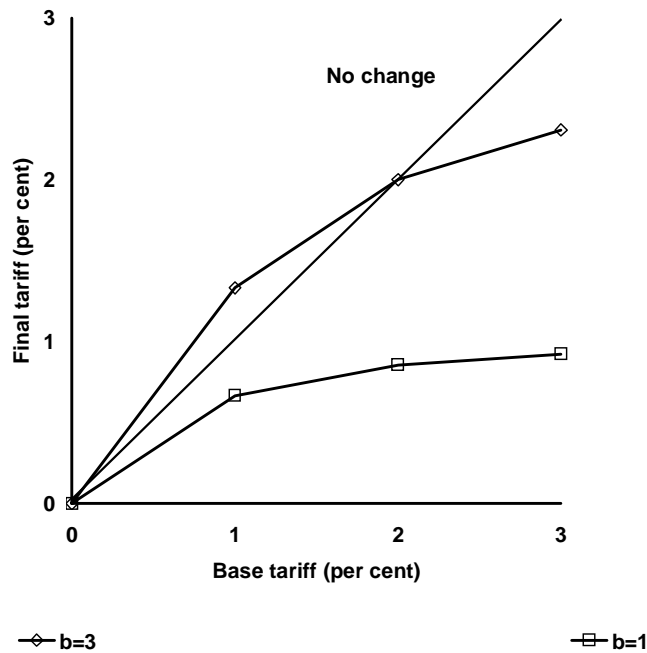
The range of base tariffs affected by this feature of the Chinese formula depends on the values of b_C and A . High values of b_C increase the range of base tariffs to be affected, whereas high values of A reduce the range of base tariffs affected.

For the proposed range of values of b_C (1 to 3), only low tariffs in low average base tariff structures are affected. For example, for $b_C = 3$, only tariff structures with $A \leq 3$ per cent are affected. In a tariff structure with $A = 1.5$ per cent, the highest

base tariff to be affected is 2.25 per cent. Dispersion can be decreased in this process, however, it is at the cost of increasing low tariffs.

Figure B.10 **Final tariffs for low tariffs in a low tariff structure with Chinese formula**

1 per cent average base tariff



Source: Productivity Commission.

Compression

The Chinese formula has a mathematical form similar to the Swiss formula, which means higher base tariffs will be reduced by a greater proportion than lower base tariffs (figure B.8(b) and figure B.8(d)). With an appropriate choice of b_C , this leads to compression, that is, no tariff is increased.

Targeting maximum tariff

As b_C and A determine the maximum possible tariff, a maximum allowable tariff can be set via b_C . Thus tariff structures with different A s require different values of b_C to have the same maximum final tariff.

Targeting tariff average

This formula can be used to target a tariff average for a given tariff structure in a similar way to the Swiss formula.

Special and differential treatment

Special and differential treatment is provided implicitly in this formula by the inclusion of A . For a given b_G , a member with a higher A reduces tariffs by a smaller proportion and has a higher allowable maximum tariff than other members. Special and differential treatment can also be provided explicitly by varying b_G .

Girard formula

The Girard formula is:

$$T_f = (b_G A T_0) / (b_G A + T_0)$$

where: A is a simple average of the base tariffs; and

b_G is a parameter, with $b_G > 0$.

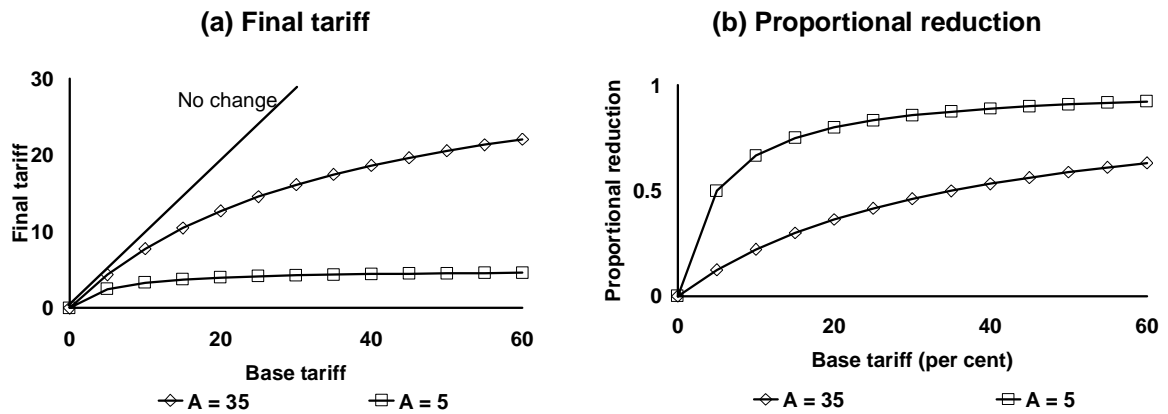
The Girard formula may be re-written as a Swiss formula, since $a_s = A \cdot b_G$. Thus the maximum allowable final tariff is a multiple (b_G) of the base tariff average (A) and, for any given tariff schedule, the Girard formula and its Swiss formula equivalent have the same properties.

However, the Girard formula also operates in a similar way to the Chinese formula in that:

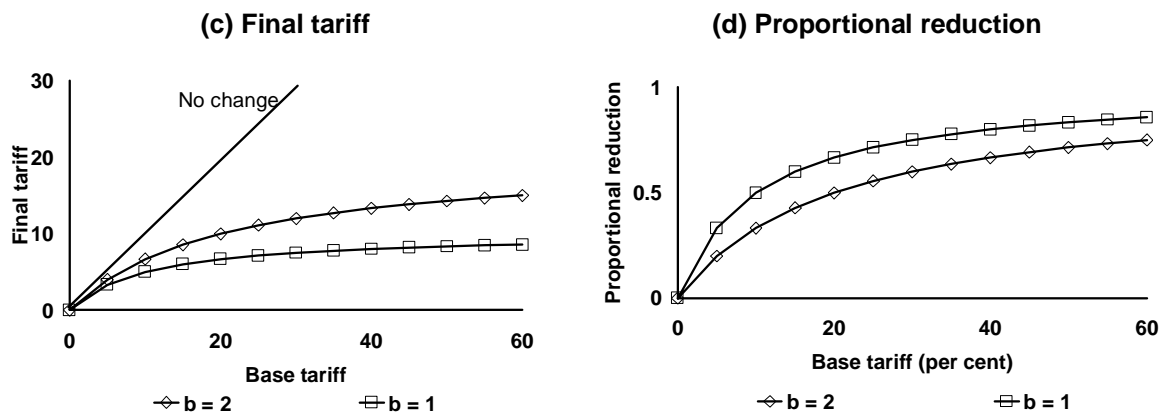
- the effect of A is that the reduction in a tariff depends on the member's base average tariff;
- only b_G needs to be agreed by members, as A is determined by the existing tariff structure;
- a base tariff has a large proportional reduction if it is in a tariff schedule with a low average tariff (figure B.11(b));
- a high value of b_G produces a small proportional reduction in the base tariff (figure B.11(d)); and
- the maximum possible final tariff is given by $A \cdot b_G$. Thus, if b_G is set at two, then the maximum possible tariff is twice the average base tariff.

Figure B.11 Final tariffs and reductions with the Girard formula

Effect of different averages (A) in the base tariff structure ($b_G = 1$, both examples)



Effect of different values for b_G ($A = 10$ per cent in both examples)



Note: the charts in panels (a) and (b) use the Girard formula ($b_G = 1$) with $A = 5$ and 35 . These formulas are equivalent to the Swiss formula with a parameter of 5 and 35 , respectively. The charts in panels (c) and (d) use the Girard formula ($A = 10$) with $b_G = 1$ and 2 . These formulas are equivalent to the Swiss formula with a parameter of 10 and 20 , respectively.

Source: Productivity Commission.

Compression

The Girard formula has a mathematical form similar to the Swiss formula, which means higher base tariffs will be reduced by a greater proportion than lower base tariffs (figure B.11(b) and figure B.11(d)). With an appropriate choice of b_G , this leads to compression, that is, no tariff is increased.

Targeting maximum tariff

As b_G and A determine the maximum possible tariff, a maximum allowable tariff can be set via b_G . Thus tariff structures with different A s require different values of b_G to have the same maximum final tariff.

Targeting tariff average

This formula can be used to target a tariff average for a given tariff structure in a similar way to the Swiss formula.

Special and differential treatment

Special and differential treatment is provided implicitly in this formula by the inclusion of A . For a given b_G , a member with a higher A reduces tariffs by a smaller proportion and has a higher allowable maximum tariff than other members. Special and differential treatment can also be provided explicitly by varying b_G .

C The cost of aggregation

Some countries use a disaggregated tariff classification to distinguish items within an HS6 category that may have different tariffs. However, not all HS6 categories are further disaggregated in a tariff schedule.¹

In practice, tariffs are imposed, and tariff reductions are made, at the line item (HSx) level. However, to allow maximum flexibility in ITAS and still be able to make the system publicly available, we simplify by aggregating the data to the 6-digit level prior to analysis. Analysis at the HS6 level may involve some loss of information and lead to differences in results. These differences are the cost of aggregation.

The purpose of this appendix is to estimate the magnitude of differences between results based on calculations at the HS6 level and at the line item (HSx) level. The analyst must then decide whether the differences are acceptable in the context of their analysis.

The source data for some countries is only provided at the HS6 level (for example, India). For these countries, there is no cost in aggregating to HS6 prior to analysis. For the remaining countries, the cost of aggregation has three components:

- differences between average tariffs estimated from the HS6-level data and at the line item (HSx) level;²
- the removal of dispersion among tariffs on line items within an HS6 category; and
- the effects of formulas imposed at the HS6 level and at the HSx level.

Results in the following sections do not account for the effects of trade weights.³

¹ For ease of exposition, we refer to the disaggregated level (which typically refers to tariff line items) as HSx. Many countries use an HS8 classification while others use an HS10 classification. Very few use an HS12 or more detailed classification. The lower levels of aggregation are based on classification systems that are peculiar to each country or customs territory concerned. Only the HS6 classification is consistent across countries.

² Given tariffs at the HS6 level and the number of line items in each HS6 category in the ITAS master data, an average over line items can be calculated as a weighted average using the proportion of line items in each HS6 category as weights.

Tariffs averaged over line items or HS6 categories

In ITAS, average tariffs are calculated using data at the HS6 level. These averages assume that each HS6 category contributes equally to the average. An alternative assumption might be that each line item contributes equally to the average tariff. Under this assumption, the more line items in an HS6 category, the larger its contribution to the average.

For example, assume there are only two HS6 categories: *a* and *b*. Category *a* contains two line items and category *b* contains four line items. Each item contributes equally to an average tariff calculated at the HSx level (and thus category *b* contributes more to the HSx-based average than category *a*). However, an average tariff calculated at the HS6 level implies each HS6 category has an equal contribution and thus each item in category *a* contributes twice as much to the average as each item in category *b*.

Whether the HSx average is higher than the HS6 average depends on the level of the tariff for each line item relative to the HS6-based average. For example, if the tariffs on the line items in category *b* are higher than those in category *a*, then the HSx-based average is higher than the HS6-based average.

Table C.1 shows average bound and applied tariffs calculated by taking a simple average for:

- tariff data at the HSx level; and
- tariff data that has been aggregated to the HS6 level (by taking simple averages).

Average bound rates

For most countries, there is little or no difference between average bound tariffs calculated at the HS6 level or at the line item level. For the few countries for which the averages differ by more than 5 per cent, the average bound tariff calculated from HSx-level data tends to be higher than the corresponding average calculated from HS6-level data.

³ Results in this appendix use data from the same source as the ITAS master database. However, some results using HS6 data in this appendix may differ from those presented in other parts of this paper. These differences arise because the master data in ITAS includes solutions to other data issues (see table 2.2) that are not incorporated in the data used for the analysis in this appendix. As a result, the cost of aggregation as presented in this appendix is only indicative of the simplified ITAS estimates.

For EU, Indonesia, Mexico, Philippines, Taiwan and Thailand, the average bound tariff across line items is up to 10 per cent higher than the average bound tariff across HS6 categories. Malaysia, New Zealand, South Africa, and the US each have an average bound tariff across line items that is between 10 and 15 per cent higher than the corresponding average across HS6 categories.

For Brazil, Canada, China, Korea and Singapore, the average bound tariff across line items is up to 6.5 per cent lower than the average bound tariff across HS6 categories.

Bound tariff data for Australia, Bangladesh, India and Japan are provided at the HS6 level. Thus, for each of these countries, their HS6-based average bound tariff is the same as their HSx-based average bound tariff.

Average applied rates

ITAS uses the latest available information to estimate post-Uruguay applied rates that are consistent with post-Uruguay bound rates.⁴ An examination of recent applied rates should provide some idea of the difference resulting from averaging applied rates over HS6 categories rather than over line items.

For most countries, there is little or no difference between average applied tariffs calculated at the HS6 level or at the line item level. For the few countries for which the averages differ by more than 5 per cent, the average applied tariff calculated from HSx-level data tends to be higher than the corresponding average calculated from HS6-level data.

For Australia, Bangladesh, EU, Indonesia, Malaysia, New Zealand, South Africa and the US, the average tariff across line items is up to 9 per cent higher than the average tariff across HS6 categories. Japan's average tariff across line items is almost 18 per cent higher than its average tariff across HS6 categories. This reflects small differences that affect a low average tariff of about 2 per cent.

For Brazil, Canada, China, Korea, Mexico, Philippines, Taiwan and Thailand, the average tariff across line items is up to 7 per cent lower than the average tariff across HS6 categories.

⁴ The analysis in this section of differences between average applied rates at the HSx and HS6 levels abstracts from the complications introduced by estimating post-Uruguay applied rates.

The two estimates of the average applied rate for India are the same as the data are provided at the HS6 level. Singapore's applied rates are all zero.

Table C.1 **Tariff averages calculated using line items (HSx) and aggregated (HS6) data**

Averages for industrial products only, per cent and per cent differences^{a,b,c}

Importing country	Bound rates				Applied rates			
	HSx level	Average tariff (HSx)	Average tariff (HS6)	Difference between estimates	HSx level	Average tariff (HSx)	Average tariff (HS6)	Difference between estimates
Australia	HS6	11.0	11.0	0.0	HS8	6.4	6.4	0.6
Bangladesh	HS6	45.2	45.2	0.0	HS8	22.0	21.7	1.5
Brazil	HS8	28.2	29.4	-4.1	HS8	15.2	16.0	-4.6
Canada	HS8	5.2	5.4	-3.9	HS8	4.7	5.0	-6.7
China	HS8	9.0	9.1	-1.6	HS8	11.1	11.2	-0.8
EU	HS8	4.0	3.9	1.7	HS8	4.8	4.7	0.6
India	HS6	34.2	34.2	0.0	HS6	36.7	36.7	0.0
Indonesia	HS9	36.2	36.0	0.4	HS9	8.0	8.0	1.2
Japan	HS6	2.3	2.3	0.0	HS9	2.3	1.9	17.9
Korea	HS10	9.6	10.2	-6.5	HS10	7.7	7.8	-1.3
Malaysia	HS9	14.6	12.7	15.4	HS9	9.2	8.5	8.9
Mexico	HS8	34.9	34.9	0.1	HS8	17.6	18.4	-4.5
New Zealand	HS8	12.1	10.9	11.8	HS8	4.4	4.3	1.7
Philippines	HS8	20.4	20.4	0.1	HS8	9.1	9.1	-0.7
Singapore	HS9	6.3	6.3	-0.1	HS9	0.0 ^d	0.0 ^d	0.0 ^d
South Africa	HS8	14.0	12.2	14.7	HS8	8.0	7.6	6.1
Taiwan	HS8	4.9	4.7	2.6	HS8	6.8	6.8	-0.4
Thailand	HS6	23.6	23.6	0.2	HS10	15.5	15.6	-0.4
US	HS8	3.6	3.2	10.6	HS8	4.1	3.9	5.8

^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b Averages calculated as the sum of tariffs divided by either the number of tariff line items (for HSx) or the number of HS6 categories (for HS6). ^c Unbound items have not been replaced with maximum applied rates. ^d Applied tariffs for Singapore are all zero.

Source: Based on WTO (1999, 2001).

Tariff dispersion within HS6 categories

Analysing tariffs at the HS6 level and at the line item level can give a different impressions of the distribution of tariffs in a schedule if there is dispersion among tariffs within each HS6 category.

For bound and applied tariffs, the extent of this difference can be gauged by examining:

- the number of HS6 categories affected by rate dispersion; and
- the difference between the tariff on each line item and the average tariff for the HS6 category to which the item belongs.

Bound rate dispersion

Table C.2 shows the number of HS6 categories affected by dispersion in bound rates. More than half of the countries included in the current implementation of ITAS have very few HS6 bound rates affected by dispersion. For these countries, presenting tariff information at the HS6 level will provide a mostly reliable indication of the structure of tariffs at the line item level.

Of the 19 countries in the current implementation of ITAS, there are nine countries for which less than 5 per cent of HS6 categories contain differences in bound rates on line items. For these countries there will be little or no difference between a tariff schedule presented at the HS6 level and one presented at the line item level.

For three countries, 5–10 per cent of HS6 items are affected by dispersion in bound rates. In four countries, bound rate dispersion affects between 10 and 15 per cent of HS6 categories. The remaining three countries have 20–35 per cent of HS6 categories affected by bound rate dispersion.

For some countries, such as Canada, EU, South Africa and the US, the large share of HS6 items affected by dispersion is mainly due to their large proportion (more than 10 per cent) of HS6 categories that include line items that are not subject to tariffs.

For countries with the most HS6 categories affected by bound rate dispersion, the difference in the structure of the tariff schedule depends on the dispersion of tariffs on line items in each HS6 category.

Table C.2 Number of HS6 items affected by bound rate dispersion^{a,b}

Importing country	HSx level	Total number of HS6 items ^c	HS6 items affected by rate dispersion		HS6 items affected by rate dispersion that include HSx tariff equal to zero	
			Number	Percent of total HS6	Number	Percent of total HS6
Australia	HS6	4284	0	0.0	0	0.0
Bangladesh ^d	HS6	139	1	0.7	0	0.0
Brazil	HS8	4444	283	6.4	27	0.6
Canada	HS8	4437	1026	23.1	524	11.8
China	HS8	4444	363	8.2	43	1.0
Taiwan	HS8	4422	606	13.7	181	4.1
EU	HS8	4421	702	15.9	443	10.0
Indonesia	HS9	4269	66	1.5	5	0.1
India	HS6	2835	0	0.0	0	0.0
Japan	HS6	4421	0	0.0	0	0.0
Malaysia	HS9	4444	305	6.9	8	0.2
Mexico	HS8	3608	460	12.7	127	3.5
New Zealand	HS8	4426	746	16.9	356	8.0
Philippines	HS8	2749	49	1.8	5	0.2
Korea	HS10	4160	181	4.4	78	1.9
South Africa	HS8	4535	1601	35.3	812	17.9
Singapore	HS9	2869	7	0.2	6	0.2
Thailand ^e	HS6	2456	14	0.6	0	0.0
US	HS8	4332	1158	26.7	610	14.1

^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level. ^b An HS6 bound rate is affected by dispersion if it is unequal to the HSx rates from which it is aggregated. ^c Number of HS6 categories including line items subject to binding commitments. ^d The CTS file for Bangladesh contains one HS6 item that contains two seven digit classifications, with different bound rates. This item is not labelled as a tariff line suffix. ^e The CTS file for Thailand contains 14 HS6 items that contain two or more seven digit classifications, with different bound rates. These items are not labelled as a tariff line suffix.

Source: Based on WTO (2001).

For most countries in ITAS, the HSx bound tariffs are close to the average bound rate for the HS6 category to which they belong. Table C.3 shows the proportion of HSx bound tariffs that are equal to their corresponding HS6 average and the proportion within 20 per cent of their corresponding HS6 average.

In four countries (Indonesia, Korea, Philippines and Singapore), up to 10 per cent of HSx tariffs are different from their corresponding HS6 average. However, up to half of these items have tariffs within 20 per cent of the average bound rate for the corresponding HS6 category.

In three countries (Brazil, China and Mexico), 10–20 per cent of HSx tariffs are different from their corresponding HS6 average. For these countries, only 3–8 per

cent of line items have tariffs that are not within 20 per cent of the average for the corresponding HS6 category.

Five countries (Canada, EU, Malaysia, New Zealand and Taiwan) have 25–40 per cent of HSx tariffs that differ from their corresponding HS6 average. However, 70–80 per cent of line items have tariffs that are within 20 per cent of the average for the corresponding HS6 category.

For the remaining two countries (South Africa and US), 40–50 per cent of HSx tariffs are equal to their corresponding HS6 average and 60 per cent of HSx tariffs are within 20 per cent of the corresponding HS6 averages.

Table C.3 HSx bound tariffs within 20 per cent of corresponding HS6 rates^a

<i>Importing country</i>	<i>Number of HSx items^b</i>	<i>HSx rates equal to HS6 rates</i>	<i>HSx rates within 20 per cent of corresponding HS6 rate</i>
	Number	Per cent	Per cent
Australia	4284	100.0	100.0
Bangladesh	141	98.6	100.0
Brazil	8404	81.9	96.5
Canada	6858	59.4	71.6
China	6099	83.1	91.6
EU	8263	68.3	79.1
India	2835	100.0	100.0
Indonesia	5913	96.0	99.3
Japan	4421	100.0	100.0
Korea	8586	90.7	94.6
Malaysia	6017	71.4	80.0
Mexico	10224	81.4	96.6
New Zealand	6053	64.8	70.9
Philippines	2858	96.2	96.7
Singapore	3288	99.5	99.5
South Africa	11570	39.2	58.8
Taiwan	7174	71.9	82.6
Thailand	2513	98.8	99.4
US	8091	48.7	59.8

^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level. ^b Number of HSx items subject to binding commitments.

Source: Based on WTO (2001).

The charts in figures C.1–C.4 at the end of this appendix illustrate the dispersion of line item rates relative to their corresponding HS6 category average. The horizontal axis shows the percentage difference from the HS6 average and the vertical axis

shows the percentage of HSx items in each percentage difference band. The central spike shows the percentage of HSx items that are equal to their HS6 average.

The closer the central spike is to 100 per cent, the less a country's average bound tariff is affected by the aggregation used in ITAS. For five countries (Australia, Bangladesh, India, Japan and Thailand) the analysis is unaffected by the aggregation as their bound tariff data are supplied at the HS6 level.

For some countries, there are also spikes at –100 per cent and 100+ per cent. For Canada, the spike at –100 indicates that 9 per cent of zero-tariff line items are included in HS6 categories with a non-zero tariff. The spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages.

Applied rate dispersion

The dispersion of applied tariffs within each HS6 category can be gauged by examining the difference between bilateral HSx tariffs and the corresponding HS6 estimates. Applied tariffs are based on the latest available data. ITAS uses this data and post-Uruguay bound rates (aggregated to the HS6 level) to estimate post-Uruguay applied rates. The process used to derive these estimates (outlined in box 2.2) may reduce the dispersion among post-Uruguay applied rates for line items within an HS6 category, as current applied rates are reduced to be consistent with post-Uruguay commitments.

Most countries have less than 10 per cent of (bilateral) HS6 tariffs affected by dispersion in (bilateral) applied rates at the line item level (table C.4).⁵ For these countries, an applied tariff schedule presented at the HS6 level should provide a reliable indication of the structure of applied rates at the line item level.

Canada, Mexico and the US have 10–16 per cent of bilateral HS6 tariffs affected by dispersion. Whether the structure of applied tariffs at the line item level appears different from the HS6 level will depend on the degree of variability within the HS6 categories affected by dispersion.

Canada, Malaysia and New Zealand are the only countries for which dispersion is mainly due to the presence of zero-tariff items in HS6 categories.

⁵ Applied tariffs in this analysis are bilateral. Aggregation from the HSx to the HS6 level involves averaging bilateral applied rates across line items to calculate an HS6 average tariff specific to each partner.

Table C.4 Number of HS6 items affected by applied rate dispersion^a

Importing country	HSx level	Total number of HS6 items imported	HS6 items affected by rate dispersion		HS6 items affected by rate dispersion that include HSx tariff equal to zero	
			Number	Percent of total HS6	Number	Percent of total HS6
Australia	HS8	74831	4562	6.1	3148	4.2
Bangladesh	HS8	4437	233	5.3	77	1.7
Brazil	HS8	55308	4590	8.3	729	1.3
Canada	HS8	92880	10902	11.7	9075	9.8
China	HS8	65308	4467	6.8	521	0.8
EU	HS8	151486	13570	9.0	4627	3.1
India	HS6	40375	0	0.0	0	0.0
Indonesia	HS9	54937	3674	6.7	1137	2.1
Japan	HS9	60210	3342	5.6	575	1.0
Korea	HS10	55530	1205	2.2	199	0.4
Malaysia	HS9	52202	3419	6.5	1896	3.6
Mexico	HS8	79721	12651	15.9	477	0.6
New Zealand	HS8	53024	3936	7.4	3020	5.7
Philippines	HS8	40971	2538	6.2	0	0.0
Singapore	HS9	68733	0	0.0	0	0.0
South Africa	HS8	67131	5564	8.3	4339	6.5
Taiwan	HS8	57363	5047	8.8	731	1.3
Thailand	HS10	45567	506	1.1	69	0.2
US	HS8	108306	17360	16.0	5757	5.3

^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

Source: Based on WTO (1999).

For most countries in ITAS, the HSx applied tariffs for each trade route are close to the average applied rate for the HS6 category (and trade route) to which they belong. Table C.5 shows the proportion of HSx applied tariffs that are equal to their corresponding HS6 average and the proportion within 20 per cent of their corresponding HS6 average.

For two countries (India and Singapore), the analysis is unaffected by the aggregation in ITAS, as their applied tariff data do not vary below the HS6 level.

In two countries (Korea and Thailand), less than 10 per cent of HSx tariffs are different from their corresponding HS6 average.

Thirteen countries (Australia, Bangladesh, Brazil, Canada, China, EU, Indonesia, Japan, Malaysia, New Zealand, Philippines, South Africa and Taiwan) have 11–24 per cent of HSx tariffs that differ from their corresponding HS6 average. Up to 9

per cent of HSx items for these countries have tariffs within 20 per cent of the average applied rate for the corresponding HS6 category.

For the remaining two countries (Mexico and US), 63–67 per cent of HSx tariffs are the same as their corresponding HS6 average and 76–83 per cent of HSx tariffs are within 20 per cent of the corresponding HS6 averages.

Table C.5 HSx applied tariffs within 20 per cent of corresponding HS6 rates^a

<i>Importing country</i>	<i>Number of HSx items imported</i>	<i>HSx rates equal to HS6 rates</i>	<i>HSx rates within 20 per cent of corresponding HS6 rate</i>
	Number	Per cent	Per cent
Australia	82971	87.7	88.5
Bangladesh	5311	88.4	90.9
Brazil	77793	76.6	83.0
Canada	115999	77.8	79.7
China	76189	85.5	92.5
EU	218594	79.1	88.5
India	40375	100.0	100.0
Indonesia	63463	85.6	86.9
Japan	74784	87.7	95.8
Korea	79722	93.2	96.8
Malaysia	62254	84.2	85.8
Mexico	124427	62.9	83.1
New Zealand	62129	84.1	87.3
Philippines	44234	87.8	87.9
Singapore	74819	100.0	100.0
South Africa	79470	81.2	83.0
Taiwan	71891	80.9	86.2
Thailand	50605	97.7	98.0
US	158835	67.2	76.4

^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

Source: Based on WTO (1999).

The charts in figures C.5–C.8 at the end of this appendix show the difference between each applied tariff at the HSx level and its corresponding HS6 average applied rate for each trade route. In these charts, the horizontal axis shows the percentage difference from the HS6 average and the vertical axis shows the percentage of HSx items that are different from the HS6 estimate. The central spike shows the percentage of HSx items that are equal to their (bilateral) HS6 average.

The closer the central spike is to 100 per cent, the less a country's applied tariffs are affected by the ITAS aggregation. A spike at –100 per cent indicates that, for a

particular trade route, there are zero tariff line items in non-zero HS6 tariff categories. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages.

Applying formulas to aggregated and disaggregated data

As a model for analysing tariff reductions, ITAS is a simplification of reality. In ITAS, formulas are imposed at the HS6 level. However, formulas are implemented at line item level in reality. This difference in the level at which analysis is conducted may bias estimates of final tariff levels and of magnitudes of tariff reductions.

The purpose of this section is to estimate order of magnitude of the bias in final average tariffs for selected countries. The analysis abstracts from differences due to other factors. As a result, some averages may differ from those in the rest of this paper. Results are included for countries with bound and applied tariff data at the same level (below HS6).

Final tariffs for an HS6 category may differ depending on whether a formula is applied before or after aggregation to the HS6 level. Differences depend on tariff levels and dispersion within each HS6 category and the extent of nonlinearity of the formula.

There will be no difference in final HS6 tariffs calculated in these two ways:

- if there is no dispersion amongst tariffs in each HS6 category; or
- if the formula used is linear.

When differences arise between the two estimates, the final tariff that is calculated by applying the formula to the HS6-level data is usually higher than the final tariff resulting from applying the formula at the line item level. This occurs with a formula that reduces high tariffs more than low tariffs. The size of the difference between the two estimates can only be determined empirically.

The remainder of this section illustrates the combined effect on bound and applied rates of a nonlinear formula and tariff dispersion within HS6 categories, as implemented in ITAS.

Bound rates

In this section, the effect of HS6 aggregation on the calculation of new bound rates is illustrated with the highly nonlinear Swiss8 formula.

Table C.6 shows average initial and final bound tariffs. The initial bound tariff [1] is calculated by averaging bound rates within each HS6 category and then averaging these across HS6 categories. The ITAS estimate [2] is calculated by:

1. aggregating initial HSx tariffs to the HS6 level as a simple average;
2. applying the Swiss8 formula to derive final HS6 tariffs; and
3. averaging these final HS6 tariffs.

The final bound tariff in column [3] is calculated by:

1. applying the Swiss8 formula to derive final HSx tariffs;
2. aggregating final HSx tariffs to the HS6 level as a simple average;
3. averaging these final HS6 tariffs.

Tariff dispersion within HS6 categories and the use of a formula that reduces high tariffs more than low tariffs results in ITAS estimates of final bound rates that contain an upward bias. However, with most initial tariffs unaffected by dispersion, the differences between the two estimates of final average rates are not large. Even for South Africa and the US, which have the most HS6 tariffs affected by dispersion, there are only small differences between the two final rates: 3.6 and 3.4 per cent for South Africa and 1.7 and 1.6 per cent for the US.

Table C.6 Effects of aggregation process on bound rates following application of Swiss8 formula^{a,b}

Final averages based on application of formula at HS6 level or at HSx level.
Industrial products

Importing country	HSx level	Initial average ^c	Final average		Percentage difference in final rates
			Formula applied at HS6 level	Formula applied at HSx level	
		[1]	[2]	[3]	[4]
Australia	HS6	11.0	3.6	3.6	0.0
Bangladesh	HS6	45.2	6.1	6.1	0.0
Brazil	HS8	29.4	6.1	6.1	0.2
Canada	HS8	5.4	2.5	2.5	2.5
China	HS8	9.1	3.8	3.8	0.3
EU	HS8	3.9	2.2	2.1	1.3
India	HS6	34.2	6.1	6.1	0.0
Indonesia	HS9	36.0	6.4	6.4	0.1
Japan	HS6	2.3	1.3	1.3	0.0
Korea	HS10	10.2	3.8	3.7	0.5
Malaysia	HS9	12.7	3.7	3.7	1.8
Mexico	HS8	34.9	6.5	6.5	0.1
New Zealand	HS8	10.9	3.0	2.9	4.5
Philippines	HS8	20.4	5.3	5.3	0.1
Singapore	HS9	6.3	3.0	3.0	0.1
South Africa	HS8	12.2	3.6	3.4	5.2
Taiwan	HS8	4.7	2.3	2.3	0.9
Thailand	HS6	23.6	5.6	5.6	0.0
US	HS8	3.2	1.7	1.6	3.7

^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level. ^b Unbound items have not been replaced with maximum applied rates. ^c Initial average bound rates are presented at the HS6 level to provide a benchmark for comparison with final bound rates.

Source: Based on WTO (2001).

Applied rates

Final applied rates are estimated as the minimum of the final bound rate and the initial (post-Uruguay) applied rate. As with bound rates, applying tariff reduction rules to calculate final applied tariffs from initial applied tariffs may give different answers if the rule is applied before or after aggregating tariffs to the HS6 level. The extent of these differences can be gauged by comparing average final applied rates under each of these two approaches.

Table C.7 shows average initial and final applied tariffs. The initial applied tariff [1] is calculated by averaging initial applied rates within each HS6 category and then averaging these across HS6 categories. The ITAS estimate [2] is calculated by:

-
1. aggregating initial bilateral HSx tariffs to the (bilateral) HS6 level as a simple average;
 2. applying the tariff reduction rule to derive bilateral final applied HS6 tariffs;
 3. averaging these bilateral final HS6 tariffs across trading partners to derive HS6 tariffs; and
 4. averaging these final HS6 tariffs.

The final applied tariff in column [3] is calculated by:

1. applying the tariff reduction rule to derive bilateral final applied HS6 tariffs;
2. aggregating final bilateral HSx tariffs to the (bilateral) HS6 level as a simple average;
3. averaging these bilateral final HS6 tariffs across trading partners to derive HS6 tariffs; and
4. averaging these final HS6 tariffs.

These three applied rates are presented for 13 countries in ITAS for which appropriate data are available.⁶

Tariff dispersion within HS6 categories and the selective reduction of applied rates to meet final bound rates at the HS6 level introduces a bias into ITAS estimates of final applied rates. The direction and magnitude of this bias must be determined empirically.

Since most initial applied tariffs at the HS6 level are unaffected by dispersion, the differences between the two estimates of final average rates are not large — less than 7 per cent. For example, although applied tariffs for Canada, Mexico and the US show the most dispersion within HS6 categories, the two estimates of their final average applied rate do not differ substantially: 1.6 and 1.5 per cent for Canada, 6.1 and 6.0 per cent for Mexico and 1.3 and 1.3 per cent for the US.

⁶ Australia, Bangladesh, Japan and Thailand are excluded as their bound and applied tariffs are not available at a consistent HS level for this analysis. Singapore is excluded as its applied rates are all zero. India is excluded as its tariffs are all at the HS6 level.

Table C.7 Effects of aggregation process on final applied rates following application of Swiss8 formula

Averages for selected countries presented at the HS6 level, per cent and per cent difference^{a,b}

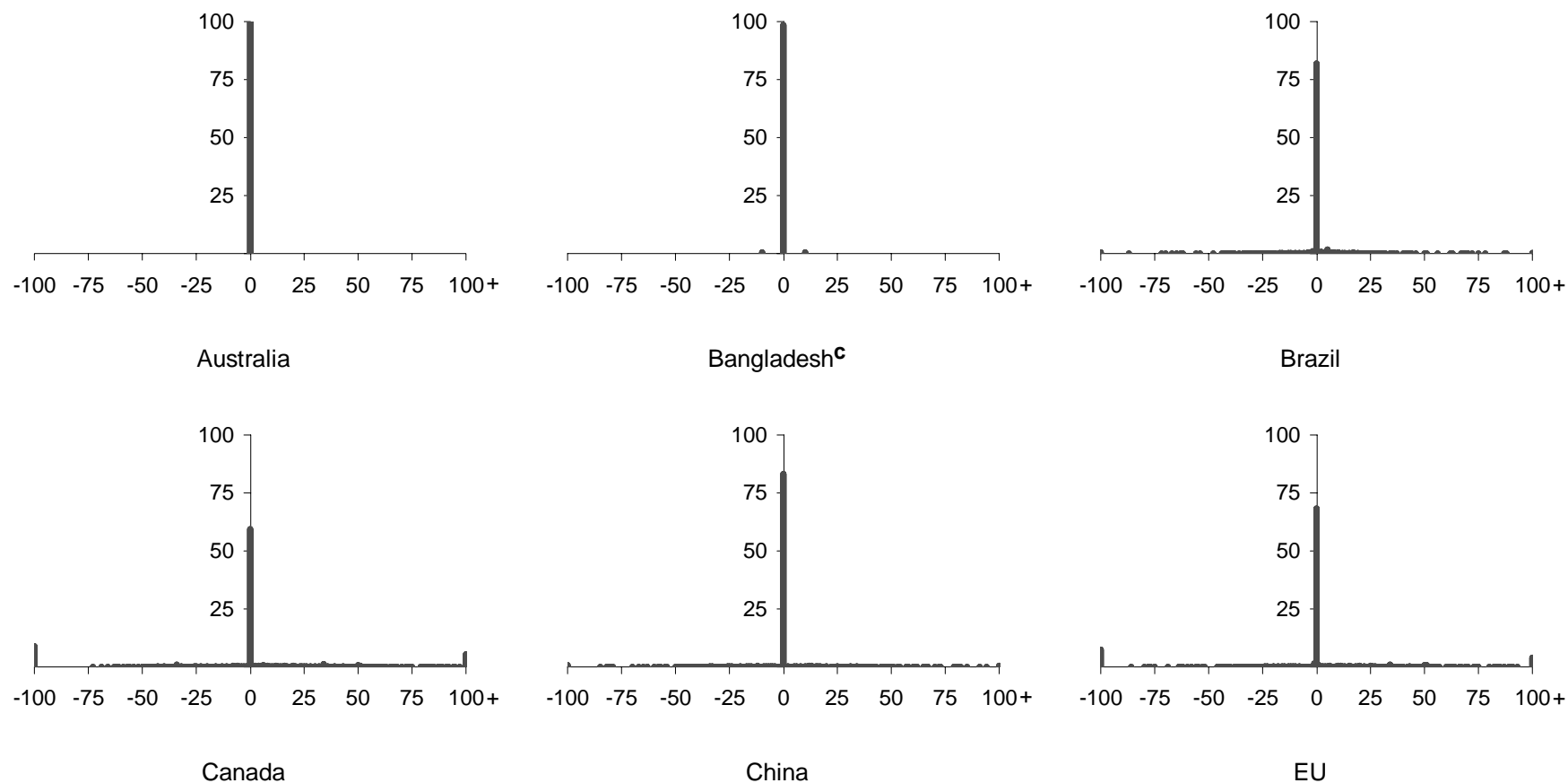
<i>Importing country</i>	<i>HSx level</i>	<i>Initial average</i>	<i>Final average</i>		<i>Difference in final rates</i>
			<i>Formula applied at HS6 level</i>	<i>Formula applied at HSx level</i>	
		[1]	[2]	[3]	[4]
Brazil	HS8	15.1	5.9	5.8	0.8
Canada	HS8	3.3	1.6	1.5	2.8
China	HS8	9.1	3.8	3.8	0.0
EU	HS8	3.9	2.2	2.2	-2.1
Indonesia	HS9	8.3	4.5	4.4	0.7
Korea	HS10	6.7	3.8	3.8	-0.2
Malaysia	HS9	8.3	2.5	2.4	3.2
Mexico	HS8	17.2	6.1	6.0	1.0
New Zealand	HS8	3.1	2.1	2.1	-0.7
Philippines	HS8	9.2	4.1	4.0	1.2
South Africa	HS8	7.8	2.3	2.2	2.4
Taiwan	HS8	4.5	2.3	2.3	-0.2
US	HS8	2.6	1.3	1.3	0.3

^a The data used in this table are the same as those used to generate the ITAS database. However, different rules are applied to calculate averages at the line item level. ^b Comparison of alternative methods of reaching final applied rates only available for countries where data supplied is of the same HS level. Singapore excluded as its applied rates are all zero. India excluded as its tariffs are all at the HS6 level.

Source: Based on WTO (1999, 2001).

Figure C.1 **Percentage difference between HSx and HS6 bound rates**

Frequency distribution of percentage differences rounded to one percentage point (horizontal axis), shown as a percentage of total number of HSx rates (vertical axis)^{a,b}



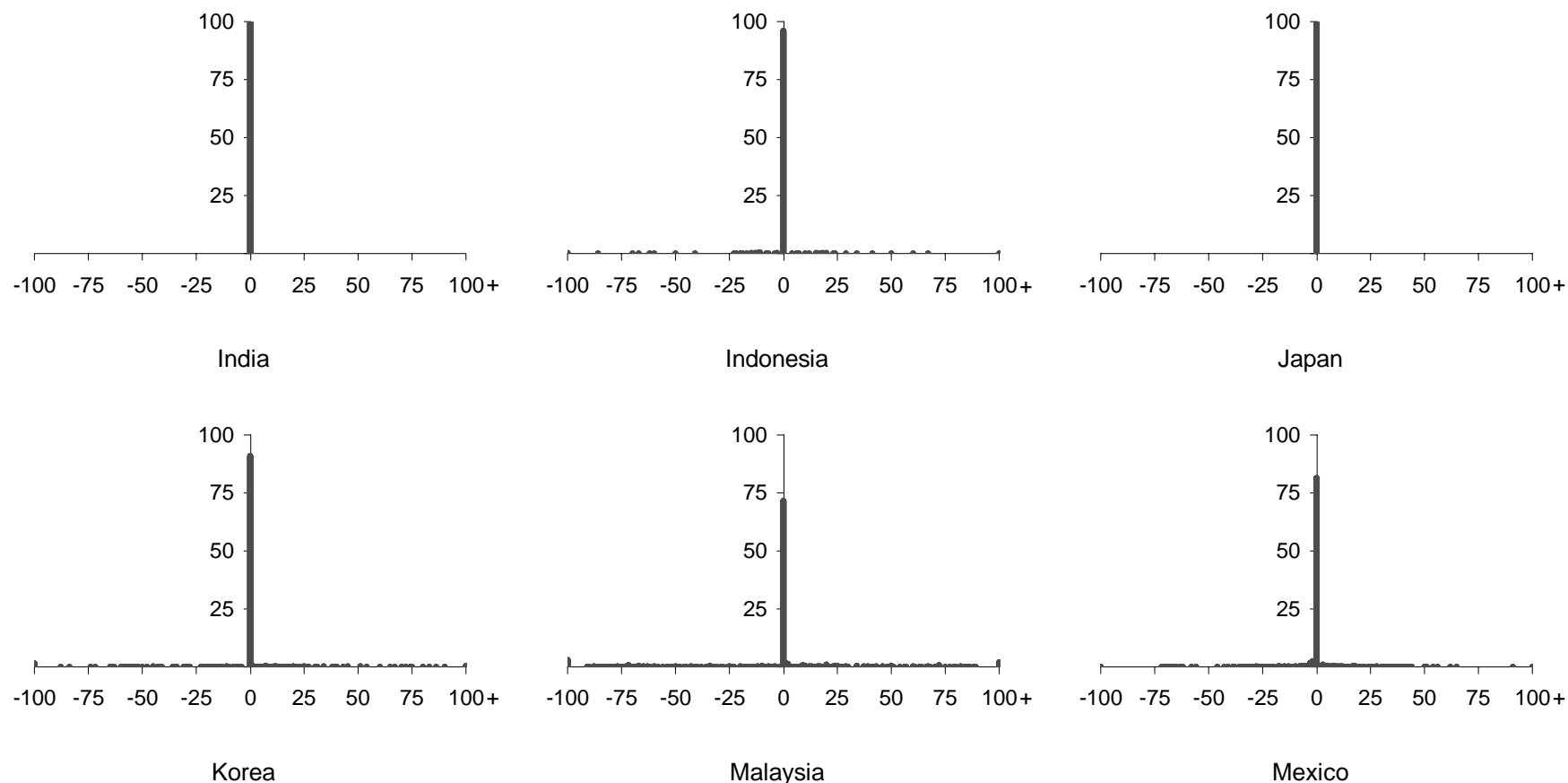
^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b A spike at -100 per cent indicates zero-tariff line items that are included in HS6 categories with a non-zero tariff. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages. ^c The CTS file for Bangladesh contains one HS6 item that contains two seven digit classifications, with different bound rates. This item is not labelled as a tariff line suffix.

Source: Based on WTO (2001).

Figure C.2 Percentage difference between HSx and HS6 bound rates

Frequency distribution of percentage differences rounded to one percentage point (horizontal axis), shown as a percentage of total number of HSx rates (vertical axis)^{a,b}



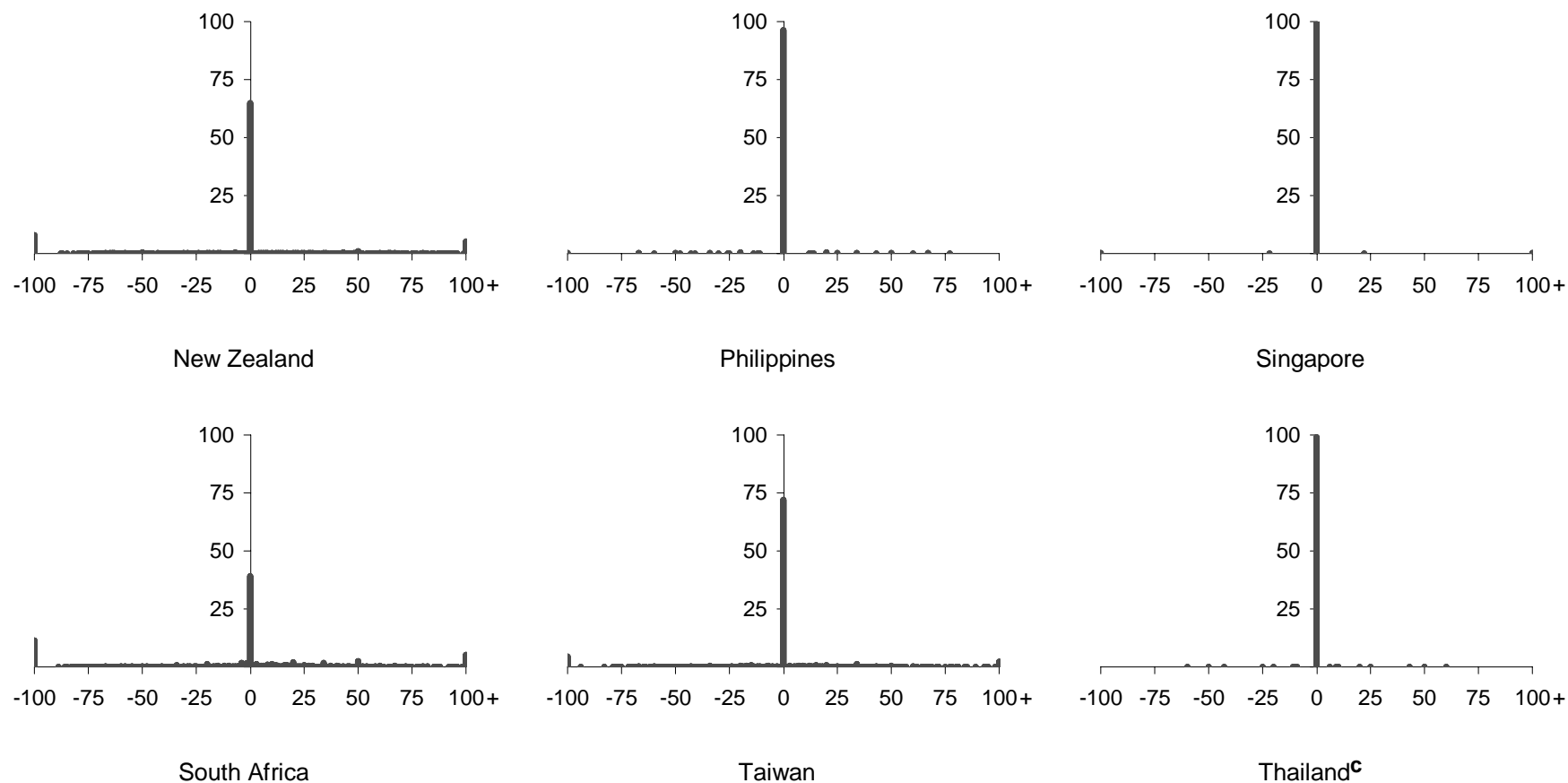
^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b A spike at -100 per cent indicates zero-tariff line items that are included in HS6 categories with a non-zero tariff. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages.

Source: Based on WTO (2001).

Figure C.3 Percentage difference between HSx and HS6 bound rates

Frequency distribution of percentage differences rounded to one percentage point (horizontal axis), shown as a percentage of total number of HSx rates (vertical axis)^{a,b}



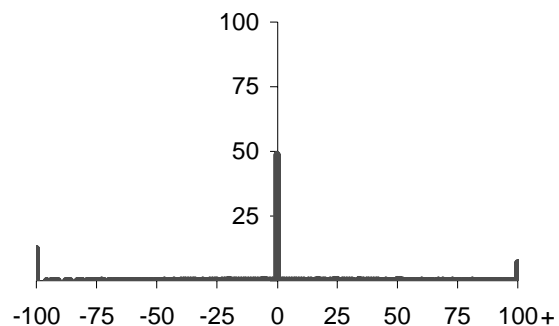
^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b A spike at -100 per cent indicates zero-tariff line items that are included in HS6 categories with a non-zero tariff. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages. ^c The CTS file for Thailand contains 14 HS6 items that contain two or more seven digit classifications, with different bound rates. These items are not labelled as a tariff line suffix.

Source: Based on WTO (2001).

Figure C.4 Percentage difference between HSx and HS6 bound rates

Frequency distribution of percentage differences rounded to one percentage point (horizontal axis), shown as a percentage of total number of HSx rates (vertical axis)^{a,b}



US

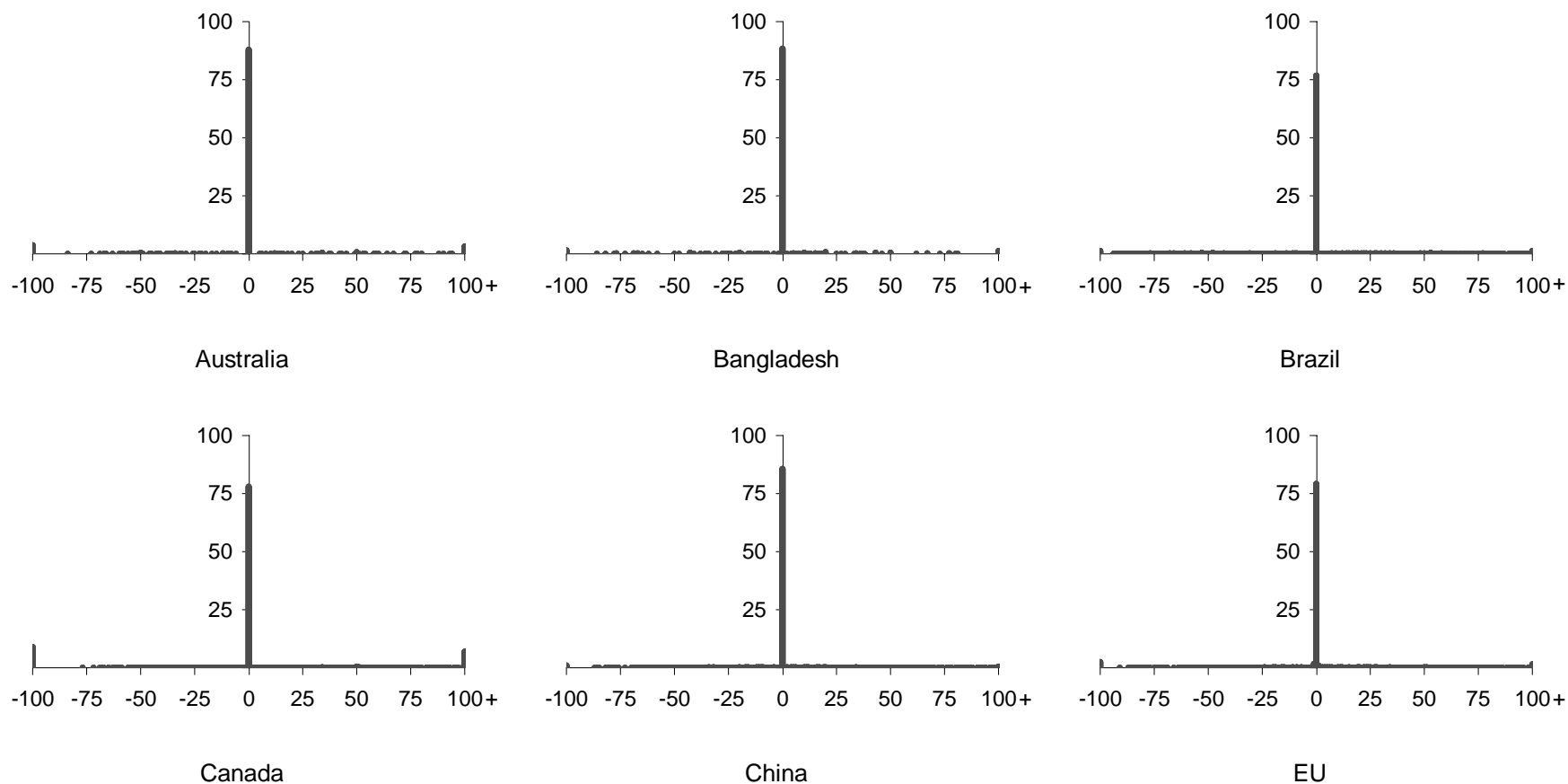
^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b A spike at -100 per cent indicates zero-tariff line items that are included in HS6 categories with a non-zero tariff. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages.

Source: Based on WTO (2001).

Figure C.5 Percentage difference between HSx and HS6 applied rates

Frequency distribution of percentage differences rounded to one percentage point (horizontal axis), shown as a percentage of total number of HSx rates (vertical axis)^{a,b}



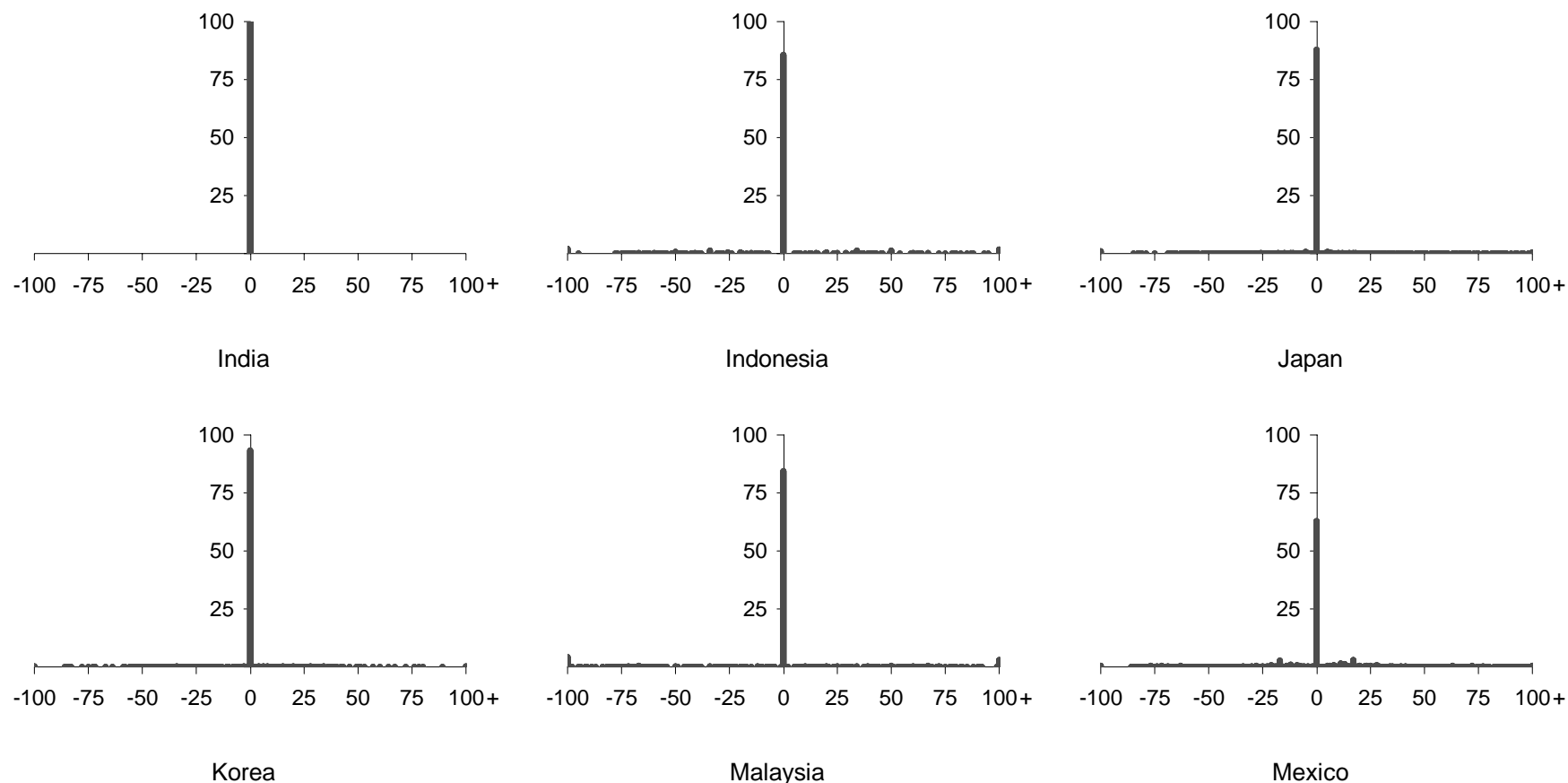
^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b A spike at -100 per cent indicates zero-tariff line items that are included in HS6 categories with a non-zero tariff. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages.

Source: Based on WTO (1999).

Figure C.6 **Percentage difference between HSx and HS6 applied rates**

Frequency distribution of percentage differences rounded to one percentage point (horizontal axis), shown as a percentage of total number of HSx rates (vertical axis)^{a,b}



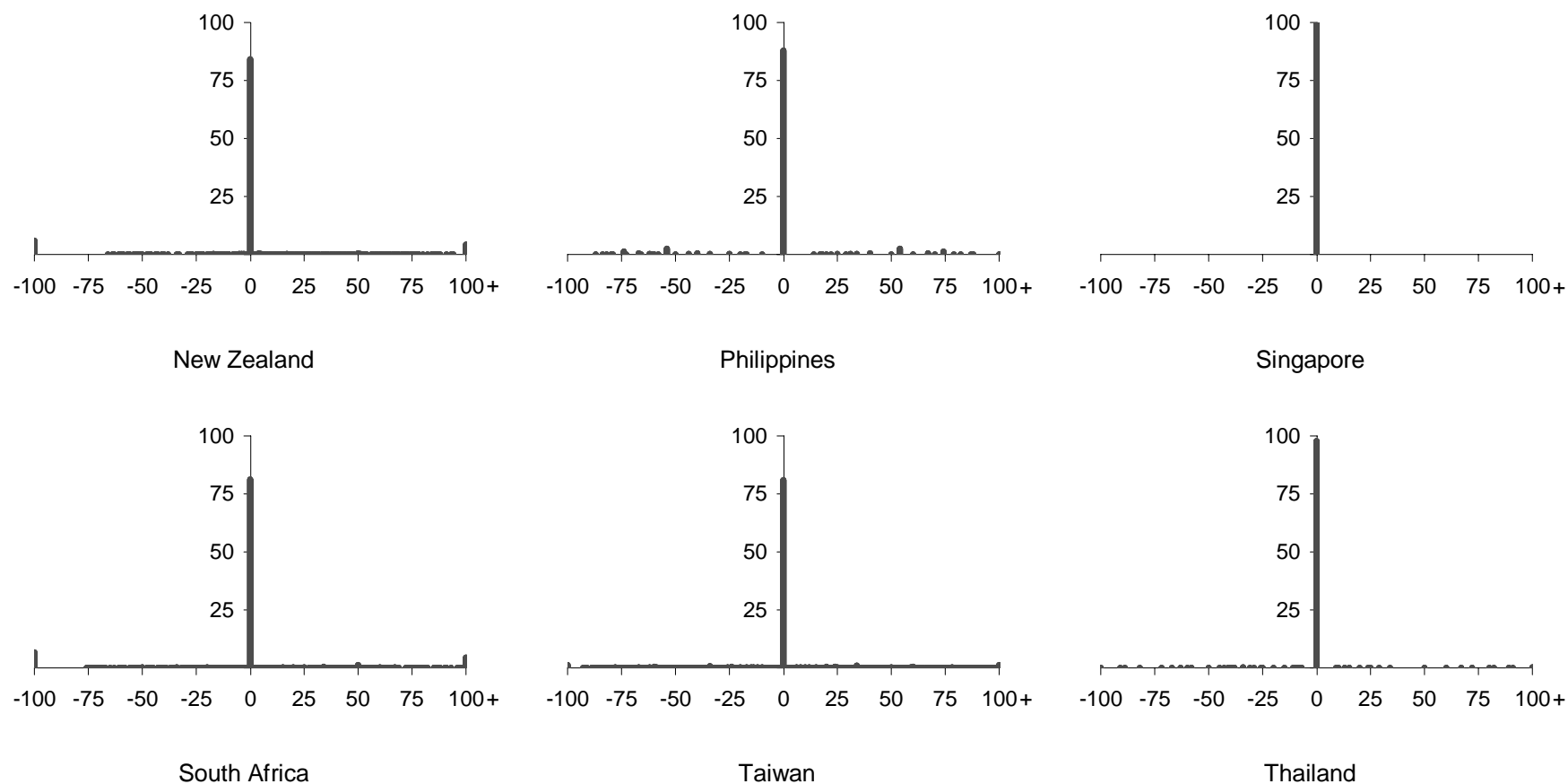
^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b A spike at -100 per cent indicates zero-tariff line items that are included in HS6 categories with a non-zero tariff. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages.

Source: Based on WTO (1999).

Figure C.7 Percentage difference between HSx and HS6 applied rates

Frequency distribution of percentage differences rounded to one percentage point (horizontal axis), shown as a percentage of total number of HSx rates (vertical axis)^{a,b}



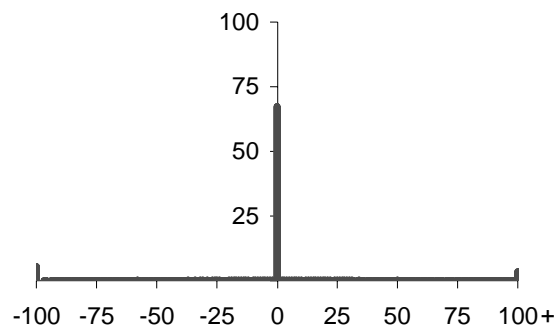
^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b A spike at -100 per cent indicates zero-tariff line items that are included in HS6 categories with a non-zero tariff. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages.

Source: Based on WTO (1999).

Figure C.8 Percentage difference between HSx and HS6 applied rates

Frequency distribution of percentage differences rounded to one percentage point (horizontal axis), shown as a percentage of total number of HSx rates (vertical axis)^{a,b}



US

^a The data used in this table are the same as those used to generate the ITAS database, however, different rules are applied to calculate averages at the line item level.

^b A spike at -100 per cent indicates zero-tariff line items that are included in HS6 categories with a non-zero tariff. A spike at 100+ per cent indicates HSx items with tariffs at least double that of the corresponding HS6 averages.

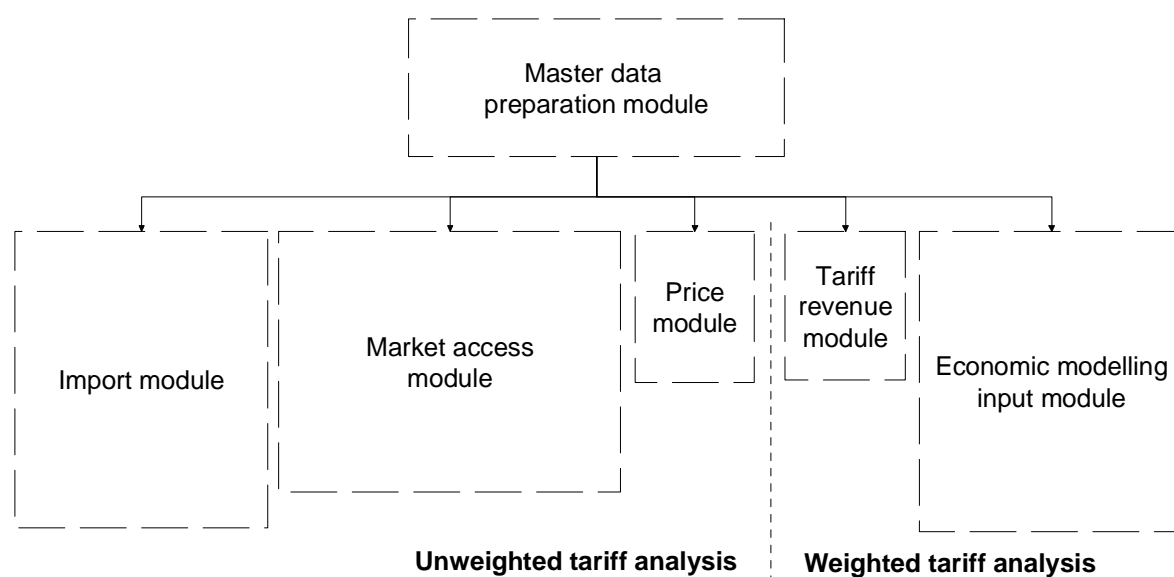
Source: Based on WTO (1999).

D Structure of ITAS

This appendix details the structure of the ITAS suite of programs, the input data requirements and the structure of the ITAS output.¹

ITAS consists of a series of modules that use Base SAS (version 8) to convert primary data into a consistent format (initial database), apply various formulas to tariffs on bilateral trade flows (final database) and create various data summaries for further analysis (figure D.1).

Figure D.1 **Structural summary of the ITAS**



Source: Productivity Commission.

After the primary data have been converted to a consistent format, formulas are implemented using two versions of many programs — the first version relates to the Girard formulas and the second version relates to the Chinese and Swiss formulas, as listed in table 3.1.

¹ ITAS was developed for a number of different purposes over the course of two years. Some parts of the system may now be redundant.

ITAS contains five modules to analyse tariff data. In the current implementation, the market access module and the tariff revenue module provide a framework using Australia as the example. They can be adapted to analyse data for another country.

The analysis modules can be run from a batch file (COMBB.BAT) using the initial data. However, users with access to the source data files from the IDB and CTS, can run the entire system by modifying the batch file to run the master data preparation module prior to the analysis modules.² Alternatively, any of the SAS programs may be run individually.

Apart from the CTS and IDB source data files, ITAS uses several files that contain labels for products or countries, or mappings between product or country classifications.

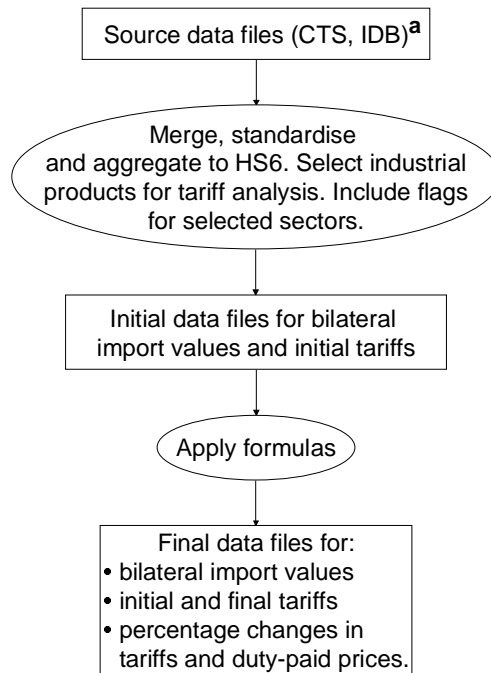
Master data preparation module

The master data preparation module is designed to process source data from the IDB and CTS and convert it from a variety of formats into a consistent form for analysis. This module uses particular tariff reduction formulas to provide projections for final bound and applied rates that are then stored in a master database for further analysis. Tariff analysis is conducted using the analysis modules described later in this appendix.

Figure D.2 provides a summary of the master data preparation module. This module contains data files and programs for each of the 19 countries in the current implementation of ITAS. Processing for each of these countries fits one of 6 patterns (figures D.3 to D.8).

² WTO copyright of the source data from the CTS and the IDB precludes the Productivity Commission from making these files available as part of the ITAS. However, a supplementary disk containing these files is available, on request, to authorised users of WTO data (see appendix E).

Figure D.2 Summary of master data preparation module

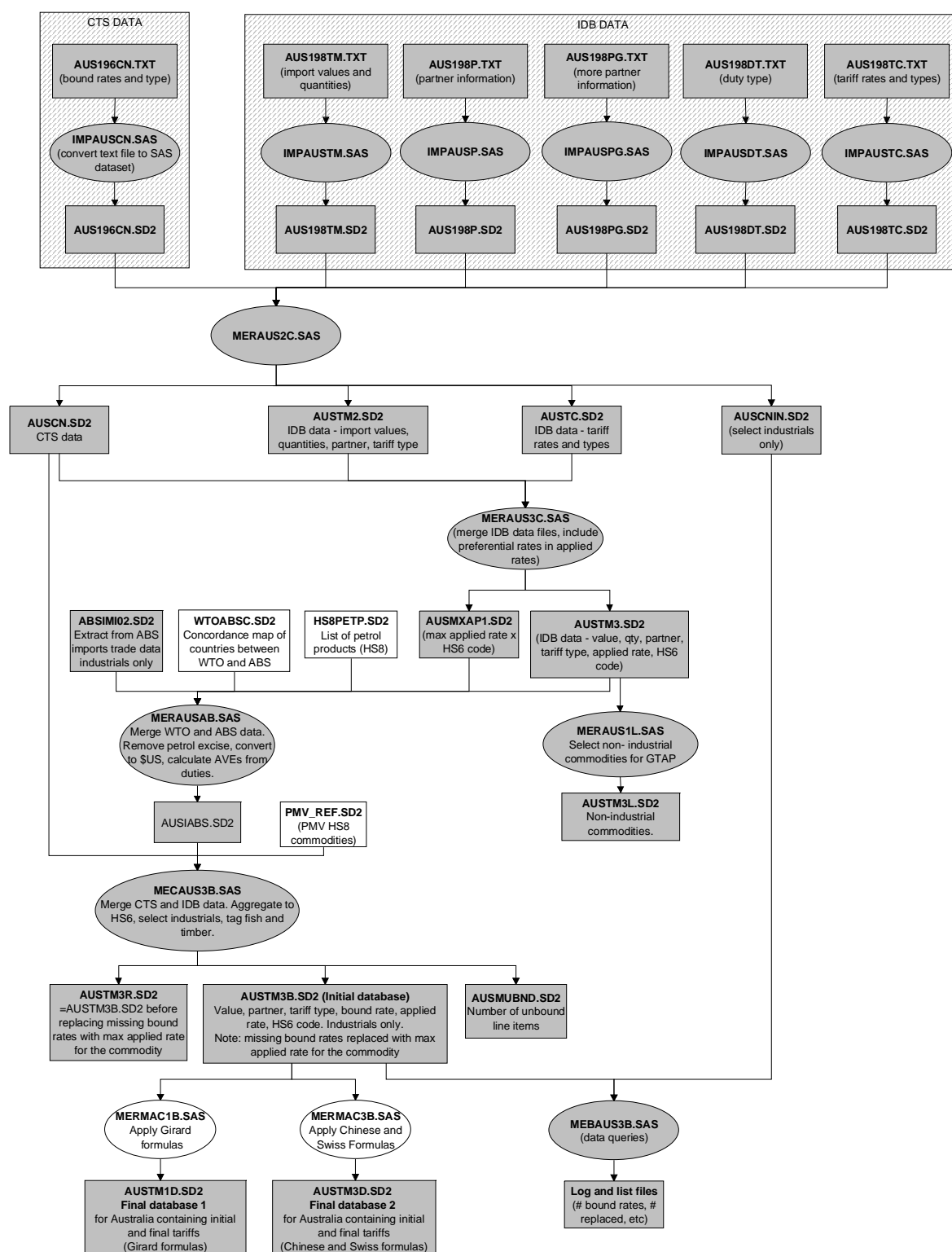


^a ABS data (ABS 2002) are used to supplement IDB data for Australia.

Note: parameters for the Flexible Swiss formula may be calculated as part of the master data preparation module using the additional SAS program FLXSWIS.SAS and the EXCEL files XXXFS.XLS (for each country) and FSSolvers.XLS.

Source: Productivity Commission.

Figure D.3 Module for preparing final data — Australia



Note: MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files. Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories, where XXX denotes the country abbreviation. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

Table D.1 File list — generating final data for Australia

<i>Filename</i>	<i>Description</i>
<i>CTS data</i>	
AUS196CN.TXT	Convert CTS data from text format (TXT) into SAS data format (SD2)
IMPAUSCN.SAS	
AUS196CN.SD2	
<i>IDB data</i>	
AUS198DT.TXT	Convert IDB data from text format into SAS data format
AUS198P.TXT	
AUS198PG.TXT	
AUS198TC.TXT	
AUS198TM.TXT	
IMPAUSDT.SAS	
IMPAUSP.SAS	
IMPAUSPG.SAS	
IMPAUSTC.SAS	
IMPAUSTM.SAS	
AUS198DT.SD2	
AUS198P.SD2	
AUS198PG.SD2	
AUS198TC.SD2	
AUS198TM.SD2	
<i>Generate initial data file for Australia</i>	
MEBAUS3B.SAS	Combine and standardise ABS, CTS and IDB data at HS6 level. Create two main data files: industrial products for further tariff analysis and GTAP modelling and non-industrial products for GTAP modelling.
MECAUS3B.SAS	
MERAUS1L.SAS	
MERAUS2C.SAS	
MERAUS3C.SAS	
MERAUSAB.SAS	
ABSIMI02.SD2	
AUSCN.SD2	
AUSCNIN.SD2	
AUSIABS.SD2	
AUSMUBND.SD2	
AUSMXAP1.SD2	
AUSTC.SD2	
AUSTM2.SD2	
AUSTM3.SD2	
AUSTM3L.SD2	
AUSTM3R.SD2	
HS8PETP.SD2	
PMV_REF.SD2	
WTOABSC.SD2	
AUSTM3B.SD2	

(Continued next page)

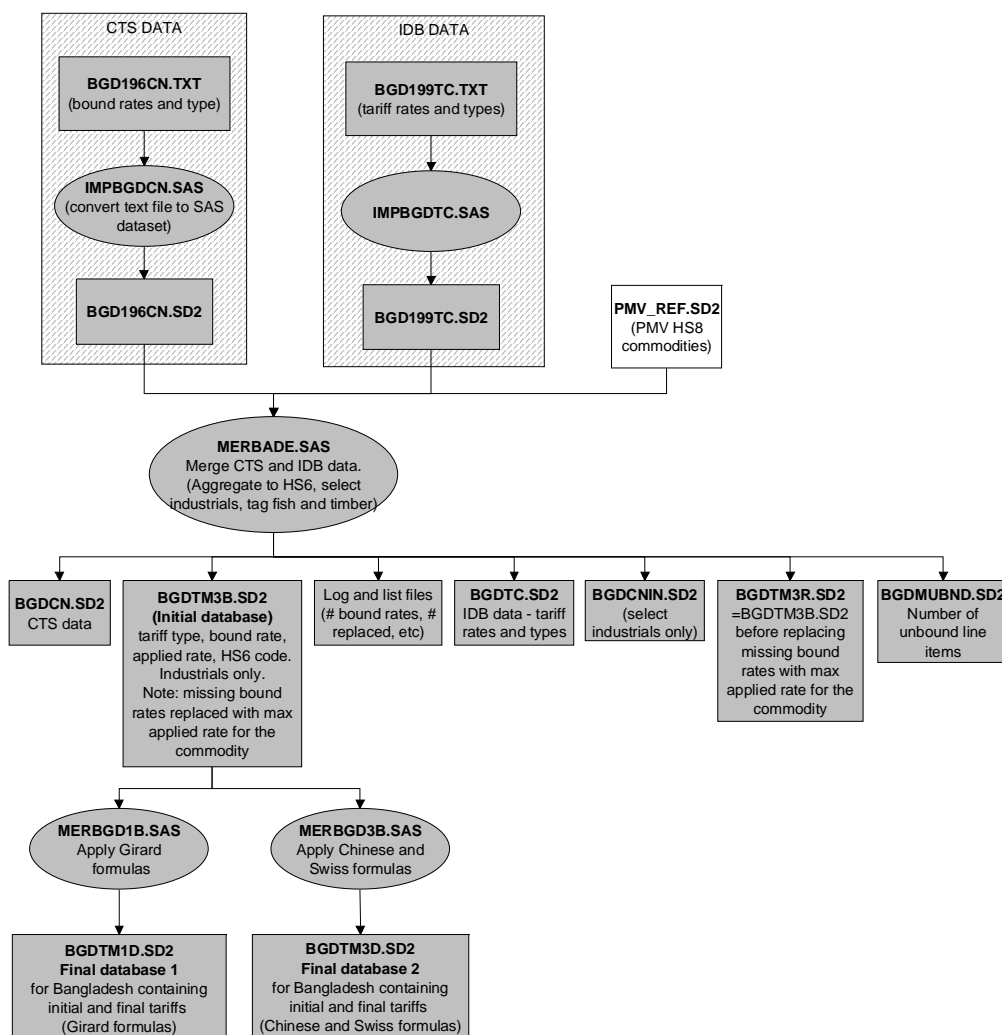
Table D.1 (continued)

<i>Filename</i>	<i>Description</i>
<i>Generate final data file for Australia</i>	
MERMAC1B.SAS	Apply both sets of formulas to generate final bound rates then estimate
MERMAC3B.SAS	final applied rates. Two final data files are created — one for each set of
AUSTM1D.SD2	formulas.
AUSTM3D.SD2	

Note: Key input and output files for this module are in italics and bold type, respectively. MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files.

Source: ITAS.

Figure D.4 Module for preparing final data — Bangladesh



Note: Only tariff rates and total value of imports for each product are currently available for Bangladesh. No information is available by trading partner. Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories, where XXX denotes the country abbreviation. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

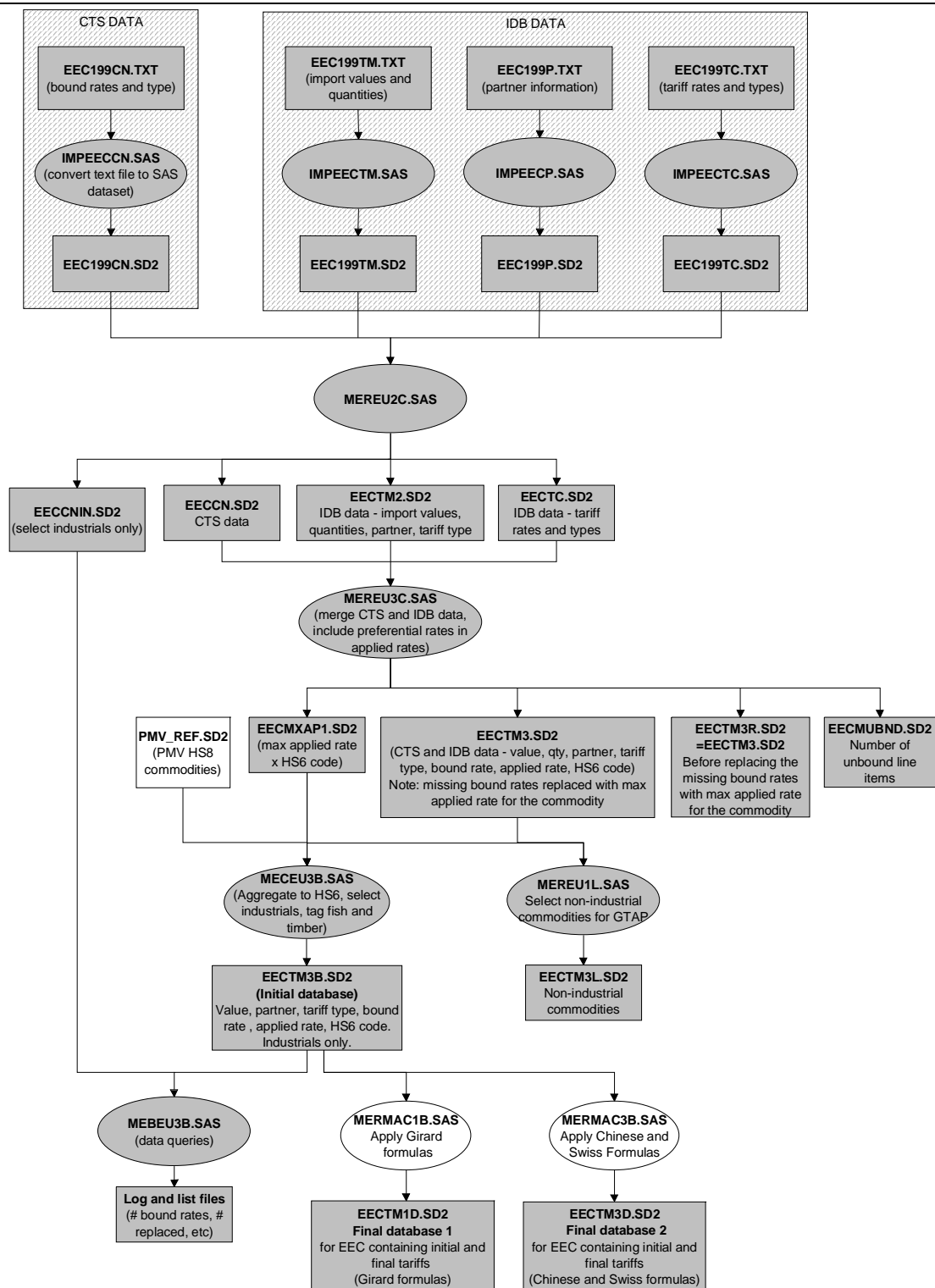
Table D.2 File list — generating final data for Bangladesh

<i>Filename</i>	<i>Description</i>
<i>CTS data</i>	
<i>BGD196CN.TXT</i>	Convert CTS data from text format into SAS data format
<i>IMPBGDCN.SAS</i>	
<i>BGD196CN.SD2</i>	
<i>IDB data</i>	
<i>BGD199TC.TXT</i>	Convert IDB data from text format into SAS data format
<i>IMPBGDTC.SAS</i>	
<i>BGD199TC.SD2</i>	
<i>Generate initial data file for Bangladesh</i>	
<i>PMV_REF.SD2</i>	Combine and standardise CTS and IDB data at HS6 level. Create two main data files: industrial products for further tariff analysis. Since GTAP modelling uses bilateral tariff information, Bangladesh's tariffs are not used in GTAP simulations.
<i>MERBADE.SAS</i>	
<i>BGDCN.SD2</i>	
<i>BGDCNIN.SD2</i>	
<i>BGDTC.SD2</i>	
<i>BGDTM3R.SD2</i>	
<i>BGDMUBND.SD2</i>	
<i>BGDTM3B.SD2</i>	
<i>Generate final data file for Bangladesh</i>	
<i>MERBGD1B.SAS</i>	Apply both sets of formulas to generate final bound rates then estimate final applied rates. Two final data files are created — one for each set of formulas.
<i>MERBGD3B.SAS</i>	
<i>BGDTM1D.SD2</i>	
<i>BGDTM3D.SD2</i>	

Note: Key input and output files for this module are in italics and bold type, respectively. Only tariff rates and total value of imports for each product are currently available for Bangladesh. No information is available by trading partner.

Source: ITAS.

Figure D.5 Module for preparing final data — EU



Note: The same processing sequence applies to Brazil, China, Korea, Mexico, Philippines and Singapore. MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files. Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories, where XXX denotes the country abbreviation. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

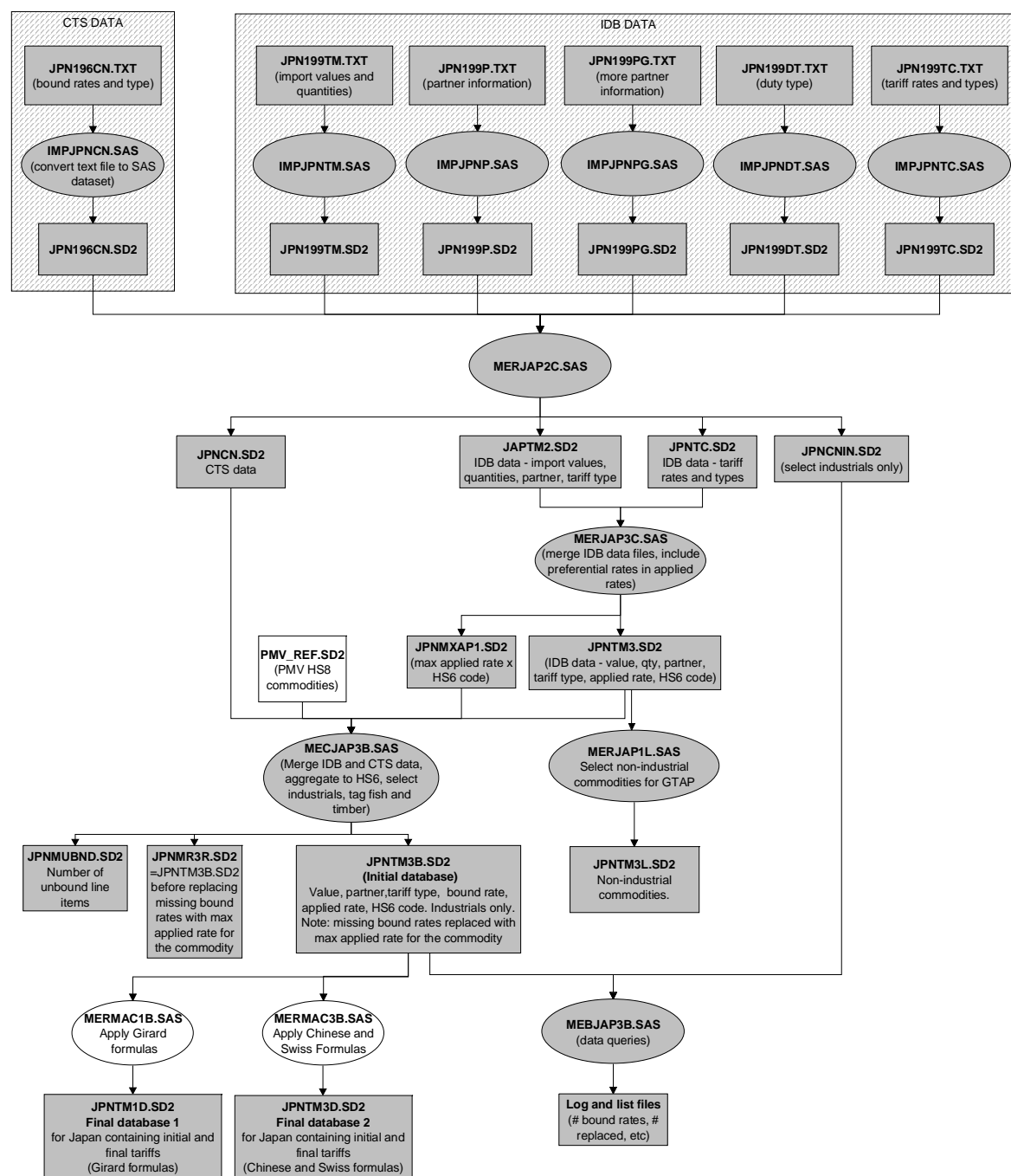
Table D.3 File list — generating final data for EU

<i>Filename</i>	<i>Description</i>
<i>CTS data</i>	
<i>EEC199CN.TXT</i>	Convert CTS data from text format into SAS data format
<i>IMPEECCN.SAS</i>	
<i>EEC199CN.SD2</i>	
<i>IDB data</i>	
<i>EEC199P.TXT</i>	Convert IDB data from text format into SAS data format
<i>EEC199TC.TXT</i>	
<i>EEC199TM.TXT</i>	
<i>IMPEECP.SAS</i>	
<i>IMPEECTC.SAS</i>	
<i>IMPEECTM.SAS</i>	
<i>EEC199P.SD2</i>	
<i>EEC199TC.SD2</i>	
<i>EEC199TM.SD2</i>	
<i>Generate initial data file for EU</i>	
<i>PMV_REF.SD2</i>	Combine and standardise CTS and IDB data at HS6 level. Create two main data files: industrial products for further tariff analysis and GTAP modelling and non-industrial products for GTAP modelling.
<i>MEBEU3B.SAS</i>	
<i>MECEU3B.SAS</i>	
<i>MEREU1L.SAS</i>	
<i>MEREU2C.SAS</i>	
<i>MEREU3C.SAS</i>	
<i>EECCN.SD2</i>	
<i>EECCNIN.SD2</i>	
<i>EECMUBND.SD2</i>	
<i>EECMXAP1.SD2</i>	
<i>EECTC.SD2</i>	
<i>EECTM2.SD2</i>	
<i>EECTM3.SD2</i>	
<i>EECTM3L.SD2</i>	
<i>EECTM3R.SD2</i>	
<i>EECTM3B.SD2</i>	
<i>Generate final data file for EU</i>	
<i>MERMAC1B.SAS</i>	Apply both sets of formulas to generate final bound rates then estimate final applied rates. Two final data files are created — one for each set of formulas.
<i>MERMAC3B.SAS</i>	
EECTM1D.SD2	
EECTM3D.SD2	

Note: Key input and output files for this module are in italics and bold type, respectively. The same processing sequence applies to Brazil, China, Korea, Mexico, Philippines and Singapore. MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files.

Source: ITAS.

Figure D.6 Module for preparing final data — Japan



Note: MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files. Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories, where XXX denotes the country abbreviation. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

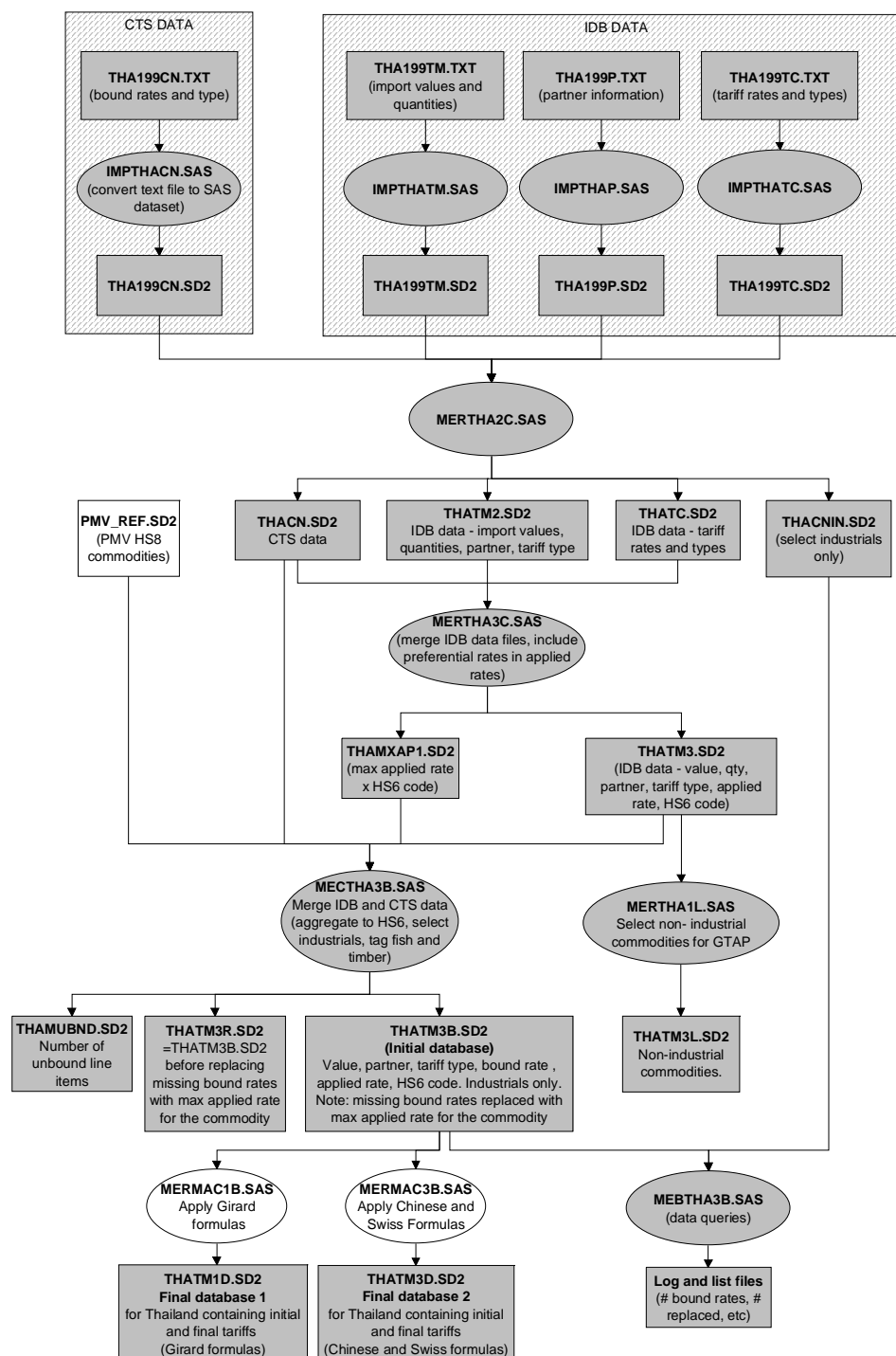
Table D.4 File list — generating final data for Japan

<i>Filename</i>	<i>Description</i>
<i>CTS data</i>	
<i>JPN196CN.TXT</i>	Convert CTS data from text format into SAS data format
<i>IMPJPNCN.SAS</i>	
<i>JPN196CN.SD2</i>	
<i>IDB data</i>	
<i>JPN199DT.TXT</i>	Convert IDB data from text format into SAS data format
<i>JPN199P.TXT</i>	
<i>JPN199PG.TXT</i>	
<i>JPN199TC.TXT</i>	
<i>JPN199TM.TXT</i>	
<i>IMPJPNDT.SAS</i>	
<i>IMPJPNP.SAS</i>	
<i>IMPJPNPG.SAS</i>	
<i>IMPJPNTC.SAS</i>	
<i>IMPJPNTM.SAS</i>	
<i>JPN199DT.SD2</i>	
<i>JPN199P.SD2</i>	
<i>JPN199PG.SD2</i>	
<i>JPN199TC.SD2</i>	
<i>JPN199TM.SD2</i>	
<i>Generate initial data file for Japan</i>	
<i>PMV_REF.SD2</i>	Combine and standardise CTS and IDB data at HS6 level. Create two main data files: industrial products for further tariff analysis and GTAP modelling and non-industrial products for GTAP modelling.
<i>MEBJAP3B.SAS</i>	
<i>MECJAP3B.SAS</i>	
<i>MERJAP1L.SAS</i>	
<i>MERJAP2C.SAS</i>	
<i>MERJAP3C.SAS</i>	
<i>JAPTM2.SD2</i>	
<i>JPNCN.SD2</i>	
<i>JPNCNIN.SD2</i>	
<i>JPNMR3R.SD2</i>	
<i>JPNMUBND.SD2</i>	
<i>JPNMXAP1.SD2</i>	
<i>JPNTC.SD2</i>	
<i>JPNTM3B.SD2</i>	
<i>JPNTM3L.SD2</i>	
<i>JPNTM3.SD2</i>	
<i>Generate final data file for Japan</i>	
<i>MERMAC1B.SAS</i>	Apply both sets of formulas to generate final bound rates then estimate final applied rates. Two final data files are created — one for each set of formulas.
<i>MERMAC3B.SAS</i>	
JPNTM1D.SD2	
JPNTM3D.SD2	

Note: Key input and output files for this module are in italics and bold type, respectively. MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files.

Source: ITAS.

Figure D.7 Module for preparing final data — Thailand



Note: The same processing sequence applies to India. MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files. Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories, where XXX denotes the country abbreviation. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

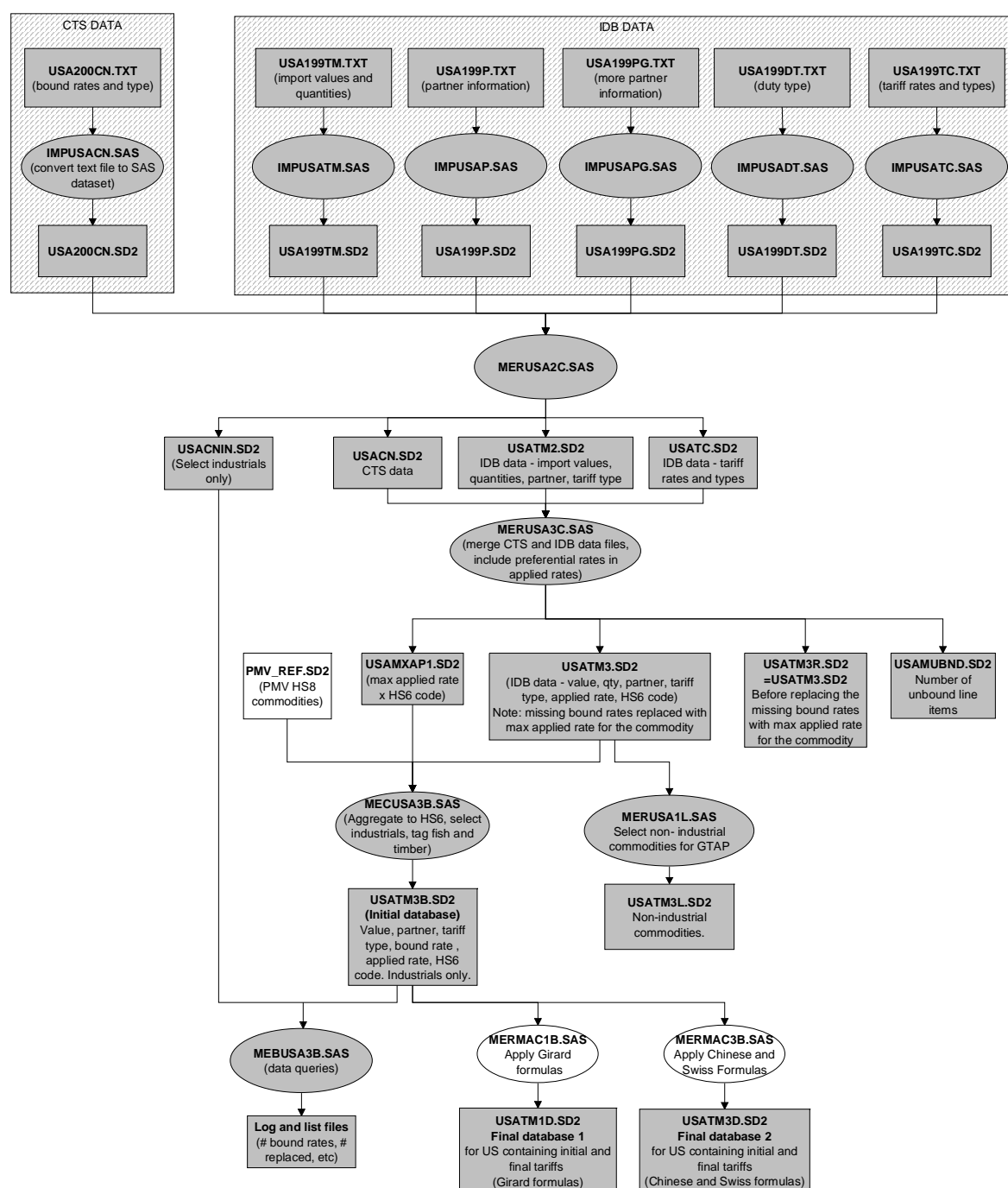
Table D.5 File list — generating final data for Thailand

<i>Filename</i>	<i>Description</i>
<i>CTS data</i>	
<i>THA199CN.TXT</i>	Convert CTS data from text format into SAS data format
<i>IMPTHACN.SAS</i>	
<i>THA199CN.SD2</i>	
<i>IDB data</i>	
<i>THA199P.TXT</i>	Convert IDB data from text format into SAS data format
<i>THA199TC.TXT</i>	
<i>THA199TM.TXT</i>	
<i>IMPTHAP.SAS</i>	
<i>IMPTHATC.SAS</i>	
<i>IMPTHATM.SAS</i>	
<i>THA199P.SD2</i>	
<i>THA199TC.SD2</i>	
<i>THA199TM.SD2</i>	
<i>Generate initial data file for Thailand</i>	
<i>PMV_REF.SD2</i>	Combine and standardise CTS and IDB data at HS6 level. Create two main data files: industrial products for further tariff analysis and GTAP modelling and non-industrial products for GTAP modelling.
<i>MEBTHA3B.SAS</i>	
<i>MECTHA3B.SAS</i>	
<i>MERTHA1L.SAS</i>	
<i>MERTHA2C.SAS</i>	
<i>MERTHA3C.SAS</i>	
<i>THACN.SD2</i>	
<i>THACNIN.SD2</i>	
<i>THAMUBND.SD2</i>	
<i>THAMXAP1.SD2</i>	
<i>THATC.SD2</i>	
<i>THATM2.SD2</i>	
<i>THATM3.SD2</i>	
<i>THATM3L.SD2</i>	
<i>THATM3R.SD2</i>	
<i>THATM3B.SD2</i>	
<i>Generate final data file for Thailand</i>	
<i>MERMAC1B.SAS</i>	Apply both sets of formulas to generate final bound rates then estimate final applied rates. Two final data files are created — one for each set of formulas.
<i>MERMAC3B.SAS</i>	
THATM1D.SD2	
THATM3D.SD2	

Note: Key input and output files for this module are in italics and bold type, respectively. The same processing sequence applies to India. MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files.

Source: ITAS.

Figure D.8 Module for preparing final data — US



Note: The same processing sequence applies to Canada, Indonesia, Malaysia, New Zealand, South Africa and Taiwan. MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh and generate the corresponding final data files. Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories, where XXX denotes the country abbreviation. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

Table D.6 File list — generating final data for US

<i>Filename</i>	<i>Description</i>
<i>CTS data</i>	
<i>USA200CN.TXT</i>	Convert CTS data from text format into SAS data format
<i>IMPUSACN.SAS</i>	
<i>USA200CN.SD2</i>	
<i>IDB data</i>	
<i>USA199DT.TXT</i>	Convert IDB data from text format into SAS data format
<i>USA199P.TXT</i>	
<i>USA199PG.TXT</i>	
<i>USA199TC.TXT</i>	
<i>USA199TM.TXT</i>	
<i>IMPUSADT.SAS</i>	
<i>IMPUSAP.SAS</i>	
<i>IMPUSAPG.SAS</i>	
<i>IMPUSATC.SAS</i>	
<i>IMPUSATM.SAS</i>	
<i>USA199DT.SD2</i>	
<i>USA199P.SD2</i>	
<i>USA199PG.SD2</i>	
<i>USA199TC.SD2</i>	
<i>USA199TM.SD2</i>	
<i>Generate initial data file for US</i>	
<i>PMV_REF.SD2</i>	Combine and standardise CTS and IDB data at HS6 level. Create two main data files: industrial products for further tariff analysis and GTAP modelling and non-industrial products for GTAP modelling.
<i>MEBUSA3B.SAS</i>	
<i>MECUSA3B.SAS</i>	
<i>MERUSA1L.SAS</i>	
<i>MERUSA2C.SAS</i>	
<i>MERUSA3C.SAS</i>	
<i>USACN.SD2</i>	
<i>USACNIN.SD2</i>	
<i>USAMUBND.SD2</i>	
<i>USAMXAP1.SD2</i>	
<i>USATC.SD2</i>	
<i>USATM2.SD2</i>	
<i>USATM3.SD2</i>	
<i>USATM3L.SD2</i>	
<i>USATM3R.SD2</i>	
<i>USATM3B.SD2</i>	
<i>Generate final data file for US</i>	
<i>MERMAC1B.SAS</i>	Apply both sets of formulas to generate final bound rates then estimate final applied rates. Two final data files are created — one for each set of formulas.
<i>MERMAC3B.SAS</i>	
USATM1D.SD2	
USATM3D.SD2	

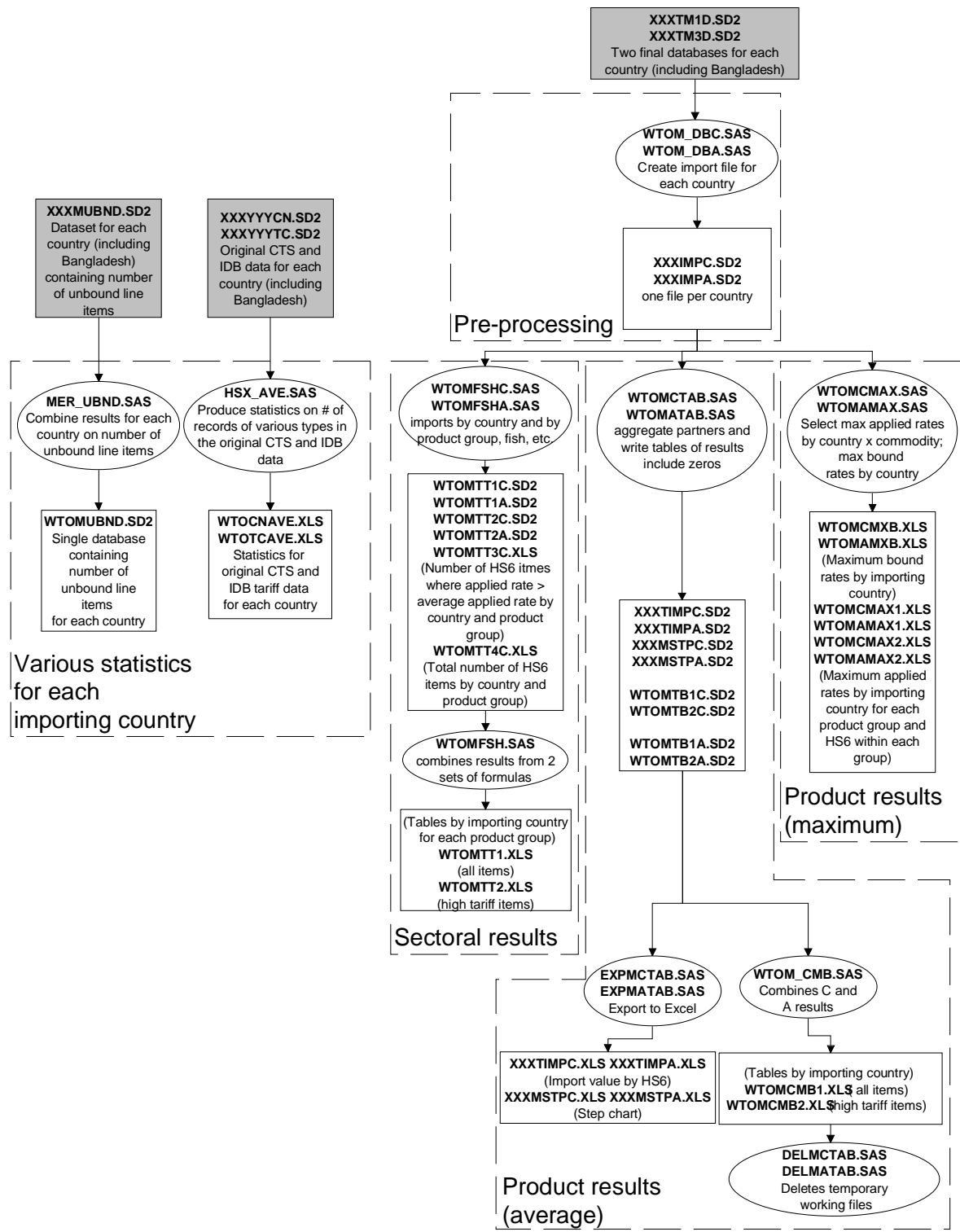
Note: Key input and output files for this module are in italics and bold type, respectively. The same process applies to Canada, Indonesia, Malaysia, New Zealand, South Africa and Taiwan. MERMAC1B.SAS and MERMAC3B.SAS process the master data files for all countries excluding Bangladesh.

Source: ITAS.

Import tariff module

The size and complexity of the final database makes it inaccessible for viewing and presentation. The import tariff module is designed to allow the analyst to extract parts of the final data at a detailed level or to condense the data into a series of summary measures based on large sections of the final data.

Figure D.9 ITAS processing — import tariff module



Note: XXX denotes country abbreviation and C/A or 1/3 indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas). Files XXXYYYCN.SD2 and XXXYYYTC.SD2 contain the raw CTS and IDB tariff data for country XXX (one file per country). Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

Table D.7 File list — import tariff module

<i>Filename^a</i>	<i>Description</i>
<i>Input data and pre-processing</i>	
<i>XXXTM1/3D.SD2</i>	Extract relevant data from master data file for each country prior to further processing
<i>XXXMUBND.SD2</i>	
<i>WTOM_DBC/A.SAS</i>	
<i>XXXIMPC/A.SD2</i>	
<i>Summary information</i>	
<i>XXXYYYCN.SD2^b</i>	Generate database information for checking purposes. For example, calculate number of records, number of missing values, number of unbound items and number of NAV tariffs.
<i>XXXYYYTC.SD2^c</i>	
<i>HSX_AVE.SAS</i>	
<i>MER_UBND.SAS</i>	
WTOCNAVE.XLS	
WTOTCAVE.XLS	
WTOMUBND.XLS	
<i>Sectoral results</i>	
<i>WTOMFSHC/A.SAS</i>	Generate tariff summaries for each sector. Summary variables are initial and final average and maximum bound and applied rates, average change in bound and applied rates and in duty-paid prices.
<i>WTOMFSH.SAS</i>	
<i>WTOMTT1C/A.SD2</i>	In file WTOMTT1.XLS, all items are included in the calculation of these summary measures. In file WTOMTT2.XLS, only high tariff items (items for which the initial applied rate exceeds 15 per cent) are included in calculating these summary measures. These numbers are used to produce a table similar to table 4.4 for each sector.
<i>WTOMTT2C/A.SD2</i>	
<i>WTOMTT3C.XLS</i>	
<i>WTOMTT4C.XLS</i>	
WTOMTT1.XLS	
WTOMTT2.XLS	
<i>Product results (average)</i>	
<i>WTOMC/ATAB.SAS</i>	The four files XXXTIMPC/A.XLS and XXXMSTPC/A.XLS contain tariff data suitable for generating line charts like those contained in chapter 4.
<i>EXPMC/ATAB.SAS</i>	
<i>WTOM_CMB.SAS</i>	The two files WTOMCMB1/2.XLS contain the data for table 4.4 (average tariffs across all industrial products).
<i>XXXTIMPC/A.SD2</i>	
<i>XXXMSTPC/A.SD2</i>	
<i>WTOMTB1C/A.SD2</i>	
<i>WTOMTB2C/A.SD2</i>	
XXXTIMPC/A.XLS	
XXXMSTPC/A.XLS	
WTOMCMB1.XLS	
WTOMCMB2.XLS	
<i>Product results (maximum)</i>	
<i>WTOMC/AMAX.SAS</i>	WTOMC/AMXB.XLS contains maximum initial and final bound rates for each sector (and for all industrial products) for each importing country.
WTOMC/AMXB.XLS	
WTOMC/AMAX1.XLS	The four files WTOMC/AMAX1/2.XLS contain maximum initial and final applied rates across all trading partners for each HS6 item and importing country and are used to generate the line charts in figures 4.2–4.5.
WTOMC/AMAX2.XLS	

^a XXX denotes country abbreviation, and C/A or 1/3 indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas). ^b XXXYYYCN.SD2 is the SAS datafile containing the raw CTS data for country XXX (one file per country). ^c XXXYYYTC.SD2 is the SAS datafile containing the raw IDB tariff data for country XXX (one file per country). Note: Key input and output files for this module are in italics and bold type, respectively.

Source: ITAS.

Market access module

ITAS contains trade and tariff data collected from the import side for each of the 19 countries. The bilateral nature of this data allows us to extract and analyse data for a particular country's exports to the remaining importing countries.³

The market access module consolidates information across importing countries to allow the user to examine the level of market access available to a particular country's exports. In order to do this, an export database is generated for a particular country in the following way.

Users run the market access module to extract data for the selected exporting country from the imports data file for each of the other importing countries in ITAS. For example, data for Australian exports is built up progressively by examining the data file for each of the remaining ITAS countries and extracting import data for which the partner country is Australia.⁴

Once the export data file is created, the market access module is then used to generate the following summary market access information:

- tariffs faced by all products in each market (average or maximum across products for each trading partner);
- tariffs faced by groups of products in each market (sectoral results); and
- tariffs faced by selected products in each market (currently defined as emerging exports).

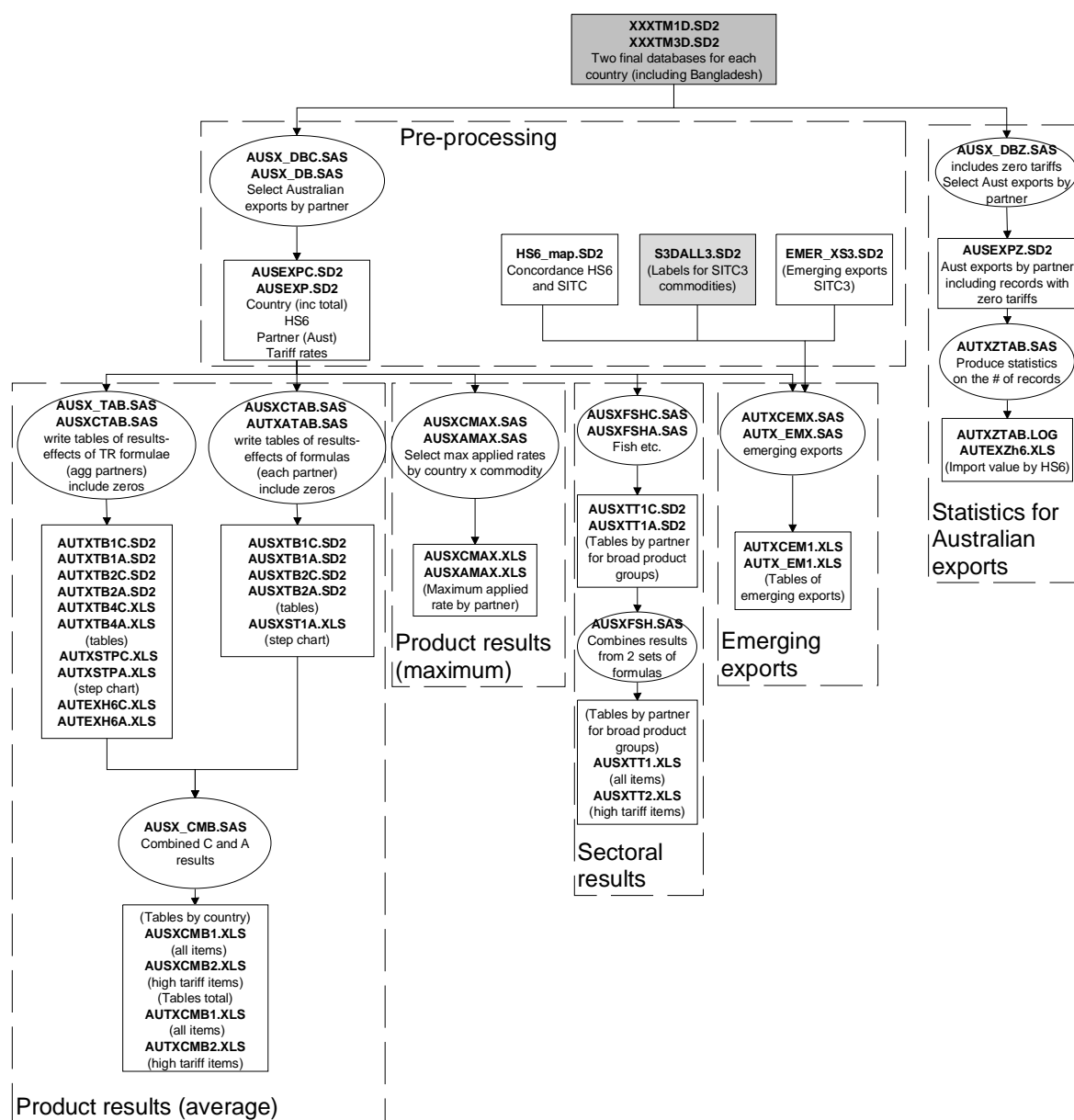
The market access module has been included to *demonstrate* the framework used to analyse access to other markets for a particular country's exports. The module currently identifies Australia as the only exporter and partner countries are limited to the remaining countries in ITAS. The module could be extended to examine market access for exports from other countries.

³ Users cannot currently examine a country's exports to Bangladesh without additional information, as the source (import) data for Bangladesh do not contain partner information. For Australian exports, this problem was solved by using ABS export data to identify the HS6 items Australia exports to Bangladesh and extracting tariff data for those items from the Bangladesh imports file.

⁴ That is, tariffs faced by Australian exports to Canada are identified as Canadian tariffs on imports from Australia.

Figure D.10 ITAS processing — market access module

Currently available for Australia only



Note: XXX denotes country abbreviation and C/A, 1/3, C/_ or C/(no C) indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas). Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

Table D.8 File list — market access module

Currently available for Australia only

<i>Filename^a</i>	<i>Description</i>
<i>Input data and pre-processing</i>	
XXXTM1/3D.SD2 HS6_MAP.SD2 S3DALL3.SD2 EMER_XS3.SD2 AUSX_DBC.SAS/ AUSX_DB.SAS AUSEXPC.SD2/ AUSEXP.SD2	Using master data file for each importing country, create two exports data files (one for each set of formulas) for Australia containing initial and final bound and applied rates and percentage changes in bound and applied rates and prices. These two files show market access in 18 partner countries (listed in table A.1) for each HS6 item that Australia exports.
<i>Product results (average)</i>	
AUTXCTAB.SAS/ AUTX_TAB.SAS AUSXCTAB.SAS/ AUSX_TAB.SAS AUSX_CMB.SAS AUTXTB1C/A.SD2 AUTXTB2C/A.SD2 AUSXTB1C/A.SD2 AUSXTB2C/A.SD2 AUTXTB4C/A.XLS AUTXSTPC/A.XLS AUTEXH6C/A.XLS AUSXST1A.XLS AUSXCMB1.XLS AUSXCMB2.XLS AUTXCMB1.XLS AUTXCMB2.XLS	Files AUTXSTPC/A.XLS and AUSXST1A.XLS contain data suitable for generating line charts showing average tariffs by product for Australian exports and tariffs by partner and product for Australian exports, respectively. AUSXCMB1.XLS — for each trading partner, the average initial and final bound and applied tariffs across all Australian exports (industrial products). AUSXCMB2.XLS — for each trading partner, the average initial and final bound and applied tariffs across Australian exports of high tariff items (those industrial products with initial applied rates in excess of 15 per cent in the importing country). AUTXCMB1.XLS — average initial and final bound and applied tariffs across all Australian exports and importing countries. AUTXCMB2.XLS — average initial and final bound and applied tariffs across Australian exports of high tariff items and all importing countries.
<i>Product results (maximum)</i>	
AUSXC/AMAX.SAS AUSXC/AMAX.XLS	For each trading partner, the maximum initial and final bound and applied tariffs across all Australian exports (industrial products).
<i>Sectoral results</i>	
AUSXFSHC/A.SAS AUSXFSH.SAS AUSXTT1C/A.SD2 AUSXTT1.XLS AUSXTT2.XLS	For Australian exports of industrial products, average and maximum initial and final bound and applied tariffs for the sector (across HS6 items in the sector and trading partners).
<i>Emerging exports</i>	
AUTXCEMX.SAS/ AUTX_EMX.SAS AUTXCEM1.XLS/ AUTX_EM1.XLS	AUTXCEM1.XLS/AUTX_EM1.XLS — using a mapping from HS6 to SITC3 products, identify groups of HS6 items ('emerging exports') and for each group calculate average and maximum initial and final bound and applied rates (across HS6 items and trading partners) for Australian exports. For each group, also calculate percentage changes in bound and applied rates and percentage changes in prices.

(Continued next page)

Table D.8 (continued)

<i>Filename^a</i>	<i>Description</i>
<i>Summary information</i>	
AUSX_DBZ.SAS	Summary information includes number of HS6 items exported by Australia and the number exported to each of Australia's trading partners.
AUTXZTAB.SAS	
AUSEXPZ.SD2	
AUTEXZH6.XLS	

^a XXX denotes country abbreviation and C/A, 1/3, C/_ or C/(no C) indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas).

Note: Key input and output files for this module are in italics and bold type, respectively.

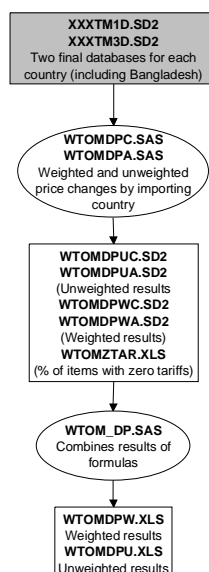
Source: ITAS.

Price module

The price module translates changes in tariffs to initial changes in duty-paid prices. It is used to extract summary information for each importing country on the average change (across HS6 items and trading partners) in duty-paid prices for each scenario and for tariff elimination. Changes in prices assume no change in trade volumes and are calculated using the power of the tariff.⁵

⁵ The power of the tariff is defined as one plus the applied tariff rate and reflects the effect of the tariff on a product's duty-paid price. A change in the power of the tariff reflects the change in the price due to a change in the tariff.

Figure D.11 ITAS processing — price module



Note: XXX denotes country abbreviation and C/A or 1/3 indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas). Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

Table D.9 File list — price module

<i>Filename^a</i>	<i>Description</i>
<i>XXXTM1/3D.SD2</i>	For each importing country, calculate trade-weighted and unweighted average change in duty-paid prices that results from each tariff reduction scenario and from a tariff elimination scenario.
<i>WTOMDPC/A.SAS</i>	
<i>WTOM_DP.SAS</i>	
<i>WTOMDPUC/A.SD2</i>	
<i>WTOMDPWC/A.SD2</i>	
<i>WTOMZTAR.XLS</i>	
WTOMDPW.XLS	
WTOMDPU.XLS	

^a XXX denotes country abbreviation and C/A or 1/3 indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas).

Note: Key input and output files for this module are in italics and bold type, respectively.

Source: ITAS.

Tariff revenue module

Tariff reductions have two direct effects — reductions in duty-paid prices of imported products and reductions in per unit tariff revenue collected by the government. As part of any analysis of tariff reduction formulas, it is also important

to gauge the effects on government revenue to assess whether a formula is likely to be acceptable to a country. That is, very large tariff reductions may be acceptable if the tariff revenue associated with those items is small relative to a government's total revenue. Conversely, even small tariff reductions may not be acceptable to a country if the duty collections associated with these imported items form a significant contribution to overall government revenue (for example in an LDC). It is therefore appropriate to include a tariff revenue module in ITAS.

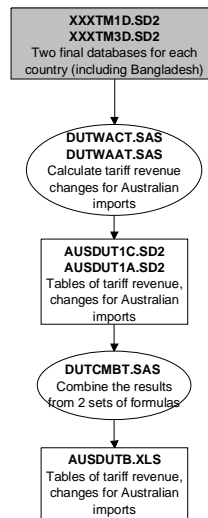
For each country, the product of import values and applied tariffs provides an estimate of tariff revenue (duty collections).⁶ Initial and final applied rates are used to estimate the initial change in customs revenues due to changes in tariffs.

These tariff revenue calculations do not take into account changes in the volume or value of trade that result from demand responses to changes in tariffs. That is, a reduction in tariffs will initially reduce total duty collections but this reduction will be lessened (and perhaps even offset) as trade volumes subsequently increase.

The tariff revenue module is included to demonstrate a framework for calculating initial revenue implications of tariff reduction scenarios. Australia is currently the only country for which revenue calculations are available in ITAS. This module could be extended to calculate the revenue impacts for other countries in ITAS.

⁶ Tariff revenue calculated in this way is only an estimate and depends on assumptions made in collecting and standardizing the tariff data. For example, revenue from items subject to specific tariffs is not included in the calculation.

Figure D.12 **ITAS processing — tariff revenue module**
Currently available for Australia only



Note: XXX denotes country abbreviation and C/A or 1/3 indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas). Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

Table D.10 **File list — tariff revenue module**
Currently available for Australia only

<i>Filename^a</i>	<i>Description</i>
<i>XXXTM1/3D.SD2</i>	Calculate changes in tariff revenue (duty collections) under each scenario using initial and final applied rates and corresponding import values. These programs calculate initial changes in tariff revenue resulting from changes in tariffs. No demand response is included in these calculations.
<i>DUTWAC/AT.SAS</i>	
<i>DUTCMBT.SAS</i>	
<i>AUSDUT1C/A.SD2</i>	
AUSDUTB.XLS	

^a XXX denotes country abbreviation and C/A or 1/3 indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas).

Note: Key input and output files for this module are in italics and bold type, respectively.

Source: ITAS.

Economic modelling input module

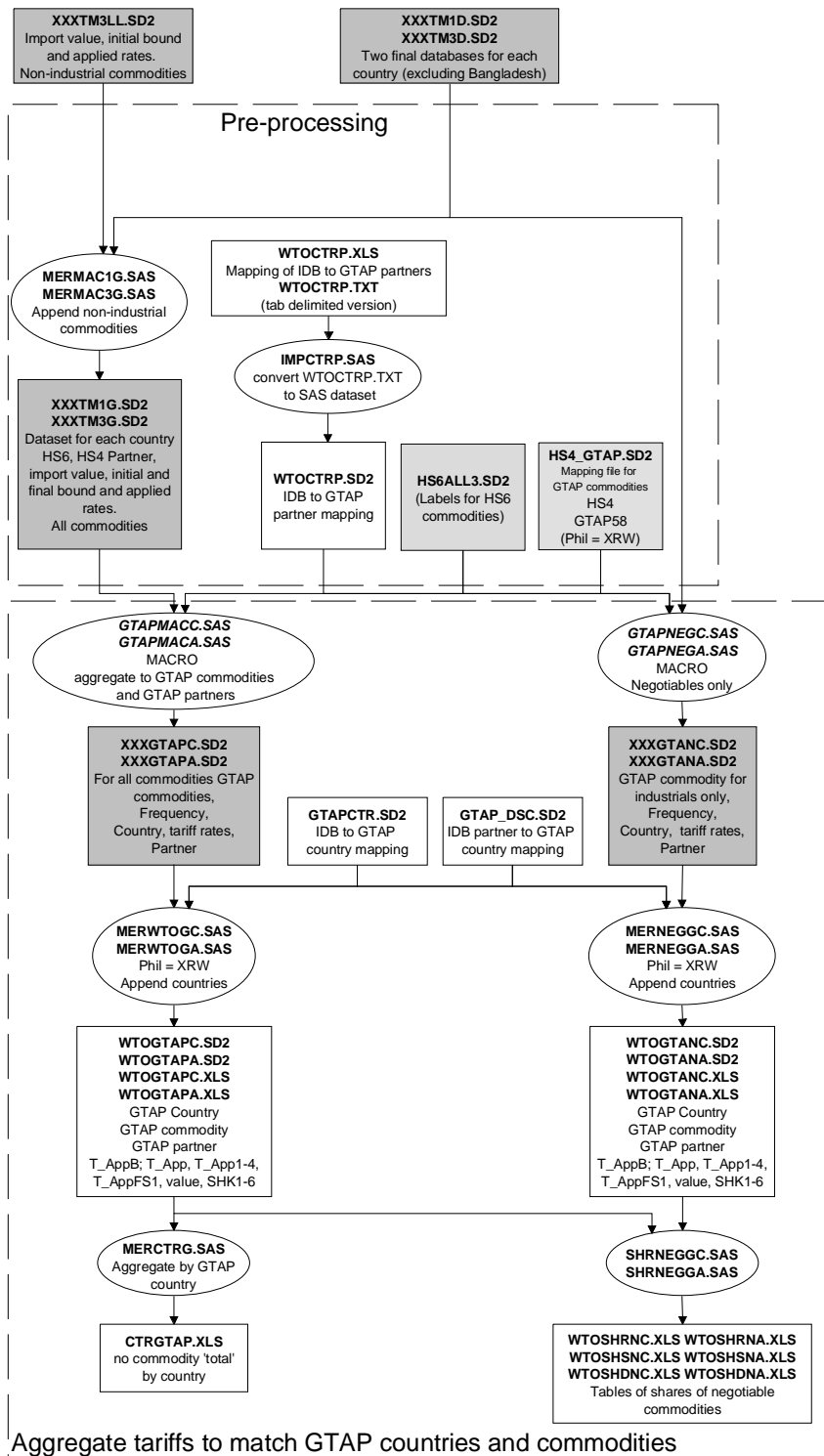
This module provides a *framework* for translating initial and final applied tariffs into a suitable format for input into an economic model (that might be used to estimate trade responses or welfare effects).⁷ One such model is GTAP.

In the current implementation, the economic modelling input module aggregates the final data to match the region and product classifications used in GTAP. Changes in these average applied rates are then available for use as input (shocks) for GTAP simulations.⁸

⁷ Such a model allows analysts to examine flow-on effects of tariff reductions.

⁸ GTAP is used as an *example* of a model that includes demand responses to reductions in applied tariffs. GTAP is not included as part of ITAS. It is not required to run or to conduct analysis using ITAS.

Figure D.13 ITAS processing — economic modelling input module



Note: XXX denotes country abbreviation and C/A or 1/3 indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas). Files and programs in shaded boxes and bubbles are found in the C:\ITAS\Y_1999\XXX directories. All other files and programs are in the C:\ITAS\MERGE directory.

Source: Productivity Commission.

Table D.11 File list — economic modelling input module

<i>Filename^a</i>	<i>Description</i>
<i>Input data and pre-processing</i>	
<i>XXXTM1/3D.SD2</i>	Collect trade-weighted tariffs and import values for industrial and non-industrial products ready to aggregate to match GTAP countries and commodities.
<i>XXXTM3LL.SD2</i>	
<i>MERMAC1/3G.SAS</i>	
<i>HS4_GTAP.SD2</i>	
<i>HS6ALL3.SD2</i>	
<i>WTOCTRP.SD2</i>	
<i>WTOCTRP.TXT</i>	
<i>XXXTM1/3G.SD2</i>	
<i>WTOCTRP.XLS</i>	
<i>Calculate GTAP shocks</i>	
<i>GTAPMACC/A.SAS</i>	Aggregate initial and final tariffs to match GTAP country and commodity classifications (contained in files WTOGTANC/A.XLS).
<i>GTAPNEGC/A.SAS</i>	
<i>MERCTRG.SAS</i>	Some GTAP commodities contain industrial and non-industrial HS6 products. For example, 'meat products nes' (GTAP commodity 20) includes 'prepared or preserved lobster' (industrial, HS6 code 160530) and 'frozen turkeys not cut in pieces' (non-industrial, HS6 code 020722). Shocks for GTAP commodities must be scaled by the import value share of industrial products in the GTAP commodity. These shares are contained in files WTOSHRNC/A.XLS (source x destination x commodity), WTOSHSNC/A.XLS (source x commodity) and WTOSHDNC/A.XLS (destination x commodity).
<i>MERNEGGC/A.SAS</i>	
<i>MERWTOGC/A.SAS</i>	
<i>SHRNEGGC/A.SAS</i>	
<i>GTAP_DSC.SD2</i>	
<i>GTAPCTR.SD2</i>	
<i>WTOGTANC/A.SD2</i>	
<i>WTOGTAPC/A.SD2</i>	
<i>XXXGTANC/A.SD2</i>	
<i>XXXGTAPC/A.SD2</i>	
<i>CTRGTAP.XLS</i>	
WTOGTANC/A.XLS	
WTOGTAPC/A.XLS	
WTOSHDNC/A.XLS	
WTOSHRNC/A.XLS	
WTOSHSNC/A.XLS	

^a XXX denotes country abbreviation and C/A or 1/3 indicates two versions of the file exist (corresponding to the two sets of formulas currently included in ITAS: C or 1 denote Girard formulas; A or 3 denote Chinese and Swiss formulas).

Note: Key input and output files for this module are in italics and bold type, respectively.

Source: ITAS.

E FAQs

The SAS programs provide answers to many of the questions relating to more detailed aspects of ITAS. These programs may be examined using any text editor.

This appendix contains answers to some of the more frequently asked questions. These questions are divided into two sections: those related to deriving new results and those relating to using the existing results.

Deriving new results from ITAS

I want to re-run ITAS to get a full set of results — what do I need to do this?

Users require appropriate hardware and licensed software to run ITAS. The current implementation of ITAS was run using SAS base (version 8) and MS Excel 2002 under Windows XP on a Pentium 4–2400Mhz with 1 Gb of RAM.

There are two steps required to re-run ITAS:

1. create a directory C:\ITAS on C drive and copy contents of the CD-ROM into this directory. Filenames and paths are used *extensively* in the SAS programs and care should be taken if the user wants to change these references.
2. run the batch file COMBB.BAT.

A full set of results for the import tariff module, market access module, price module, tariff revenue module and economic modelling input module is generated in approximately three hours.¹

I want to change the formulas — where and how do I do this?

Ten formulas are implemented in the following four programs:²

¹ To re-run the master data preparation module adds approximately one hour to the processing time on the specified machine.

- MERMAC1B.SAS applies five variations of the Girard formula to the tariff schedule of each country (excluding Bangladesh);
- MERMAC3B.SAS applies three variations of the Chinese formula and two variations of the Swiss formula to the tariff schedule of each country (excluding Bangladesh);
- MERBGD1B.SAS applies five variations of the Girard formula to the Bangladesh tariff schedule; and
- MERBGD3B.SAS applies three variations of the Chinese formula and two variations of the Swiss formula to the Bangladesh tariff schedule.

To change the formulas, these programs should be modified in the appropriate places and the system then re-run using the batch file COMBB.BAT. For example, to change from a Swiss8 to Swiss10 formula for Bangladesh we find the existing code in the SAS program and modify the parameter value to get new SAS code for Swiss10 (table E.1). Changing parameter values in formulas in ITAS is relatively simple and probably does not even require a specialised SAS programmer.

Table E.1 Example code for changing a formula
Swiss8 to Swiss10 for Bangladesh^a

<i>Existing code for Swiss8</i>	<i>Replacement code (Swiss10)</i>
<pre>/* Swiss 8 */ if tu_bound ne . then tu_bnd4 = (tu_bound*8) / (tu_bound+8) ; else tu_bnd4 = . ;</pre>	<pre>/* Swiss 10 */ if tu_bound ne . then tu_bnd4 = (tu_bound*10) / (tu_bound+10) ; else tu_bnd4 = . ;</pre>

^a For all other countries the same code must be changed in file MERMAC3B.SAS. Further, similar code implements formulas on trade-weighted HS6 tariffs and must also be changed.

Source: ITAS program MERBGD3B.SAS.

For other countries, similar changes are required to implement formulas on both unweighted and trade-weighted tariffs (for subsequent analysis using an economic model, such as GTAP).

I want to see the effects of a new formula — how can I do this without using SAS?

A set of MS Excel files containing initial bound and applied rates for each HS6 product and trading partner are generated by ITAS to allow users to apply other formulas to these initial rates in Excel. These Excel files are called XXXBL.XLS,

² Table 3.1 lists the formulas and appendix B details how each works.

where *XXX* refers to the abbreviation for each country (see table A.2) and are found in the \ITAS\Utilities\Excel_data directory.

However, some of these Excel files are very large and make this method of calculating final rates slow, cumbersome and likely to result in user-errors.³ Users would also have to do any subsequent aggregation/averaging of final rates for their analysis.

I want to add an importing country — how do I do it?

Programs in the master data preparation module convert the WTO source data into the format used in the final database in ITAS. Variations in the basic processing structure between countries are shown in appendix D (figures D.3 to D.8). There are three main steps to add an importing country: acquiring WTO data; adding a series of SAS programs for the new country to the master data preparation module; and including the new country in each program in the analysis modules.

Source data

Source data in text file format are located in the IDB File Transfer Facility on the WTO members website (<http://members.wto.org>). CTS and IDB data for a country may be downloaded by the following categories of authorised WTO users:

- all WTO Members;
- Acceding countries or territories that have provided IDB submissions;
- the WTO Secretariat; and
- the following intergovernmental organisations: Caribbean Regional Negotiating Machinery; Caribbean Community Secretariat (CARICOM); Food and Agricultural Organisation; International Monetary Fund; International Textiles and Clothing Bureau; International Trade Center; Organisation for Economic Co-operation and Development; United Nations Conference on Trade and Development; United Nations Economic and Social Commission for Asia and the Pacific; and the World Bank.

Other intergovernmental organisations require prior approval by the WTO Committee on Market Access to gain access to the data.

³ For example, for the EU there are more than 150,000 records across three Excel worksheets.

SAS programming

Appendix D shows how the source data from the WTO and programming required to create a consistent database can vary considerably. Rather than set up from scratch a new system of SAS programs to create an initial database, it is easier to find an existing processing sequence that provides the closest match to the required processing, make a copy and modify it to process data for the new country (by changing country name references, for example).

Once a consistent initial database has been constructed, most of the subsequent programs in the sequence need to be modified to read and process the files for the additional country.

I want to use twice the MFN rate for unbound items for all formulas — how do I do this?

Most scenarios use the MFN rate for unbound items. However, the current implementation of ITAS uses twice the MFN rate for unbound items in the Girard 1c scenario. This treatment of unbound items can be extended to the other formulas as follows.

For unweighted tariff analysis, variable `tu_bound` uses the MFN rate for unbound items and `tu_bnd_g` uses twice the MFN rate for unbound items.⁴ The treatment of unbound items is changed by substituting the corresponding variables that appear in each formula in programs `MERMAC1B.SAS`, `MERMAC3B.SAS`, `MERBGD1B.SAS` and `MERBGD3B.SAS`.⁵

I want to analyse tariffs on the exports from Thailand — how would I do this?

The market access module is currently set up to examine the tariffs on Australian exports. Three main programs extract the data for exports: `AUSX_DBC.SAS`; `AUSX_DB.SAS`; and `AUSX_DBZ.SAS` (see figure D.10 in appendix D).

⁴ For weighted tariff analysis, `t_bound` uses the MFN rate and `t_bnd_g` uses twice the MFN rate for unbound items.

⁵ Other treatments of unbound items can be included by changing the way the initial bound rate `tu_bnd_g` (and `t_bnd_g`) is calculated or by generating additional variables for the initial bound rate. These variables are created in files `MERBADE.SAS` and `MECXXX3B.SAS`, where `XXX` refers to the abbreviation for each country (see table A.2).

These programs currently read the final data file for each country except Australia and extract data for which the export partner is Australia, thereby generating a consolidated file for Australian exports to the remaining 18 countries in ITAS.

A file containing trade and tariff data for Thailand's exports can be created by amending these programs to read the final data file for each country except Thailand and extracting data for which Thailand is the exporting partner. If the output files (AUSEXPC.SD2, AUSEXP.SD2 and AUSEXPZ.SD2) are not renamed then the remaining programs in the market access module may be re-run (and Australian market access information will be overwritten with that for Thailand).

I want to use the Flexible Swiss formula but target a different maximum bound rate — how would I do this?

FSsolvers.XLS contains detailed instructions on how to gather the required data and use the solver function in Excel to calculate the a and b parameters for the Flexible Swiss formula.

In general, the process is as follows:

- Paste data for a country into the spreadsheet.
- Ensure all formulas cover the entire data range.
- Re-set the a and b parameters to 8 and 1 to verify that you have correctly re-generated the Swiss8 results (that is, to check the formulas are working).
- Specify the new target maximum for the (observed) final tariff.
- Run the solver.
- Examine the results (some results may not be feasible in light of the way the Flexible Swiss formula effectively 'pivots' the final tariffs from the Swiss formula).

After the Flexible Swiss parameter values have been calculated, these values are manually entered into the MERMAC3B.SAS program and the Flexible Swiss formula activated.

Using existing results from ITAS

I want to create tables — how was table 4.4 created?

Table 4.4 uses data from WTOMCMB1.XLS and WTOMCMB2.XLS which are located in the \ITAS\MERGE directory. The average applied tariffs, Swiss8, Girard 1a and Combined Swiss are in the rows which correspond to the variable name TU_APP which is the SAS summary variable name representing average applied rates. The Combined Swiss rates use Swiss8 for industrialised countries and the Swiss16 results for developing countries. The percentage changes were calculated from these data.

I want to set up a distribution graph — where are the data and how do I do it?

Distribution graphs such as those contained in figure 4.1 are generated using the histogram facility in Excel. The required data are contained in four files:

- WTOMCMAX1.XLS — initial and final (Girard formulas) bound and applied rates for each HS6 item (maximum across partners) for Australia, Bangladesh, Brazil, Canada, China, EU, India, Indonesia and Japan;
- WTOMCMAX2.XLS — initial and final (Girard formulas) bound and applied rates for each HS6 item (maximum across partners) for Korea, Malaysia, Mexico, New Zealand, Philippines, Singapore, South Africa, Taiwan, Thailand and US;
- WTOMAMAX1.XLS — initial and final (Chinese and Swiss formulas) bound and applied rates for each HS6 item (maximum across partners) for Australia, Bangladesh, Brazil, Canada, China, EU, India, Indonesia and Japan; and
- WTOMAMAX2.XLS — initial and final (Chinese and Swiss formulas) bound and applied rates for each HS6 item (maximum across partners) for Korea, Malaysia, Mexico, New Zealand, Philippines, Singapore, South Africa, Taiwan, Thailand and US.

I liked the line charts — where are the data and how do I create one?

Two types of line chart are useful for summarising tariff structures — one comparing bound and applied schedules and another comparing how a schedule of applied rates is expected to change when formulas are implemented (see figures 4.2 to 4.5).

Data for these charts are contained in files WTOMCMAX1.XLS and WTOMCMAX2.XLS (Girard formulas) and WTOMAMAX1.XLS, WTOMAMAX2.XLS (Chinese and Swiss formulas).

An additional Excel file included with ITAS (STEP CHARTS.XLS) contains instructions for creating a line chart and two example charts, showing bound and applied rates for a country on one chart and initial and final applied rates for a country on another chart. Charts for other countries and/or formulas are created by replacing the data in the spreadsheet.

I need to summarise tariffs on chemical products — where do I find the data I need?

The import tariff module creates a set of sector-specific results. Average initial and final bound and applied rates for the chemical product sector of each importing country are contained in WTOMTT1.XLS. Similar averages for high tariff items in the sector are contained in WTOMTT2.XLS.⁶

The market access module produces sectoral results relating to tariffs on Australia's exports.⁷ AUSXTT1.XLS contains initial and final bound and applied tariffs averaged across trading partners and HS6 products in the chemical products sector.

How many commodities are there?

The 1996 HS6 classification currently adopted in ITAS identifies 5734 products, of which 4938 are industrial products.

Why aren't the formulas used at the individual line item level and what difference does aggregating to HS6 make?

Tariffs on bilateral imports are aggregated from line items to HS6 categories before formulas are used. Applying formulas at this level allows users to specify their own formulas, if required, and for ITAS to be made available to everyone, including non-authorized users in the sense of the WTO conditions of use. Applying formulas at the line item level would mean either hard-wiring particular formulas and making results aggregated to the HS6 level available, or restricting the availability of ITAS to users authorised to access WTO data.

⁶ High tariff items are those HS6 items with initial applied rates in excess of 15 per cent.

⁷ This module could be extended to cover exports from other countries, as outlined in chapter 5.

Sensitivity analysis in appendix C shows that, for most countries and HS6 categories, there is little difference between initial and final tariffs estimated at the HS6 level or at the more disaggregated level.

Where do I get more information on WITS?

World Integrated Trade Solution (WITS) is a software system developed by the World Bank in close collaboration with UNCTAD. Although the software is free, use of the WITS-compatible databases may be subject to a fee or to access restrictions. Further information and registration details are available at <http://wits.worldbank.org/witsweb>.

Where do I get more information on MAcMap?

Market Access Map (MAcMap) is a database jointly produced by CEPII and the ITC. A range of information about the database and some selected simulation results are available on the MAcMap website, located at <http://www.cepii.fr/anglaisgraph/bdd/macmap.htm>.

Where do I get more information on PC-IDB?

Personal Computer Integrated Database (PC-IDB) is produced by the WTO. It is available on CD-ROM, but access is restricted to authorised WTO users. The database is periodically updated and distributed to WTO members. Further details are available by contacting the WTO.

Where do I get more information on GTAP?

The Global Trade Analysis Project model (GTAP) is a computable general equilibrium model of the world economy. The original model is documented in Hertel (1997). The latest version (version 6.2) was released in November 2003 and is available at <http://www.gtap.agecon.purdue.edu>.

The latest database used by GTAP (version 5) is documented in Dimaranan and McDougall (2002). The GTAP database is updated bi-annually, with the next release (version 6) due in 2004.

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