



CENTRE FOR  
INTERNATIONAL  
ECONOMICS

# ***Modelling international developments***

***GTAP simulations of TCF  
protection removal***

***Prepared for the***

***Productivity Commission***

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# 1

## *Introduction*

### **This report**

This report presents the results of a number of simulations using the GTAP model of the world economy. These simulations are designed to capture some of the potential implications of Australian, US, EU, Chinese and global liberalisation of TCF protection. This report should be used in conjunction with our previous report (CIE 2002a) examining the effect of a broad range of global liberalisation scenarios.

Table 1.1 summarises the simulations and indicates their presentation in chapters 2 to 4. Chapter 5 of the report undertakes some sensitivity analysis of the results while the appendix summarises some technical details of the simulations.

#### **1.1 Simulations undertaken**

<i>Simulation</i>	<i>Reported in</i>
1. Unilateral removal of Australia's TCF protection	Chapter 2
2. Unilateral 50% reduction in Australia's TCF protection	Chapter 2
3. Unilateral removal of the US's TCF protection	Chapter 3
4. Unilateral removal of the EU's TCF protection	Chapter 3
5. Unilateral removal of China's TCF protection	Chapter 3
6. Removal of TCF protection in Australia and the EU	Chapter 4
7. Removal of TCF protection in Australia and the US	Chapter 4
8. Removal of TCF protection in Australia and greater China	Chapter 4
9. Removal of TCF protection in APEC region	Chapter 4
10. Global TCF trade liberalisation	Chapter 4

## Some key results

### *The Australian TCF sector*

While the analysis in this report looks broadly at the effects of a number of TCF liberalisation scenarios, one area of particular interest is the extent to which liberalisation elsewhere in the world improves or worsens the prospects of the Australian TCF industry.

To examine this question, table 1.2 summarises key results from 5 of the simulations presented in this report. The table shows the effect on Australian GDP and real income, as well as output in three aggregate TCF sectors of: unilateral Australian liberalisation; US liberalisation, EU liberalisation; Chinese liberalisation; and global liberalisation.

#### 1.2 Summary effects on Australia

	<i>Australian</i>	<i>US</i>	<i>EU</i>	<i>Chinese</i>	<i>Global</i>
	% change	% change	% change	% change	% change
GDP	0.10	0.00	0.00	0.01	0.10
Real income	0.04	0.00	0.00	0.03	0.08
Textile output	-18.3	1.7	-0.3	-1.0	-19.6
Clothing and footwear output	-48.7	-0.2	-0.2	-0.8	-43.0
Leather products output	-10.0	0.1	-3.4	-4.4	-22.2

Source: GTAP simulations

#### *Australia liberalisation*

The first results column in table 1.2 shows the effects of Australia removing its TCF tariffs from their 1997 levels (the level in the GTAP database, an average of 15.8 per cent for textiles, 27.4 per cent for clothing and 12.1 per cent for leather products — see table 2.1). The results follow the usual pattern for this type of simulation. There is a reallocation of activity away from the protected textiles sector towards other industries and an increase in total real income.

In this simulation, the output of each of the TCF industry declines. The extent of the decline in the results here is largely a function of the import substitution elasticity we have chosen for these simulations. We have chosen a relatively large value for this elasticity.

#### *US liberalisation*

If the US alone liberalises, there is a very small effect on any of Australia's TCF industries. While the US does have barriers against Australia's

products the barriers against other exporters, in particular China, are several times greater. Following the US liberalisation, US importers see significant relative price changes, with the Chinese product appearing relatively cheaper and hence Chinese exports to the US increasing several-fold.

In this simulation, Australia's clothing and footwear output declines slightly because of a loss of exports to the US market. Thus, despite a removal of US barriers against Australia, Australian exports to the US decline because of increased competition from China.

Interestingly, Australia's exports of textiles and leather increase slightly because of increased sales to China, which now purchases more of these inputs in order to services the US market.

#### *EU liberalisation*

There is a similar pattern of Australian results for EU liberalisation, except in this case all of Australia's TCF industries decline. As in the case of the US, this is because EU barriers are higher against other countries (particularly in Asia) than they are against Australia, and so when the barriers are removed, the EU tends to substitute towards Asian products and away from Australian products.

#### *Chinese liberalisation*

Removal of Chinese import protection shows another set of mechanisms at work. Following China's liberalisation, there is an increase in Australia's exports to China. At the same time however, China's exports also increase. This leads Australia to import more and subsequently a decline in Australian demand for domestic TCF products.

#### *Global liberalisation*

Global liberalisation consists of each of the above, plus liberalisation from other countries. Most of the effect on Australian TCF output is from Australia's own liberalisation. As a result of a mix of the mechanisms described above, there are some small differences with the Australian liberalisation results, but these do not offset the decline in output from that liberalisation.

### *Implications and caveats*

These results suggest that the removal of the measurable trade distortions (tariffs and quotas) in countries elsewhere in the world may lead in some instances to increased TCF activity in Australia. In most cases, however, this global liberalisation will have little impact on the fortunes of the Australian industry, and in some cases it could lead to a reduction in Australian output.

The main reason for this result is that according to the protection estimates embedded in the GTAP database, restrictions against other countries are considerably greater than restrictions against Australia.

There are some important caveats to this result.

- The GTAP model is highly aggregated, with only three broad industry groups representing all the diversity of the TCF sector. It is quite likely that this aggregation masks some important outcomes for particular niche Australia products — both in terms of the starting levels of protection, and in terms of the responses to the removal of that protection.
- There may also be a variety of barriers to trade that do not figure in the protection estimates within the database. While these are designed to capture the key elements of policies such as the MFA, there may be other less measurable restrictions that are not covered.
- The Australian TCF industry most likely perceives a range of restrictions to trade when they seek to export. Given the long term distortions that have been established as part of the MFA — distortions which no longer just work at the margin, but have changed the very nature of the TCF business — it is difficult to determine precisely how much things will change as the MFA is phased out.

### ***Broad sources of welfare change***

There are two broad sources of welfare change captured in the simulations presented here. The first is changes in allocative efficiency. Removing import tariffs and/or quotas reduces activity in the previously protected sector and increases activity in other sectors in the economy. Typically, the expanding sectors are export oriented, as import protection tends to tax exporters. This change in activity involves the reallocation of resources to uses that do not require any protection and so leads to an overall welfare gain.

The second source of welfare change is changes in a country's terms of trade — which can change because of changes in export prices, or import prices, or both. Typically, when a country removes its own import tariff, this leads to an increase in exports. Depending on the demand conditions facing these exports, this increase in the quantity of exports may result in a decline in their price. Thus, a country removing its own tariffs may experience a terms of trade loss. On the other hand, removing import quotas can be equivalent to reducing an export tax in exporting countries, which may lead to terms of trade gain.

When a foreign country reduces its protection against products from the home country, then the increase in demand for the home country's products will increase the price of those products, resulting in an improvement in the home country's terms of trade. Thus, while removing protection at home may be associated with a terms of trade loss, protection removed overseas will result in a terms of trade gain.

### ***Welfare results for each simulation***

Chart 1.3 summarises the welfare effects (measured as the percentage change in real income) that result from each of the simulations. In general, these effects are very small, being less than 0.1 per cent for Australia, for example, in all simulations. This is because TCF sectors account for a small share in both production and trade.

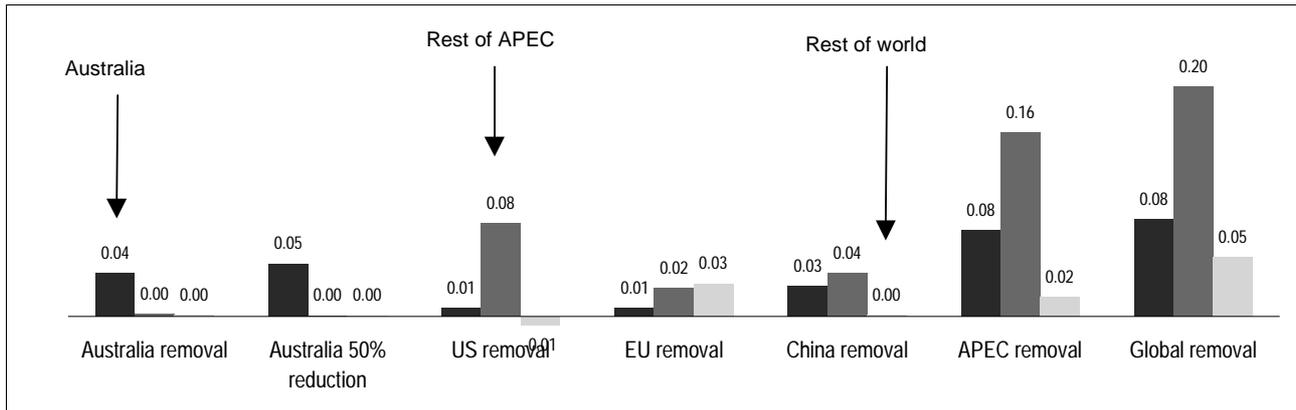
In the simulations of unilateral removal or reduction of Australia's TCF tariffs, Australia's gains come through improvements in domestic resource allocation which more than offset the loss of terms of trade. So does the global TCF liberalisation. On the other hand, Australia's gains come through improvements in its terms of trade when the US or the EU unilaterally removes its TCF tariffs. However, the unilateral removal of China's TCF tariffs provides a special case where Australia gains through improvements in both domestic resource allocation and terms of trade with the former being larger than the latter.

An important finding from the simulations is that Australia achieves higher benefits when it unilaterally removes or reduces TCF tariffs than cases where other countries (the US, the EU and China) unilaterally remove their tariffs. This is because that Australia is a net importer of TCF products and the liberalisation in other countries does not provide any improvement in the economic structure which is distorted by the protection of TCF sectors. A unilateral 50 per cent reduction in Australia's TCF tariffs brings about higher welfare gains than a unilateral removal. And the sensitivity analysis shows that the welfare gains have smaller variation as a result of changing

parameter values in the case of unilateral reduction than in the case of unilateral removal.

All the model results are sensitive to the choices of parameter values, as discussed in the chapter on sensitivity analysis.

### 1.3 Summary welfare results Percentage change in income



Data source: GTAP model simulations

## Key features of the modelling design

### *The GTAP model*

GTAP is a global general equilibrium model and database. Its origins lie in work originally undertaken at the (then) Industry Commission. Since the publication of the first GTAP book (Hertel et al 1997) the GTAP project (based at Purdue University) has become a global network of developers, contributors and users.

The full GTAP database covers 66 regions and 57 sectors, and the latest version of the database is calibrated around 1997 as a base year. For the simulations presented here we aggregated the database to 14 regions and 18 sectors. These are set out in table 1.4 and the mapping of these aggregates to the full GTAP database is summarised in the appendix.

We have chosen this aggregation to make simulation with the model manageable while not losing the essence of the kinds of interactions the simulations outlined above are designed to capture.

#### 1.4 GTAP regions and sectors used in this report

<b>Regions</b>	<b>Sectors</b>
Australia	Crops
NZ	Livestock
US	Forestry & mining
Canada	Food processing
Mexico	Textile
EU	Clothing
Chinas	Leather products
Korea	Paper products
Other Asian APEC	Chemicals etc
Malaysia	Ferrous metals
Singapore	Motor vehicles
Thailand	Transport nec
Japan	Other equipment
ROW	Electrical
	Other manufacturing
	Utilities and construction
	Trade & transport
	Services

### ***Trade-offs in using a global model***

GTAP is a globally consistent database of production, consumption and trade. It provides an invaluable tool for analysing global interactions, particularly the effects of other countries' trade reforms on a particular country such as Australia.

There are, however, two important trade-offs with such a global database. First, the database will not necessarily reflect the full details of a particular sector in a particular region. For example, the export and import shares for the Australian TCF industry represented in the model may not be the same as what is observed from recent Australian data. Second, and related, the database is inevitably aggregated. For example, the three TCF sectors (textiles, clothing and leather products) include a variety of different products.

These trade-offs mean that some care should be used in interpreting the model results. It is important to keep in mind that for the simulations presented here (most of which are concerned with the effects on Australia of the actions of other regions), it is the relativities between different simulations that are most important.

### ***The model closure***

The main closure used in this report treats all endowments (land, labour and capital) as fixed. That is, the quantities of each of these used within a region do not vary as a result of the policy under consideration. This closure choice has both advantages and disadvantages. The advantage is that it allows the simulations to focus on the resource allocation effects of

the change under consideration. The potential source of gain in this case is that resources can be used more efficiently following trade liberalisation, for example.

The disadvantage is that the simulations do not show the capital cumulation effects that might result from trade reform. That is, the simulations focus on the static rather than the dynamic effects of liberalisation. To some extent this is inevitable, as GTAP is a comparative static model. However, in the sensitivity analysis presented in chapter 5 we show the effects of an alternative closure that allows capital to vary in each region.

### ***Key parameter choices***

We have used the standard GTAP parameters file with one exception: the trade parameters. There are two sets of these parameters:

- those determining the substitution between domestic and imported goods in each region; and
- those determining the substitution between imports from different sources.

For both of these sets, we have doubled the standard values. This follows common practice with the GTAP model. It is essentially based on the observation that the standard parameter set often generates unreasonably large terms of trade effects and that with the standard parameters it is difficult to replicate observed trade flows.

The values of the elasticity of substitution between imports from different sources range from 8 to 20 in the doubled-the-standard parameter set (the values for textile, clothing and leather products are, respectively, 8.8, 17.6 and 17.6). In GTAP, the export demand elasticities facing each region are implicitly determined by the import-import substitution elasticities in the countries that the region exports to. It turns out that the value of these import substitution elasticities (which are the same for all regions but differ by sector) sets an upper bound to the (absolute) value of the export demand elasticity for each commodity facing each region. Thus the upper (absolute) value of the export demand elasticities vary from 8 to 20.

In chapter 5 we present sensitivity analysis of groups of model parameters to give an indication of the importance of parameter choices for the simulations presented here.

### ***The welfare measure***

In the simulations presented here we use equivalent variation (EV, the change in real income measured at the prices prevailing before the change in the simulation) as our welfare measure. GTAP has one single representative household per region, so EV can easily be measured. When presented in dollar terms, the change in EV refers to 1997 US dollars.

### **Treatment of TCF policies**

In addition to tariffs, TCF imports are often restricted by quotas. Since its inception in 1974, the Multi-Fibre Arrangement (MFA) has allowed developed countries to negotiate discriminatory quotas on imports of textiles and clothing from participating exporting countries and to unilaterally impose country specific restrictions where agreement with supplying countries could not be reached. The United States, the European Union, Canada, Norway, Japan and Switzerland are the developed country participants in the MFA, though Switzerland and Japan have not, for some time, imposed restrictions under the Arrangement. The WTO Agreement on Textiles and Clothing (ATC), which was negotiated during the Uruguay Round, requires WTO members to phase out their MFA restrictions over a ten-year period from 1 January 1995. Operating within the rules of the ATC, the US has chosen not to integrate products with the highest barriers to imports until toward the end of the transition period.

These two types of protection are present in the GTAP model and database. Import quotas in the protected developed country are treated as destination specific export taxes from the point of view of the exporting countries. This is because the MFA operates as a series of voluntary export restraints, so the quota rents accrue (at least partially) to the exporting country.

Table 1.5 summarises the export tax equivalent (from the view of the exporter) of the protective regime of the US, the EU and Canada.

## 1.5 Export tax equivalent of import quotas

Exporting region	US		EU		Canada	
	Textile	Clothing	Textile	Clothing	Textile	Clothing
	Per cent					
Australia	0.00	0.00	0.00	0.00	0.00	0.00
NZ	0.00	0.00	0.00	0.00	0.00	0.00
US	0.00	0.00	0.00	0.00	0.00	0.00
Canada	0.00	0.00	0.00	0.00	0.00	0.00
Mexico	0.00	0.00	0.10	4.69	0.00	0.00
EU	0.00	0.00	0.00	0.00	0.00	0.00
Chinas	9.44	20.69	7.13	11.65	9.51	23.19
Korea	0.00	0.00	0.00	0.00	0.00	0.00
Other Asian APEC	2.27	1.90	1.60	0.60	2.40	1.90
Malaysia	7.72	7.79	6.28	6.35	7.84	7.68
Singapore	8.10	7.80	6.30	6.00	8.10	7.80
Thailand	0.00	0.60	0.20	0.20	0.00	0.60
Japan	8.28	13.19	6.40	7.80	8.30	13.20
ROW	7.89	8.08	3.23	2.28	8.64	13.74
Average <sup>a</sup>	7.82	12.15	4.02	4.75	8.14	16.66

<sup>a</sup> only includes quota binding exporting countries

Source: GTAP database v.5

The GTAP database provides one source of information on the tariff and export tax equivalents of restrictions under the MFA. These equivalents are notoriously difficult to estimate, particularly because the quotas are applied at a very detailed commodity level<sup>1</sup>. In order to check the values in the current GTAP database, we thought it would be useful to compare them with rates that CIE has recently estimated in some product specific projects.

In tables 1.6 and 1.7 we compare the US and the EU's TCF tariff rates in the GTAP Database with estimates that CIE has derived in previous projects.

These tables show that the EU clothing and the US textile barriers in the GTAP Database are similar to our earlier estimates. However, the GTAP estimates for US clothing protection are lower than our earlier estimates.

<sup>1</sup> This feature of the MFA means that it is impossible to use an aggregated model such as GTAP to actually model the policies as a series of quotas. Rather, these quotas must be converted to tariff or tax equivalents to allow aggregation.

### 1.6 Comparison of the US TCF barriers (tariff equivalent)

	<i>GTAP Data</i>			<i>CIE estimates</i>
	<i>Import tariff</i>	<i>Export tax</i>	<i>Combined</i>	
	Per cent			
Textile	11.2	7.82	19.9	
Cotton yarn				6.9-7.5
Wool and wool blend yarn				6.1-7.9
Other fibre yarn				7.5-8.6
Cotton fabric				8.2-8.8
Wool and wool blend fabric				18.8-24.1
Other fibre fabric				8.4-10.7
Clothing	13.3	12.15	27.1	
Cotton apparel				34.9-46.2
Wool and wool blend apparel				3.6-33.1
Other fibre apparel				50.5-67.8
Leather products	13.5	0.00	13.5	n.a. <sup>a</sup>

<sup>a</sup> not available

Source: GTAP Database v.5; CIE (2000)

### 1.7 Comparison of the EU clothing barriers (tariff equivalent)

	<i>GTAP Data</i>			<i>CIE estimation:</i>	<i>CIE estimation:</i>
	<i>Tariff</i>	<i>Export tax</i>	<i>Combined</i>	<i>import weighted</i>	<i>product weighted</i>
	Per cent				
Clothing	11.9	4.75	17.2		
Wool				7.4	17.8
Cotton				12.3	17.4
Man-made and other				13.9	14.6

<sup>a</sup> not available

Source: GTAP Database v.5; CIE (2002)

In order to test the importance of this difference, our sensitivity analysis reported in chapter 5 replaces the standard GTAP estimates with our alternatives. Because our estimates do not have the source specific information required by the GTAP model, we adjust the tariff equivalent rate according to the US imports of clothing from different sources (table 1.8). It can be seen from the table that most clothing imports are from Asian countries. Therefore it is assumed that the import quota for clothing from Asian countries except Japan are binding, implying that total protection level (combination of import tariff and export tax) for those countries are 46 per cent. The database is updated to reflect this assumption using GTAP's ALTERTAX closure.

### 1.8 The US imports of clothing

<b>Sources</b>	<b>Import shares</b>
	Per cent
Australia	0.12
NZ	0.02
US	0.00
Canada	2.74
Mexico	10.37
EU	4.80
Chinas	28.31
Japan	0.32
Korea	3.25
Other Asian APEC	7.89
Malaysia	1.46
Singapore	0.49
Thailand	3.16
ROW	37.09
Total	100.00

*Source:* GTAP Database v.5

## Other modelling implications

The GTAP treatment of the MFA is to convert the quota into a tax equivalent. Implicitly, any quota rent goes to the government as a tax. This means that following liberalisation, the exporting country removes a tax, allowing exports to increase and, all other things constant, leading to an increase in the price received by exporters.

However, in a number of exporting countries, the quota arrangements often work differently. For example, in many (if not all) cases, the quota rents are allocated to the exporter and are not captured by the government. An implication is that following liberalisation, the exporter will lose a valuable rent. Rather than seeing an increase in price, the exporters may see a decline in their average price. This may in turn lead to a reduction in activity, rather than the increase implied by the standard GTAP treatment.

The extent to which this is an issue can only be assessed on a country by country basis. It is well known that in some developing countries, the presence of (particularly EU) export quota leads to production distortions well beyond what can be captured by an export tax. This should be kept in mind when interpreting the various results presented below.

# 2

## *Unilateral change of Australia's TCF tariffs*

In the GTAP database, average Australian tariff rates for textile, clothing and leather product imports are 15.8 per cent, 27.4 per cent and 12.1 per cent, respectively (table 2.1), and our simulations involve their removal from these levels.

### 2.1 Australian tariff rates for TCF imports

<i>Sources</i>	<i>Textile</i>	<i>Clothing</i>	<i>Leather products</i>
	Per cent		
New Zealand	0.0	0.0	0.0
US	12.6	23.8	12.6
Canada	7.5	26.5	8.0
Mexico	13.5	25.7	11.2
EU	12.2	25.2	15.6
Chinas	21.8	29.6	12.3
Japan	14.5	25.5	4.5
Korea	17.7	25.1	12.2
Other Asian APEC	11.8	30.9	15.7
Malaysia	8.4	30.2	13.4
Singapore	10.5	29.2	9.3
Thailand	10.5	30.3	11.7
ROW	17.6	31.1	11.4
<b>Average</b>	<b>15.8</b>	<b>27.4</b>	<b>12.1</b>

Source: GTAP database v.5

Tables 2.2 and 2.3 report key results from unilateral removal of Australia's TCF tariffs. Tables 2.4 and 2.5 report key results from a unilateral 50 per cent reduction in Australia's TCF tariffs.

## **Unilateral removal of Australia's TCF tariffs**

As table 2.2 indicates, there are three components of the welfare effects: an allocative efficiency effect (resulting from the reallocation of activity away from subsidised towards non subsidised industries); a terms of trade effect (resulting either from a change in export or import prices) and an effect related to the price of capital relative to the price of savings.

2.2 **Welfare effects of removing Australia's TCF tariffs** Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	130	383	-250	-3
NZ	-27	-16	-12	1
US	-23	-6	-19	2
Canada	0	0	0	0
Mexico	2	1	2	0
EU	41	20	23	-2
Chinas	191	54	141	-4
Japan	46	28	18	-1
Korea	14	-5	19	0
OthASAPEC	32	10	20	2
Malaysia	3	-1	4	0
Singapore	3	0	3	0
Thailand	1	-3	5	0
ROW	90	40	45	4
<b>Total APEC</b>	<b>371</b>	<b>443</b>	<b>-69</b>	<b>-3</b>
<b>World</b>	<b>502</b>	<b>503</b>	<b>-1</b>	<b>0</b>

Source: GTAP simulation

Australia's tariff removal leads to an improvement in allocative efficiency (\$383 million) some of which is offset by a worsening in the terms of trade. Table 2.3 indicates that this is a result of a decline in Australia's prices received (export prices) relative to prices paid (import prices).

Australia's tariff removal has some flow on effects to the regions that export TCF to Australia (most significantly, China). For these countries, the positive effect is mostly due to an improvement in their terms of trade, arising from increased Australian demand for TCF.

For Australia, the sectoral results show a predictable pattern. The output of the three TCF sectors (and livestock) declines, while the output of other industries increases. The decline in livestock, although it is negligible, is caused by the decline in the output of leather products.

New Zealand has a similar sectoral impact to Australia. The clothing sector in other countries tends to benefit the most the unilateral removal of Australia's TCF tariffs. Clothing output in other Asian APEC countries increases by 1.57 per cent, followed by China with 1.37 per cent increase and Malaysia with a 0.76 per cent rise.

## 2 UNILATERAL CHANGE OF AUSTRALIA'S TCF TARIFFS

## 2.3 Unilateral removal of Australia's TCF tariffs: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.10	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Income	0.04	-0.05	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Investment	-0.05	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.01
Exports	3.32	-0.08	0.00	0.00	0.01	0.00	0.09	0.01	0.03	0.06	0.01	0.01	0.01	0.01
Imports	2.99	-0.12	-0.01	0.00	0.01	0.00	0.13	0.01	0.04	0.08	0.02	0.01	0.02	0.02
GDP deflator	-0.59	-0.16	0.00	0.00	0.00	0.00	0.04	0.00	0.01	0.02	0.00	0.00	0.00	0.01
Terms of trade	-0.34	-0.07	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.02	0.00	0.00	0.01	0.00
Prices received	-0.34	-0.16	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Prices paid	0.00	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
<b>Sectoral output</b>														
Crops	0.47	0.56	0.00	-0.01	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01
Livestock	-0.03	-0.58	-0.01	-0.02	-0.01	-0.02	0.00	-0.01	-0.02	-0.01	-0.03	-0.01	-0.04	-0.01
Forestry & mining	0.63	0.32	0.00	0.00	0.00	0.00	-0.07	-0.01	-0.02	-0.04	-0.01	-0.01	-0.01	-0.01
Food processing	0.66	0.71	-0.01	-0.02	-0.01	-0.01	-0.05	-0.01	-0.02	-0.03	-0.03	-0.07	-0.04	-0.01
Textile	-18.32	-9.53	-0.04	-0.13	-0.03	-0.05	0.72	0.04	0.37	0.14	-0.02	-0.32	0.01	0.11
Clothing	-48.68	-11.60	0.03	0.04	0.02	0.06	1.37	0.03	0.09	1.57	0.76	0.46	0.48	0.38
Leather	-10.04	-15.58	0.11	0.05	0.03	0.32	-0.03	0.02	0.09	0.97	0.65	-0.13	0.06	-0.01
Paper products	0.13	0.19	0.00	0.00	0.00	0.00	-0.07	0.00	-0.01	-0.07	-0.02	-0.02	-0.01	0.00
Chemicals etc	0.64	0.14	0.00	0.00	0.00	0.00	-0.05	0.00	0.02	-0.02	0.01	0.01	0.00	0.00
Other manufact	1.85	0.63	0.00	0.01	0.01	0.00	-0.12	-0.01	-0.05	-0.13	-0.04	-0.05	-0.03	-0.03
Ferrous metals	1.33	0.38	0.00	0.01	0.00	0.00	-0.14	0.00	-0.03	-0.09	-0.02	-0.02	-0.03	-0.02
Motor vehicles	1.88	0.70	0.00	0.00	-0.01	-0.01	-0.16	-0.02	-0.07	-0.15	-0.01	0.01	-0.01	-0.02
Transport nec	2.59	0.15	-0.01	-0.01	0.00	-0.01	-0.21	0.00	-0.08	-0.08	-0.05	0.00	-0.05	-0.04
Electrical	1.67	0.71	0.02	0.03	0.04	0.01	-0.19	0.01	-0.03	-0.06	0.01	0.00	-0.01	-0.01
Other equipment	1.69	0.74	0.01	0.02	0.01	0.00	-0.14	0.01	-0.02	-0.04	0.01	0.01	-0.02	-0.02
Utilities & constr	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.00
Trade & transport	0.18	0.16	0.00	0.00	0.00	0.00	-0.03	0.00	0.01	-0.01	0.00	0.02	0.00	0.00
Services	0.05	0.03	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.03	-0.01	-0.01	-0.01	0.00

Source: GTAP simulation

## Unilateral 50% reduction in Australia's TCF tariffs

A unilateral 50 per cent reduction in Australia's TCF tariffs results in smaller allocative efficiency gains and terms of trade losses than completely removing the tariffs. However, the net benefit Australia gains is higher than tariff removal (US\$160 million versus US\$130 million), although the total world gain is smaller (US\$337 million versus US\$502 million). The sectoral impacts are similar to the previous simulation, but with smaller magnitudes.

These two simulations presented here suggest that Australia can improve its welfare through unilateral tariff reform. The simulations suggest that the optimal extent of the reform depends on the balance of the allocative efficiency gain and the terms of trade loss. As will be discussed further in chapter 5, this balance depends crucially on the choice of the model's trade parameters.

2.4 **Welfare effects of 50 per cent reduction in Australia's TCF tariffs** Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	160	274	-112	-1
NZ	-18	-8	-11	1
US	-9	-2	-8	1
Canada	0	0	0	0
Mexico	1	0	1	0
EU	26	14	13	-1
Chinas	88	25	65	-2
Japan	25	15	10	-1
Korea	7	-2	10	0
OthASAPEC	14	4	8	1
Malaysia	1	-1	2	0
Singapore	1	0	1	0
Thailand	1	-1	2	0
ROW	40	19	19	2
<b>Total APEC</b>	<b>271</b>	<b>305</b>	<b>-32</b>	<b>-1</b>
<b>World</b>	<b>337</b>	<b>337</b>	<b>0</b>	<b>0</b>

Source: GTAP simulation

## 2 UNILATERAL CHANGE OF AUSTRALIA'S TCF TARIFFS

## 2.5 Unilateral removal of Australia's TCF tariffs: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.07	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Income	0.05	-0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment	-0.02	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Exports	1.48	-0.11	0.00	0.00	0.00	0.00	0.04	0.00	0.01	0.03	0.01	0.00	0.01	0.01
Imports	1.31	-0.17	0.00	0.00	0.00	0.00	0.06	0.00	0.02	0.04	0.01	0.00	0.01	0.01
GDP deflator	-0.26	-0.11	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Terms of trade	-0.15	-0.06	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Prices received	-0.16	-0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Prices paid	0.00	-0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Sectoral output</b>														
Crops	0.23	0.35	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00
Livestock	-0.06	-0.34	-0.01	-0.01	0.00	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	0.00
Forestry & mining	0.29	0.21	0.00	0.00	0.00	0.00	-0.03	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	0.00
Food processing	0.31	0.45	0.00	-0.01	0.00	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-0.04	-0.02	-0.01
Textile	-9.86	-5.84	-0.01	-0.06	-0.01	-0.02	0.32	0.03	0.19	0.07	-0.02	-0.14	0.01	0.05
Clothing	-24.11	-8.38	0.02	0.02	0.02	0.05	0.63	0.02	0.06	0.65	0.34	0.22	0.21	0.16
Leather	-7.57	-10.65	0.06	0.03	0.02	0.14	0.04	0.01	0.07	0.42	0.31	-0.03	0.06	0.01
Paper products	0.06	0.15	0.00	0.00	0.00	0.00	-0.03	0.00	0.00	-0.03	-0.01	-0.01	0.00	0.00
Chemicals etc	0.29	0.11	0.00	0.00	0.00	0.00	-0.02	0.00	0.01	-0.01	0.01	0.01	0.00	0.00
Other manufact	0.86	0.44	0.00	0.01	0.00	0.00	-0.06	0.00	-0.02	-0.06	-0.02	-0.02	-0.01	-0.01
Ferrous metals	0.61	0.27	0.00	0.01	0.00	0.00	-0.07	0.00	-0.02	-0.04	-0.01	-0.01	-0.01	-0.01
Motor vehicles	0.88	0.47	0.00	0.00	0.00	0.00	-0.07	-0.01	-0.04	-0.06	0.00	0.01	0.00	-0.01
Transport nec	1.20	0.20	0.00	0.00	0.00	-0.01	-0.10	0.00	-0.04	-0.03	-0.02	0.00	-0.03	-0.02
Electrical	0.78	0.45	0.01	0.02	0.02	0.01	-0.09	0.00	-0.01	-0.02	0.01	0.00	-0.01	0.00
Other equipment	0.79	0.50	0.00	0.01	0.01	0.00	-0.06	0.00	-0.01	-0.02	0.00	0.01	-0.01	-0.01
Utilities & constr	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Trade & transport	0.10	0.11	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Services	0.05	0.02	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00

Source: GTAP simulation

## 3

## *Unilateral liberalisation of TCF trade in other countries*

### Unilateral liberalisation of TCF trade in the US

The unilateral liberalisation of TCF trade in the US includes the removal of the import tariffs and quotas. As discussed before, MFA quota generates rents which are treated as export tax of TCF to the US in the GTAP database. Therefore removing import quotas is equivalent to reducing the export tax of TCF to the US. Tables 3.1 and 3.2 show the effects of TCF trade liberalisation in the US. The total gain worldwide from this removal is US\$10 444 million, much higher than the gain when Australia unilaterally removes its TCF tariffs presented in the previous chapter.

3.1 **Welfare effects of removing the US TCF tariffs** Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	25	-17	32	11
NZ	8	-4	12	0
US	8209	3993	4514	-298
Canada	-48	-189	113	28
Mexico	-650	-330	-400	80
EU	-202	-227	21	4
Chinas	3790	6480	-2587	-103
Japan	-95	-15	-86	6
Korea	60	-90	138	12
OthASAPEC	-9	109	-183	65
Malaysia	-31	10	-28	-13
Singapore	-15	-10	-18	12
Thailand	95	175	-76	-4
ROW	-693	520	-1413	200
<b>Total APEC</b>	<b>11339</b>	<b>10113</b>	<b>1431</b>	<b>-204</b>
<b>World</b>	<b>10444</b>	<b>10405</b>	<b>39</b>	<b>0</b>

Source: GTAP simulation

## 3.2 Unilateral removal of the US TCF tariffs: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.00	0.00	0.10	0.00	-0.10	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.10	0.00
Income	0.00	0.00	0.10	0.00	-0.20	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.10	0.00
Investment	0.00	0.00	0.00	0.10	-0.60	0.00	0.40	0.00	0.10	0.20	0.00	0.00	0.30	0.10
Exports	0.10	0.10	4.90	0.10	1.10	0.00	4.20	0.00	0.30	0.90	0.10	-0.20	0.70	0.30
Imports	0.10	0.10	4.60	0.20	0.60	0.00	3.70	-0.20	0.40	0.70	0.00	-0.20	0.80	0.20
GDP deflator	0.10	0.10	-0.60	-0.10	-0.80	0.10	1.00	0.10	0.20	0.30	0.10	0.10	0.30	0.10
Terms of trade	0.00	0.10	0.40	0.10	-0.30	0.00	-0.60	-0.10	0.10	-0.10	0.00	0.00	-0.10	-0.10
Prices received	0.10	0.10	-0.40	-0.20	-0.60	0.10	-0.40	0.10	0.20	0.00	0.10	0.10	0.00	-0.10
Prices paid	0.10	0.10	-0.80	-0.20	-0.30	0.10	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.00
<b>Sectoral output</b>														
Crops	0.20	0.10	0.30	0.50	0.30	0.10	-0.30	0.10	0.00	-0.10	0.00	0.10	-0.20	0.00
Livestock	0.40	0.40	0.40	0.10	0.20	0.10	0.50	0.20	-0.10	0.20	0.10	0.10	-0.40	0.00
Forestry & mining	0.00	-0.10	0.70	0.20	1.00	0.00	-2.20	0.00	-0.20	-0.50	-0.10	-0.20	-0.90	-0.10
Food processing	0.00	-0.10	0.30	0.20	0.20	0.10	-1.20	0.10	-0.10	-0.20	0.00	0.80	-1.00	-0.10
Textile	1.70	1.50	-21.00	-18.80	-22.00	0.10	17.50	4.00	8.20	11.30	11.20	7.10	18.10	3.40
Clothing	-0.20	0.40	-50.80	-15.30	-38.60	-1.10	59.10	0.90	-6.10	0.80	6.10	-10.90	24.70	-0.40
Leather	0.10	0.30	-20.90	-16.60	-11.40	-1.10	8.20	1.50	5.70	33.80	3.40	4.00	7.20	-1.30
Paper products	0.00	0.00	0.40	0.00	0.20	0.00	-2.30	0.00	0.10	-0.50	0.00	-0.10	-0.40	-0.10
Chemicals etc	0.00	0.00	0.10	-0.10	-1.00	0.00	-2.10	0.10	0.50	-0.10	-0.20	0.90	-0.40	0.00
Other manufacture	0.50	0.20	2.10	1.30	3.20	0.20	-3.90	0.20	0.00	-0.80	0.20	0.50	-1.60	0.00
Ferrous metals	0.10	0.10	1.50	0.80	3.30	0.10	-4.90	0.10	-0.30	-0.70	0.10	0.20	-2.00	-0.10
Motor vehicles	-0.70	-0.40	1.90	0.30	5.50	-0.40	-5.90	-1.30	-1.40	-1.90	-0.40	0.00	-0.90	-0.50
Transport nec	-1.30	-1.10	3.00	1.10	2.00	-1.00	-7.90	-1.00	-3.00	-2.30	-2.10	-0.90	-7.60	-1.00
Electrical	-0.10	0.00	2.70	2.40	6.50	0.20	-7.30	-0.10	-0.70	-1.00	-0.50	-0.70	-3.70	-0.10
Other equipment	-0.30	-0.40	1.80	0.70	6.00	-0.10	-5.40	0.10	-0.70	-1.20	-0.60	-0.20	-2.90	-0.30
Utilities & construct	0.00	0.00	0.00	0.10	-0.60	0.00	0.10	0.00	0.10	0.10	0.00	0.00	0.30	0.00
Trade & transport	0.00	0.00	0.20	0.20	0.20	0.10	-1.20	0.00	0.20	-0.20	0.10	0.40	-0.30	0.10
Services	0.00	0.00	0.00	0.10	0.30	0.00	-0.60	0.00	-0.10	-0.60	-0.30	-0.40	-0.80	-0.10

Source: GTAP simulations

The biggest winner of this unilateral removal of the US TCF tariffs is the US, achieving a US\$8 209 million of welfare improvement due to allocation efficiency improvement and terms of trade gains. Terms of trade gains come from the lower import prices of TCF due to reduction in the export tax in exporting countries. It is followed by the greater China, (including Hong Kong and Taiwan), achieving a US\$3 790 million of welfare improvement due to allocation efficiency improvement. Australia's gain from this is moderate, being US\$25 million, exclusively from terms of trade gains.

Except the rest of the world, the biggest loser is Mexico, registering a net loss of US\$650 million, because of losses in both allocative efficiency and terms of trade. Trade liberalisation of TCF in the US means that the protection level in Mexico is relatively higher than before, causing losses in allocative efficiency. On the other hand, its terms of trade deteriorates due to lower TCF prices in the world market which is caused by the eliminating of import quotas to the US. The EU is the second biggest loser at US\$202 million due to deteriorating allocative efficiency as the EU is relatively more protective after the liberalisation of TCF trade in the US. Malaysia loses as well because losses in quota rent due to eliminating the quota are bigger than the gains from removing import tariffs in the US.

In percentage terms, the largest income gainers are greater China (0.31 per cent), followed by the US (0.11 per cent), Thailand (0.07 per cent) and Korea (0.04 per cent). Australia and New Zealand are only marginally better (0.01 per cent). The largest losers are Mexico (-0.19 per cent), followed by Malaysia and Singapore (-0.02 per cent each).

The sectoral composition of these gains differs considerably between regions. For Australia, the textile sector gain due to better position in the world market and higher demand for textiles from other boosting countries like China. On the other hand, the clothing sector in Australia contracts because of tougher competition suggested by lower price of clothing in the world market.

## **Unilateral removal of TCF tariffs in the EU**

Tables 3.3 and 3.4 show the effect of the unilateral removal of the EU's TCF tariffs. The total gain worldwide is US\$6 749 million, less than the previous case.

### 3 UNILATERAL LIBERALISATION OF TCF TRADE IN OTHER

China is the biggest winner, but the magnitude is smaller than the previous case (US\$2 804 million versus US\$3 790 million). It is followed by the rest of the world (US\$2 384), other Asian APEC country group (US\$1 313 million) and the EU (US\$865 million). Again Australia benefits little from this removal, with EV being only US\$25 million.

Similarly to the reasoning for the EU in the previous simulation, the biggest loser is the US which suffers from worsening allocative efficiency and terms of trade. It is followed by Japan.

The largest percentage gainers in this simulation are Other Asian APEC countries, China and Thailand and Malaysia, each of which experiences large changes in its overall trade.

#### 3.3 Welfare effects of removing the EU TCF tariffs Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	25	-13	40	-3
NZ	2	-2	6	-2
US	-737	-227	-634	124
Canada	33	-3	67	-30
Mexico	49	22	50	-23
EU	865	2215	-1451	101
Chinas	2804	2664	288	-148
Japan	-328	-15	-114	-199
Korea	99	-38	158	-21
OthASAPEC	1313	770	413	130
Malaysia	76	61	45	-30
Singapore	-23	-7	-21	5
Thailand	187	91	111	-14
ROW	2384	1235	1038	112
<b>Total APEC</b>	<b>3499</b>	<b>3304</b>	<b>408</b>	<b>-212</b>
<b>World</b>	<b>6749</b>	<b>6753</b>	<b>-5</b>	<b>0</b>

Source: GTAP simulation

## 3.4 Removing the EU TCF tariffs: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.00	0.00	0.00	0.00	0.01	0.03	0.21	0.00	-0.01	0.25	0.06	-0.01	0.06	0.02
Income	0.01	0.00	-0.01	0.01	0.01	0.01	0.24	-0.01	0.03	0.47	0.08	-0.03	0.14	0.05
Investment	-0.02	-0.01	-0.06	-0.04	-0.02	-0.15	0.26	-0.07	0.03	0.74	-0.02	-0.01	0.28	0.23
Exports	0.05	0.01	-0.03	0.00	0.08	1.07	2.36	0.07	0.36	2.41	0.23	-0.13	0.53	0.66
Imports	0.07	0.03	-0.15	0.00	0.09	1.01	2.49	-0.14	0.47	2.85	0.22	-0.13	0.81	0.88
GDP deflator	0.04	0.02	-0.02	0.01	0.03	-0.51	0.79	0.01	0.18	1.05	0.17	0.05	0.37	0.13
Terms of trade	0.06	0.03	-0.04	0.02	0.03	-0.05	0.06	-0.06	0.09	0.41	0.03	-0.01	0.15	0.09
Prices received	0.06	0.02	0.00	0.01	0.01	-0.40	0.14	0.02	0.12	0.45	0.09	0.07	0.19	-0.01
Prices paid	0.01	-0.01	0.04	-0.01	-0.02	-0.34	0.08	0.07	0.03	0.05	0.06	0.08	0.04	-0.10
<b>Sectoral output</b>														
Crops	0.35	0.42	0.18	0.32	0.06	0.48	-0.07	0.13	0.03	-0.44	-0.01	0.03	-0.12	-0.02
Livestock	0.18	-0.07	0.14	0.14	0.00	0.44	0.35	0.17	-0.04	0.38	-0.12	0.11	-0.35	0.06
Forestry & mining	0.13	0.21	0.07	0.07	0.00	0.86	-1.34	0.12	-0.14	-1.72	-0.16	0.06	-0.67	-0.18
Food processing	0.12	0.25	0.04	0.04	-0.01	0.40	-0.81	0.08	-0.09	-0.78	-0.35	0.75	-0.84	-0.21
Textile	-0.26	-4.08	0.23	0.20	0.26	-19.47	12.85	2.91	7.65	26.60	19.08	9.43	17.33	5.27
Clothing	-0.18	0.00	0.16	0.22	1.08	-42.22	36.10	0.42	-1.49	28.43	30.22	0.83	15.67	6.63
Leather	-3.44	-4.09	2.46	3.04	1.24	-18.03	3.93	0.94	7.64	76.89	50.77	7.30	18.23	1.04
Paper products	-0.02	0.09	0.00	-0.08	-0.06	0.26	-1.46	0.05	0.09	-2.51	-0.34	0.02	-0.38	-0.35
Chemicals etc	0.01	-0.01	-0.01	-0.02	-0.03	0.35	-1.30	0.10	0.43	-0.84	-0.47	1.08	-0.37	-0.31
Other manufacture	0.32	0.36	0.19	0.37	0.05	1.49	-2.54	0.12	-0.22	-4.15	-0.38	0.21	-1.80	-0.72
Ferrous metals	0.05	0.11	0.00	-0.02	-0.11	1.49	-3.27	0.07	-0.47	-3.23	-0.59	0.10	-1.93	-0.83
Motor vehicles	-0.55	-0.39	-0.36	-0.62	-0.71	1.73	-4.10	-0.87	-1.74	-6.84	-1.41	-0.40	-0.94	-1.41
Transport nec	-0.29	0.00	0.04	-0.41	-0.15	4.06	-4.97	-0.17	-2.05	-4.83	-2.07	-0.23	-5.85	-1.00
Electrical	0.01	0.24	0.22	0.65	0.83	2.09	-4.75	0.05	-0.72	-3.80	-0.75	-0.69	-3.33	-0.49
Other equipment	-0.29	-0.32	-0.08	-0.10	-0.24	1.88	-3.59	-0.03	-0.88	-3.09	-1.51	-0.44	-2.87	-1.09
Utilities & construct	-0.01	0.00	-0.03	-0.02	-0.01	-0.01	0.08	-0.06	0.07	0.66	0.11	0.00	0.28	0.07
Trade & transport	0.01	0.02	0.02	0.05	0.00	0.32	-0.75	0.02	0.18	-0.52	-0.16	0.29	-0.41	0.03
Services	-0.03	-0.02	-0.01	-0.04	-0.04	0.06	-0.35	-0.01	-0.10	-1.48	-0.52	-0.39	-0.75	-0.09

Source: GTAP simulation

The sectoral impact also differs significantly across countries. But a general pattern is that those with terms of trade gains (losses) have a rise (fall) in TCF sectors. For example, textile and clothing output in greater China increases by 12.85 per cent and 36.10 per cent, respectively. On the other hand, the EU's outputs in these two sector declines by 19.47 per cent and 42.22 per cent, respectively. The largest percentage rising sector in Australia is crops, which increases by 0.35 per cent. The biggest falling sector is leather products, with output down by 3.44 per cent. This is due to a substitution effect. The EU imports of leather products from Australia enjoy lower tariff rates than from other countries, and the removal of tariffs means a smaller change in relative prices which substitute Australian products for products from other sources.

## Unilateral removal of TCF tariffs in China

Tables 3.5 and 3.6 show the effect of the unilateral removal of greater China's TCF tariffs. The total gains worldwide are US\$5 470 million, slightly lower than the gains when the EU unilaterally removes its TCF tariffs. It can also be seen from table 3.5 that almost all the gains are to APEC countries.

The biggest winners of this removal are China and Japan, both achieving gains of US\$1 868 million, although through different channels. China gains US\$3 913 million in allocative efficiency, despite losses in the terms of trade and capital prices. On the other hand, Japan gains in both allocative efficiency and terms of trade. The US, Korea and the EU also benefit from China's unilateral removal of TCF tariffs, achieving US\$907 million, US\$746 million and US\$483 million, respectively, through similar mechanisms to Japan.

Australia's welfare gain from this removal is more than triple the gains in the unilateral removal of EU TCF tariffs, but still 30 per cent lower than the gains when Australia unilaterally removes its TCF tariffs.

Losers from China's unilateral removal of TCF tariffs are other Asian countries and Mexico. These countries' allocative efficiency deteriorates because their protection in TCF sectors is higher in relative terms after China's removal. On top of that, their terms of trade worsens because these countries have a similar economic structure to China, ie. a higher share of TCF exports, and world price of TCFs is pulled down by China's action.

### 3.5 Welfare effects of removing China TCF tariffs Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	91	54	34	3
NZ	13	10	3	0
US	907	378	434	94
Canada	98	65	36	-3
Mexico	-50	-4	-48	3
EU	483	242	229	12
Chinas	1868	3913	-2039	-6
Japan	1868	831	1154	-117
Korea	746	160	595	-10
OthASAPEC	-138	-46	-95	3
Malaysia	-42	-16	-24	-2
Singapore	33	-1	30	4
Thailand	-62	-25	-38	1
ROW	-346	-88	-275	17
<b>Total APEC</b>	<b>5333</b>	<b>5319</b>	<b>43</b>	<b>-29</b>
<b>World</b>	<b>5470</b>	<b>5473</b>	<b>-3</b>	<b>0</b>

Source: GTAP simulation

The TCF sectors are the most significantly affected sectors. Output of clothing and leather products in China increases while the output of textiles decreases, reflecting better allocation of resources. On the other hand, both Japan and Korea achieve higher output of textiles.

All three TCF sectors in Australia decrease, with leather products being the worst hit sector (down by 4.42 per cent). On the other hand, higher output will be registered in motor vehicle and electronic equipment sectors, up by 0.34 per cent and 0.25 per cent, respectively.

## A comparison to Australia's unilateral reform

The simulations show that Australia gains more from its unilateral removal or reduction of TCF tariffs than from other countries' unilateral removal. This is because tariff removal usually benefits exporters, but Australia is a net importer of TCFs. Australia could have limited gains in the terms of trade because the import price is now lower due to tariff removal in other country, but it generally suffers from even more deteriorating allocative efficiency.

On the other hand, unilateral removal or reduction of Australia's TCF tariffs can facilitate the restructuring of the economy, leading to a much higher allocative efficiency gains than losses in the terms of trade. These simulations confirm the suggestion made in the previous chapter that Australia could unilaterally reduce its TCF tariffs to improve its welfare.

It should be pointed out, however, that the welfare gains from Australia's unilateral action are achieved in the cost of TCF sectors. When Australia unilaterally reduces its TCF tariffs to the half of the current levels, which is a more gentle reform compared to the unilateral removal, textile output decreases about 10 per cent, clothing output decreases more than 24 per cent, and leather product output is down by 7.6 per cent. Therefore, it might be in the interest of Australia to pursue bilateral or multilateral tariff reform. We will present the results of simulating such scenarios in the next chapter.

## 3.6 Removing China's TCF tariffs: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.01	0.02	0.00	0.01	0.00	0.00	0.30	0.02	0.04	-0.01	-0.02	0.00	-0.02	0.00
Income	0.03	0.02	0.01	0.02	-0.01	0.01	0.16	0.05	0.19	-0.05	-0.04	0.05	-0.04	-0.01
Investment	0.00	-0.01	-0.01	0.00	-0.07	-0.01	0.27	0.01	0.14	-0.10	-0.01	0.03	-0.08	-0.08
Exports	0.17	0.08	0.17	0.11	0.14	-0.01	6.48	0.80	0.86	-0.08	0.03	0.05	-0.01	0.00
Imports	0.20	0.09	0.18	0.13	0.08	-0.01	6.53	1.15	1.25	-0.18	0.02	0.08	-0.08	-0.08
GDP deflator	-0.01	-0.04	-0.03	-0.03	-0.01	-0.05	-0.33	0.13	0.45	-0.13	-0.06	0.01	-0.08	-0.09
Terms of trade	0.05	0.02	0.05	0.01	-0.05	0.01	-0.45	0.24	0.36	-0.08	-0.03	0.02	-0.05	-0.02
Prices received	-0.02	-0.04	-0.03	-0.03	-0.08	-0.05	-0.56	0.11	0.31	-0.11	-0.03	0.01	-0.07	-0.08
Prices paid	-0.07	-0.06	-0.08	-0.04	-0.03	-0.06	-0.11	-0.13	-0.06	-0.03	0.00	-0.02	-0.01	-0.06
<b>Sectoral output</b>														
Crops	-0.04	-0.03	-0.02	-0.03	0.01	-0.06	-0.18	-0.11	-0.12	0.04	0.01	-0.07	0.03	0.01
Livestock	0.02	0.08	0.11	0.07	0.02	0.01	0.06	0.07	0.05	0.00	0.08	0.06	0.10	-0.04
Forestry & mining	-0.04	0.02	-0.02	-0.02	0.06	0.00	-0.12	-0.25	-0.80	0.15	0.02	-0.16	0.06	0.07
Food processing	0.01	0.01	0.01	0.02	0.01	-0.01	0.02	-0.05	-0.09	0.09	0.09	0.19	0.16	0.06
Textile	-1.00	-1.97	-1.67	-2.23	-2.05	-2.29	-3.90	14.82	19.18	-3.31	-7.01	-6.86	-2.67	-1.62
Clothing	-0.76	-5.69	-3.49	-4.81	-4.87	-5.14	11.61	6.22	0.09	-4.77	-7.67	-3.53	-3.75	-3.72
Leather	-4.42	-1.80	-1.56	-4.08	-1.63	-3.54	3.63	-2.27	29.83	-2.98	-0.85	-5.01	-3.75	-1.91
Paper products	-0.01	0.06	0.01	0.02	0.02	-0.02	0.03	0.03	-0.24	0.30	0.13	-0.06	0.02	0.06
Chemicals etc	-0.02	0.07	-0.04	0.00	-0.12	-0.05	-0.01	-0.03	0.44	0.11	0.06	-0.15	0.07	0.04
Other manufacture	-0.17	0.06	-0.03	-0.08	0.23	0.00	0.33	-0.32	-1.45	0.38	0.04	-0.29	0.12	0.18
Ferrous metals	0.12	0.18	0.11	0.20	0.37	0.14	-0.27	-0.35	-1.66	0.49	0.34	0.11	0.53	0.29
Motor vehicles	0.34	0.53	0.21	0.47	0.91	0.33	-0.17	-1.02	-2.50	1.23	0.40	0.23	0.21	0.42
Transport nec	0.11	0.08	0.30	0.35	0.26	0.63	-0.78	-1.10	-4.76	0.32	0.45	-0.02	1.06	0.81
Electrical	0.25	0.35	0.34	0.51	0.98	0.40	-0.84	-0.38	-2.16	0.56	0.39	0.17	0.91	0.38
Other equipment	0.11	0.24	0.12	0.21	0.73	0.23	-0.36	-0.58	-1.94	0.35	0.54	0.21	0.54	0.34
Utilities & construct	-0.01	0.00	0.00	0.00	-0.07	0.00	0.17	-0.02	0.21	-0.09	-0.07	-0.01	-0.07	-0.03
Trade & transport	0.03	0.07	0.03	0.05	0.03	0.10	-0.23	0.00	-0.08	0.07	0.17	0.29	0.08	0.12
Services	0.01	0.02	0.00	0.01	0.03	0.01	-0.17	0.00	-0.14	0.11	0.02	-0.10	0.06	0.04

Source: GTAP simulation

## 4

## Multilateral and global TCF liberalisation

In this chapter we present simulations involving TCF liberalisation in more than one country. The simulations are presented in the order of broadness. First, TCF liberalisation in Australia and each one of the EU, the US and China is discussed. This is followed by simulation of TCF liberalisation in APEC countries. Finally global TCF liberalisation is discussed.

### Removal of TCF protections in Australia and the EU

Tables 4.1 and 4.2 show the effects of removing TCF protection in Australia and the EU. Australia, the EU and the world as a whole have higher welfare than the cases where Australia or the EU unilaterally removes their protection.

4.1 **Welfare effects of removing TCF protections in Australia and the EU**  
Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	153	373	-215	-6
NZ	-26	-18	-7	-1
US	-757	-232	-650	125
Canada	33	-4	67	-30
Mexico	51	23	52	-23
EU	906	2239	-1432	99
Chinas	2993	2717	428	-152
Japan	-281	13	-95	-200
Korea	114	-42	177	-21
OthASAPEC	1343	779	433	132
Malaysia	79	60	49	-30
Singapore	-20	-6	-19	5
Thailand	189	88	116	-14
ROW	2487	1281	1090	117
<b>Total APEC</b>	<b>3871</b>	<b>3750</b>	<b>336</b>	<b>-215</b>
<b>World</b>	<b>7264</b>	<b>7270</b>	<b>-6</b>	<b>0</b>

Source: GTAP simulation

## 4.2 Removing TCF tariffs in Australian and the EU: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.09	-0.03	0.00	0.00	0.01	0.03	0.21	0.00	-0.01	0.25	0.06	-0.01	0.06	0.03
Income	0.04	-0.04	-0.01	0.01	0.01	0.01	0.26	-0.01	0.03	0.48	0.08	-0.03	0.14	0.06
Investment	-0.08	-0.02	-0.07	-0.04	-0.02	-0.15	0.27	-0.07	0.04	0.76	-0.02	-0.01	0.29	0.23
Exports	3.34	-0.07	-0.03	0.01	0.08	1.08	2.45	0.08	0.39	2.46	0.24	-0.12	0.54	0.67
Imports	3.02	-0.10	-0.15	0.00	0.10	1.01	2.61	-0.14	0.51	2.93	0.25	-0.12	0.84	0.91
GDP deflator	-0.56	-0.15	-0.02	0.01	0.03	-0.50	0.83	0.01	0.19	1.07	0.18	0.05	0.38	0.14
Terms of trade	-0.29	-0.04	-0.05	0.02	0.03	-0.05	0.09	-0.05	0.11	0.42	0.03	-0.01	0.16	0.10
Prices received	-0.28	-0.14	0.00	0.01	0.01	-0.39	0.17	0.02	0.13	0.47	0.09	0.07	0.19	-0.01
Prices paid	0.01	-0.10	0.04	-0.01	-0.02	-0.34	0.08	0.07	0.02	0.04	0.06	0.08	0.04	-0.10
<b>Sectoral output</b>														
Crops	0.82	0.99	0.18	0.31	0.05	0.47	-0.07	0.12	0.03	-0.45	-0.01	0.04	-0.12	-0.03
Livestock	0.15	-0.65	0.12	0.12	-0.01	0.42	0.35	0.16	-0.06	0.37	-0.15	0.10	-0.39	0.05
Forestry & mining	0.77	0.54	0.07	0.07	0.00	0.85	-1.40	0.11	-0.17	-1.76	-0.18	0.05	-0.68	-0.19
Food processing	0.79	0.97	0.04	0.02	-0.01	0.39	-0.86	0.07	-0.11	-0.81	-0.38	0.68	-0.89	-0.22
Textile	-18.63	-13.68	0.20	0.07	0.24	-19.50	13.50	2.94	8.02	26.71	19.13	9.10	17.37	5.38
Clothing	-49.49	-11.92	0.19	0.26	1.11	-42.11	37.34	0.45	-1.39	29.90	31.18	1.35	16.17	7.06
Leather	-15.28	-20.27	2.56	3.08	1.27	-17.60	3.86	0.94	7.69	77.64	51.69	7.18	18.27	1.04
Paper products	0.11	0.28	0.00	-0.07	-0.06	0.25	-1.52	0.05	0.08	-2.57	-0.36	0.00	-0.38	-0.35
Chemicals etc	0.65	0.14	-0.02	-0.02	-0.03	0.35	-1.34	0.10	0.45	-0.85	-0.47	1.09	-0.38	-0.31
Other manufacture	2.20	1.00	0.19	0.38	0.06	1.48	-2.66	0.11	-0.27	-4.27	-0.43	0.16	-1.83	-0.75
Ferrous metals	1.40	0.49	0.00	-0.01	-0.10	1.49	-3.39	0.06	-0.50	-3.31	-0.62	0.07	-1.96	-0.85
Motor vehicles	1.33	0.32	-0.36	-0.62	-0.71	1.72	-4.24	-0.90	-1.81	-6.97	-1.42	-0.38	-0.95	-1.43
Transport nec	2.32	0.16	0.04	-0.42	-0.15	4.04	-5.15	-0.17	-2.13	-4.90	-2.12	-0.23	-5.90	-1.04
Electrical	1.70	0.95	0.24	0.68	0.87	2.10	-4.92	0.06	-0.74	-3.85	-0.74	-0.68	-3.35	-0.50
Other equipment	1.42	0.43	-0.08	-0.08	-0.23	1.88	-3.72	-0.03	-0.90	-3.13	-1.51	-0.43	-2.89	-1.12
Utilities & construct	0.02	0.00	-0.03	-0.02	-0.01	-0.02	0.08	-0.06	0.07	0.67	0.11	0.00	0.28	0.07
Trade & transport	0.20	0.18	0.02	0.05	0.00	0.33	-0.77	0.02	0.18	-0.53	-0.16	0.31	-0.41	0.03
Services	0.03	0.01	-0.01	-0.04	-0.04	0.06	-0.36	-0.01	-0.10	-1.50	-0.53	-0.40	-0.76	-0.10

Source: GTAP simulation

Australia achieves significant gains compare to the previous two unilateral removal simulations. Relative to its own unilateral removal, Australia's allocative efficiency gains are similar, but the term of trade losses are much smaller.

## Removal of TCF protection in Australia and the US

Tables 4.3 and 4.4 present the effects of removing TCF protection in Australia and the US. This is also a better policy for Australia and the world as a whole than unilaterally removing TCF protection in Australia or the US. It leads to a slightly smaller gain in terms of trade for the US than the case where the US unilaterally liberalises its TCF trade.

4.3 **Welfare effects of TCF liberalisation in Australia and the US** Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	152	371	-227	8
NZ	-20	-20	-1	1
US	8176	3990	4484	-297
Canada	-48	-189	113	28
Mexico	-648	-329	-399	80
EU	-159	-206	45	2
Chinas	3991	6535	-2437	-107
Japan	-49	14	-68	5
Korea	75	-94	157	12
OthASAPEC	27	120	-161	68
Malaysia	-28	9	-23	-13
Singapore	-12	-10	-15	12
Thailand	97	172	-70	-4
ROW	-589	566	-1360	205
<b>Total APEC</b>	<b>11715</b>	<b>10569</b>	<b>1353</b>	<b>-207</b>
<b>World</b>	<b>10967</b>	<b>10929</b>	<b>38</b>	<b>0</b>

Source: GTAP simulation

## 4.4 Removing TCF tariffs in Australian and the US: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.09	-0.03	0.05	-0.03	-0.08	0.00	0.51	0.00	-0.02	0.04	0.01	-0.01	0.11	0.01
Income	0.04	-0.03	0.11	-0.01	-0.19	0.00	0.34	0.00	0.02	0.01	-0.03	-0.02	0.07	-0.01
Investment	-0.05	-0.01	0.01	0.07	-0.58	-0.03	0.42	-0.05	0.08	0.17	-0.04	0.04	0.30	0.06
Exports	3.35	-0.03	4.91	0.06	1.11	-0.02	4.27	0.01	0.32	0.93	0.07	-0.22	0.74	0.34
Imports	3.04	-0.03	4.63	0.16	0.64	-0.04	3.85	-0.18	0.47	0.83	0.02	-0.21	0.83	0.27
GDP deflator	-0.48	-0.05	-0.56	-0.13	-0.79	0.05	1.05	0.07	0.23	0.30	0.11	0.14	0.34	0.09
Terms of trade	-0.31	-0.01	0.38	0.06	-0.32	0.00	-0.56	-0.05	0.09	-0.12	-0.04	0.00	-0.10	-0.11
Prices received	-0.21	-0.04	-0.43	-0.15	-0.62	0.05	-0.39	0.07	0.16	0.01	0.08	0.13	0.00	-0.07
Prices paid	0.09	-0.03	-0.80	-0.21	-0.30	0.06	0.17	0.12	0.06	0.13	0.12	0.14	0.10	0.04
<b>Sectoral output</b>														
Crops	0.64	0.67	0.31	0.52	0.27	0.09	-0.26	0.04	0.02	-0.13	0.03	0.06	-0.17	0.03
Livestock	0.40	-0.14	0.34	0.12	0.20	0.12	0.53	0.19	-0.08	0.17	0.03	0.10	-0.46	0.04
Forestry & mining	0.60	0.27	0.69	0.18	0.97	-0.04	-2.27	0.01	-0.23	-0.55	-0.12	-0.17	-0.89	-0.13
Food processing	0.70	0.65	0.33	0.14	0.18	0.05	-1.25	0.07	-0.11	-0.25	-0.06	0.72	-1.04	-0.08
Textile	-16.52	-8.10	-21.00	-18.90	-21.96	0.00	18.12	4.00	8.61	11.48	11.24	6.75	18.14	3.56
Clothing	-49.90	-11.65	-50.77	-15.23	-38.54	-1.08	60.28	0.93	-5.98	2.50	6.96	-10.40	25.24	0.07
Leather	-10.96	-16.20	-20.76	-16.62	-11.42	-0.80	8.20	1.47	5.77	34.78	4.07	3.87	7.24	-1.36
Paper products	0.12	0.19	0.36	-0.02	0.20	-0.03	-2.38	0.04	0.05	-0.53	-0.01	-0.09	-0.38	-0.11
Chemicals etc	0.65	0.11	0.07	-0.11	-0.98	-0.04	-2.15	0.08	0.54	-0.11	-0.24	0.92	-0.45	-0.04
Other manufacture	2.35	0.89	2.14	1.36	3.22	0.20	-3.99	0.16	-0.05	-0.94	0.12	0.40	-1.68	-0.06
Ferrous metals	1.41	0.46	1.53	0.77	3.29	0.07	-5.01	0.10	-0.32	-0.75	0.05	0.20	-2.05	-0.16
Motor vehicles	1.18	0.28	1.86	0.27	5.54	-0.45	-6.02	-1.33	-1.49	-2.08	-0.43	0.03	-0.94	-0.49
Transport nec	1.22	-0.88	3.04	1.13	2.03	-1.04	-8.08	-0.96	-3.11	-2.34	-2.16	-0.89	-7.65	-1.00
Electrical	1.54	0.77	2.70	2.43	6.58	0.17	-7.47	-0.04	-0.72	-1.07	-0.47	-0.74	-3.69	-0.12
Other equipment	1.44	0.33	1.76	0.71	6.00	-0.08	-5.48	0.06	-0.77	-1.23	-0.62	-0.19	-2.91	-0.36
Utilities & construct	0.04	0.02	0.02	0.08	-0.63	-0.01	0.13	-0.03	0.11	0.16	0.04	0.04	0.31	0.03
Trade & transport	0.20	0.17	0.23	0.17	0.23	0.14	-1.19	0.03	0.23	-0.17	0.07	0.46	-0.34	0.09
Services	0.03	0.00	0.04	0.09	0.32	-0.03	-0.58	-0.01	-0.10	-0.59	-0.30	-0.39	-0.81	-0.08

Source: GTAP simulation

## Removal of TCF protection in Australia and Greater China

Tables 4.5 and 4.6 presents the effect of removing TCF protection in Australia and greater China region (including Hong Kong and Taiwan). To both Australia and China, this is a better policy in terms of welfare improvement than unilateral removal of either country's TCF tariffs.

To the world as a whole, this is also a better policy. Total welfare gains increase from US\$502 million and US\$5 470 million, respectively, to US\$5 915 million. But it has different impacts on other countries. Generally speaking, Asian countries are better off than with China's unilateral removal, but worse off than Australia's unilateral removal. On the other hand, the EU and North American countries tend to be better off than Australia's unilateral removal, but worse off than China's unilateral removal.

### 4.5 Welfare effects of TCF liberalisation in Australia and China Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	223	407	-184	0
NZ	-12	-5	-8	1
US	882	371	414	97
Canada	97	64	36	-3
Mexico	-48	-4	-47	3
EU	523	260	253	11
Chinas	2027	3950	-1914	-9
Japan	1912	858	1173	-118
Korea	761	156	616	-10
OthASAPEC	-112	-38	-79	5
Malaysia	-39	-17	-20	-2
Singapore	36	-1	32	4
Thailand	-61	-28	-34	1
ROW	-275	-56	-241	21
<b>Total APEC</b>	<b>5667</b>	<b>5714</b>	<b>-14</b>	<b>-32</b>
<b>World</b>	<b>5915</b>	<b>5918</b>	<b>-3</b>	<b>0</b>

Source: GTAP simulation

## 4.6 Removing TCF tariffs in Australian and China: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPAC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.10	-0.01	0.00	0.01	0.00	0.00	0.31	0.02	0.03	-0.01	-0.02	0.00	-0.02	0.00
Income	0.06	-0.02	0.01	0.02	-0.01	0.01	0.17	0.05	0.19	-0.04	-0.04	0.05	-0.04	-0.01
Investment	-0.04	-0.01	-0.01	0.00	-0.07	-0.01	0.28	0.00	0.15	-0.09	-0.01	0.04	-0.07	-0.08
Exports	3.53	0.01	0.17	0.11	0.15	0.00	6.61	0.81	0.89	-0.03	0.04	0.06	0.00	0.02
Imports	3.29	-0.01	0.18	0.13	0.08	0.00	6.70	1.16	1.29	-0.12	0.04	0.09	-0.06	-0.06
GDP deflator	-0.59	-0.18	-0.03	-0.03	-0.09	-0.05	-0.29	0.13	0.47	-0.11	-0.06	0.02	-0.08	-0.09
Terms of trade	-0.25	-0.04	0.05	0.01	-0.04	0.01	-0.42	0.24	0.38	-0.07	-0.03	0.03	-0.05	-0.02
Prices received	-0.35	-0.19	-0.03	-0.03	-0.07	-0.05	-0.53	0.11	0.31	-0.10	-0.03	0.01	-0.06	-0.08
Prices paid	-0.10	-0.15	-0.07	-0.04	-0.03	-0.06	-0.11	-0.13	-0.06	-0.04	0.00	-0.02	-0.01	-0.06
<b>Sectoral output</b>														
Crops	0.40	0.48	-0.03	-0.04	0.00	-0.06	-0.19	-0.12	-0.12	0.02	0.00	-0.07	0.03	0.00
Livestock	-0.01	-0.48	0.09	0.04	0.01	-0.01	0.06	0.05	0.03	-0.01	0.05	0.05	0.06	-0.04
Forestry & mining	0.56	0.31	-0.02	-0.02	0.06	-0.01	-0.19	-0.26	-0.83	0.12	0.01	-0.17	0.05	0.06
Food processing	0.64	0.65	0.00	0.00	0.01	-0.02	-0.03	-0.06	-0.11	0.06	0.06	0.12	0.12	0.05
Textile	-18.49	-10.92	-1.71	-2.35	-2.07	-2.35	-3.20	14.94	19.64	-3.25	-7.08	-7.18	-2.71	-1.53
Clothing	-45.60	-15.31	-3.46	-4.76	-4.84	-5.09	13.08	6.23	0.13	-3.54	-7.04	-3.16	-3.39	-3.43
Leather	-14.57	-16.31	-1.44	-4.03	-1.60	-3.24	3.61	-2.24	29.95	-2.01	-0.21	-5.11	-3.68	-1.91
Paper products	0.11	0.22	0.01	0.02	0.02	-0.02	-0.04	0.03	-0.25	0.24	0.12	-0.08	0.02	0.06
Chemicals etc	0.60	0.19	-0.04	0.00	-0.12	-0.05	-0.06	-0.02	0.46	0.09	0.07	-0.14	0.07	0.04
Other manufacture	1.59	0.61	-0.03	-0.07	0.24	0.00	0.21	-0.33	-1.50	0.28	0.00	-0.33	0.10	0.16
Ferrous metals	1.40	0.51	0.11	0.21	0.38	0.15	-0.41	-0.35	-1.70	0.41	0.32	0.09	0.51	0.28
Motor vehicles	2.14	1.16	0.21	0.47	0.90	0.32	-0.33	-1.05	-2.58	1.11	0.39	0.24	0.20	0.40
Transport nec	2.60	0.17	0.29	0.34	0.25	0.62	-0.99	-1.11	-4.86	0.25	0.41	-0.02	1.03	0.78
Electrical	1.84	0.99	0.36	0.54	1.02	0.41	-1.04	-0.37	-2.20	0.52	0.41	0.18	0.91	0.38
Other equipment	1.73	0.91	0.13	0.22	0.74	0.23	-0.50	-0.57	-1.97	0.32	0.55	0.23	0.53	0.33
Utilities & construct	0.02	0.01	0.00	0.00	-0.07	0.00	0.18	-0.02	0.21	-0.08	-0.06	-0.01	-0.08	-0.03
Trade & transport	0.20	0.21	0.03	0.06	0.03	0.11	-0.26	0.00	-0.07	0.07	0.17	0.31	0.08	0.12
Services	0.05	0.04	0.00	0.01	0.03	0.01	-0.18	0.00	-0.14	0.09	0.01	-0.11	0.05	0.03

Source: GTAP simulation

## Removal of TCF protection in the APEC region

Tables 4.7 and 4.8 present the effects of expanding TCF trade liberalisation to whole APEC region. Every country except Mexico, Malaysia and the rest of the world benefits from this liberalisation. Consequently, the world welfare gain reaches US\$24 443million.

The US appears to be the largest winner in this simulation with an EV increase of US\$10 684 million, for the same reason discussed in the unilateral removal of the US TCF protection. China is the second largest winner with an EV increase of US\$5 330 million, more than double the value at previous simulation where Australia and China remove their TCF tariffs. Compared to China, Australia's further gain is moderate, but still 18 per cent higher than the previous simulation. For Japan, its welfare gain increases slightly from US\$1 912 million to US\$1 937 million because tariff removal leads to terms of trade losses. This effect is more serious in Mexico where the terms of trade loss is higher than the allocative efficiency gains.

4.7 **Welfare effects of TCF liberalisation in the APEC region** Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	263	396	-141	8
NZ	26	55	-30	1
US	10684	4211	6675	-202
Canada	1771	977	753	42
Mexico	-335	329	-770	106
EU	2707	1387	1443	-123
Chinas	5330	10295	-4782	-184
Japan	1937	2002	-4	-62
Korea	1444	372	1095	-23
OthASAPEC	1074	1290	-456	240
Malaysia	-23	171	-156	-39
Singapore	164	-2	144	21
Thailand	247	585	-334	-4
ROW	-845	2300	-3364	220
<b>Total APEC</b>	<b>22581</b>	<b>20683</b>	<b>1995</b>	<b>-97</b>
<b>World</b>	<b>24443</b>	<b>24369</b>	<b>74</b>	<b>0</b>

Source: GTAP simulation

## 4.8 Removing APEC TCF protection: macroeconomic and sectoral results by region Per cent change from baseline

	Other										ROW			
	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	ASAPAC		Malaysia	Singapore	Thailand
<b>Macroeconomic results</b>														
GDP	0.10	0.08	0.05	0.15	0.08	0.02	0.80	0.05	0.08	0.42	0.16	0.00	0.37	0.05
Income	0.08	0.04	0.15	0.31	-0.10	0.04	0.46	0.05	0.37	0.38	-0.02	0.24	0.18	-0.02
Investment	-0.13	0.02	-0.07	0.13	-0.99	-0.10	0.82	-0.12	0.40	1.21	0.05	0.18	-0.01	-0.02
Exports	3.56	2.43	5.28	1.99	4.64	0.10	13.49	4.09	3.59	8.39	2.00	-0.23	4.98	2.23
Imports	3.27	2.47	5.09	2.61	4.04	0.08	13.26	4.66	4.50	7.87	2.09	-0.09	4.84	1.85
GDP deflator	-0.51	-0.47	-0.63	-0.66	-1.47	0.02	1.00	-0.13	1.04	1.16	-0.10	0.37	-0.60	-0.20
Terms of trade	-0.19	-0.17	0.60	0.36	-0.64	0.05	-1.03	-0.04	0.66	-0.37	-0.19	0.12	-0.46	-0.28
Prices received	-0.23	-0.29	-0.50	-0.40	-0.99	0.01	-1.01	-0.05	0.63	-0.30	-0.06	0.22	-0.43	-0.34
Prices paid	-0.04	-0.11	-1.09	-0.75	-0.35	-0.04	0.02	-0.01	-0.03	0.07	0.13	0.10	0.03	-0.05
<b>Sectoral output</b>														
Crops	0.67	1.15	0.32	0.96	0.44	-0.02	-0.46	0.10	-0.21	-0.80	-0.03	-0.19	0.04	-0.06
Livestock	0.52	-0.11	0.47	0.59	0.33	0.13	0.61	0.34	-0.27	0.64	0.06	0.24	0.03	0.01
Forestry & mining	0.72	0.91	0.74	0.81	1.53	-0.04	-2.95	0.21	-1.72	-2.89	-0.41	-0.67	-0.11	0.05
Food processing	0.77	1.71	0.36	0.71	0.27	0.02	-1.77	0.08	-0.42	-1.33	-0.23	0.86	-0.20	0.12
Textile	-20.34	-18.73	-24.00	-39.17	-30.44	1.11	22.79	17.61	55.47	31.33	25.91	22.05	6.80	-6.63
Clothing	-49.39	-56.38	-58.67	-80.62	-62.74	-8.92	85.69	-10.84	-3.64	56.91	15.83	-4.19	-0.84	5.36
Leather	-22.44	-4.65	-20.50	-54.68	-34.29	-4.37	9.49	-42.66	31.37	138.26	770.13	52.13	-2.54	-3.09
Paper products	0.14	0.71	0.37	0.60	0.48	-0.07	-2.97	0.00	-0.48	-3.96	-0.29	-0.45	0.05	0.07
Chemicals etc	0.67	0.54	0.03	0.53	-1.35	-0.16	-2.61	0.31	1.87	-1.33	-0.55	1.38	0.34	0.00
Other manufacture	2.27	1.94	2.23	3.13	5.06	0.07	-4.81	0.25	-2.81	-5.95	-0.69	-0.62	-0.01	0.43
Ferrous metals	1.61	1.36	1.67	2.53	5.22	0.07	-6.70	0.45	-3.84	-5.00	-0.05	-0.18	0.07	0.28
Motor vehicles	1.19	1.13	1.85	2.48	9.48	-0.56	-8.08	-1.06	-6.50	-10.67	-1.04	-1.01	-0.39	0.13
Transport nec	1.20	-0.05	3.57	3.89	3.40	-0.81	-10.77	-0.23	-12.55	-8.10	-3.98	-2.05	-3.15	-0.07
Electrical	1.79	2.01	3.26	4.23	10.20	0.49	-10.37	0.47	-5.39	-6.21	-1.13	-1.14	-0.55	0.45
Other equipment	1.45	1.38	1.94	2.21	9.48	-0.07	-7.41	0.55	-4.97	-5.20	-1.90	-1.22	-0.80	0.06
Utilities & construct	-0.02	0.09	-0.01	0.25	-1.05	-0.06	0.36	-0.07	0.60	1.04	0.20	0.19	0.07	-0.03
Trade & transport	0.25	0.46	0.30	0.46	0.42	0.35	-1.70	0.07	0.00	-0.94	0.07	0.86	0.12	0.30
Services	0.05	0.07	0.06	0.34	0.61	0.00	-1.00	-0.01	-0.40	-2.59	-0.79	-0.83	-0.27	-0.06

Source: GTAP simulation

## Global TCF liberalisation

Tables 4.9 and 4.10 presents the effects of global TCF trade liberalisation. The world welfare gain increase by about 40 per cent compared to the APEC liberalisation simulation. All regions except Mexico gain under this simulation. But Mexico's welfare loss decreases due to the EU joining the liberalisation process.

The US and greater China are still the largest winners with EV rising by 5 per cent and 60 per cent, respectively, from the APEC liberalisation. Australia also achieves a 12 per cent further increase in welfare.

### 4.9 Welfare effects of global TCF liberalisation Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	295	390	-101	7
NZ	24	53	-28	-1
US	11190	4337	6694	159
Canada	1683	971	711	1
Mexico	-303	373	-750	74
EU	4983	3461	1566	-43
Chinas	8527	12781	-3908	-345
Japan	1980	2106	203	-330
Korea	1765	350	1463	-48
OthASAPEC	2393	2042	-70	421
Malaysia	19	229	-135	-75
Singapore	163	-6	140	29
Thailand	500	684	-164	-20
ROW	897	6258	-5533	172
<b>Total APEC</b>	<b>28237</b>	<b>24312</b>	<b>4054</b>	<b>-129</b>
<b>World</b>	<b>34117</b>	<b>34030</b>	<b>87</b>	<b>0</b>

Source: GTAP simulation

The only loser of the global TCF liberalisation is Mexico, which suffers a terms of trade loss of US\$750 million which more than offsets the allocative efficiency gain. This is due to two effects. First, its TCF exports in this simulation have much lower prices than those in any other unilateral or bilateral liberalisation simulations simply because of a broader extent of liberalisation which is compounded by the strong competition from Chinese and other Asian countries' TCF exports. This may partly explain why Mexico was one of the last few countries who finalised the WTO accession agreement with China. Second, because every country liberalises TCF protection, some resources are shifted from TCF production to other

products, leading to higher export supply and lower price of other products, which hurts Mexico further.

4.10 Global TCF liberalisation: macroeconomic and sectoral results by region Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	0.10	0.08	0.05	0.15	0.10	0.04	0.99	0.05	0.08	0.66	0.22	-0.01	0.43	0.13
Income	0.08	0.04	0.16	0.30	-0.09	0.07	0.73	0.05	0.45	0.86	0.02	0.24	0.36	0.02
Investment	-0.14	0.00	-0.10	0.06	-1.03	-0.19	1.14	-0.15	0.51	2.20	0.08	0.23	0.36	-0.05
Exports	3.72	2.36	6.03	1.99	4.77	1.25	17.05	4.23	4.21	12.32	2.73	-0.30	5.85	6.49
Imports	3.48	2.39	5.73	2.54	4.16	1.28	17.16	4.73	5.40	12.26	2.89	-0.14	6.14	5.68
GDP deflator	-0.45	-0.48	-0.52	-0.65	-1.46	-0.50	1.97	-0.07	1.38	2.47	0.07	0.46	-0.15	-0.63
Terms of trade	-0.13	-0.17	0.63	0.32	-0.65	0.07	-0.83	-0.04	0.88	0.02	-0.19	0.12	-0.23	-0.46
Prices received	-0.16	-0.29	-0.43	-0.38	-0.97	-0.41	-0.72	0.01	0.86	0.14	0.01	0.32	-0.17	-0.73
Prices paid	-0.03	-0.12	-1.05	-0.70	-0.33	-0.48	0.11	0.05	-0.02	0.12	0.21	0.19	0.06	-0.27
<b>Sectoral output</b>														
Crops	0.85	1.47	0.37	1.10	0.46	0.25	-0.67	0.17	-0.23	-1.42	-0.08	-0.28	-0.12	0.09
Livestock	0.78	-0.11	0.57	0.83	0.35	0.45	1.44	0.53	-0.32	1.16	-0.10	0.40	-0.39	-0.06
Forestry & mining	0.72	1.07	0.53	0.78	1.47	0.65	-4.54	0.17	-2.22	-5.22	-0.77	-0.92	-1.03	0.31
Food processing	0.84	1.88	0.30	0.76	0.28	0.29	-2.35	0.14	-0.56	-2.32	-0.82	1.42	-1.18	0.15
Textile	-19.56	-22.91	-20.88	-38.04	-30.15	-17.74	32.96	24.41	66.69	54.74	47.69	31.57	23.26	-3.33
Clothing	-43.02	-56.50	-39.97	-79.32	-62.91	-46.93	121.79	-8.75	0.06	96.89	50.71	-0.53	17.79	-5.80
Leather	-22.16	-17.57	-7.47	-51.95	-31.78	-22.12	29.03	-41.11	43.97	241.59	1091.38	90.24	28.63	-21.15
Paper products	0.13	0.90	0.26	0.63	0.45	0.10	-4.53	0.06	-0.46	-6.98	-0.71	-0.47	-0.39	0.11
Chemicals etc	0.65	0.60	-0.09	0.58	-1.41	0.09	-4.12	0.40	2.31	-2.52	-1.02	2.76	-0.15	0.09
Other manufacture	2.33	2.35	1.77	3.39	5.11	1.27	-7.58	0.24	-3.49	-10.76	-1.37	-0.83	-2.41	1.02
Ferrous metals	1.59	1.54	1.24	2.54	5.10	1.34	-10.09	0.39	-4.84	-8.95	-0.77	-0.35	-2.37	0.73
Motor vehicles	0.63	1.06	1.07	2.00	9.09	1.09	-12.30	-2.14	-8.79	-18.08	-2.58	-1.60	-1.40	0.37
Transport nec	0.95	0.29	2.74	3.56	3.38	3.44	-15.30	-0.90	-15.85	-13.40	-6.15	-2.35	-9.62	1.61
Electrical	1.88	2.54	2.95	4.86	11.27	2.74	-15.10	0.50	-6.63	-10.69	-1.88	-1.84	-4.32	1.37
Other equipment	1.11	1.31	1.38	2.21	9.46	1.71	-11.07	0.38	-6.33	-8.80	-3.54	-1.72	-4.12	0.56
Utilities & construct	-0.02	0.08	-0.04	0.20	-1.07	-0.07	0.46	-0.12	0.73	1.88	0.35	0.23	0.35	0.00
Trade & transport	0.24	0.50	0.26	0.50	0.40	0.71	-2.50	0.09	0.20	-1.58	-0.11	1.20	-0.36	0.58
Services	0.00	0.05	0.02	0.28	0.56	0.05	-1.38	-0.03	-0.55	-4.39	-1.49	-1.39	-1.17	-0.01

Source: GTAP simulation

# 5

## *Sensitivity analysis*

### Changes in parameter groups

There are three key parameter groups in the GTAP model:

- **trade parameters** which include the elasticity of substitution between domestic and imported goods in aggregate, and the elasticity of substitution between imported goods from different sources;
- **supply parameters** including the elasticity of substitution between primary factors, the elasticity of substitution between intermediate inputs (in composite) and value added and the elasticity of transformation between endowment commodities; and
- **demand parameters** which include the substitution and income parameters.

We undertake sensitivity analysis for each of these parameter groups using the sensitivity facilities built into the GEMPACK implementation of GTAP. This essentially involves simulating a variation in the parameters according to some distribution, and then observing the mean and standard deviation of the corresponding results. A 50 per cent variation in a set of parameters will result in a particular standard deviation for the model results. This standard deviation provides information about the sensitivity of the model results to the parameter group.

For the sensitivity analysis here we conduct our variations around simulations of the global liberalisation and Australia's unilateral actions (unilateral removal or 50 per cent reduction in Australia's TCF tariffs). We have assumed a 50 per cent variation in each of the parameter groups and this variation is assumed to have a triangular distribution.

Results are presented in tables 5.1 to 5.3. To summarise what would otherwise be a large number of results, we have reported the sensitivity to changes in EV, and the allocative and terms of trade components of EV only. Further, we have converted the standard deviation to a 95 per cent confidence interval and expressed this confidence interval as a single percentage of the mean value. Thus, for example, a value of 50 per cent

implies that the 95 per cent confidence interval involves a 50 per cent variation above or below the mean. A value of greater than 100 per cent implies that the confidence interval includes a change in sign of the base value.

Several points are evident from these results.

- EV results are extremely sensitive to the choice of trade parameters, as are its allocative efficiency and terms of trade components.
- All country results are very sensitive to the trade parameters, but Mexico and New Zealand are the most sensitive in the global liberalisation simulation. The overall EV results vary by 154 per cent and 130 per cent, respectively, as a result of the 50 per cent variation in the trade parameters. This means that its welfare gain is not unlikely to be negative. It may look erroneous as the allocative and terms of trade components vary by less than 100 per cent. But it is correct because the mean of allocative efficiency gains and terms of trade losses are of large and similar magnitude and have opposite sign and thus the total EV effects are small in mean and high in variance.

### 5.1 Sensitivity analysis of global liberalisation: confidence interval expressed as a percentage<sup>a</sup>

Region	Trade parameters			Supply parameters			Demand parameters		
	EV	Allocative component	Terms of trade component	EV	Allocative component	Terms of trade component	EV	Allocative component	Terms of trade component
Australia	66	40	38	0	0	2	4	0	9
NZ	130	44	31	8	1	5	7	0	6
US	47	38	49	0	0	0	0	2	1
Canada	38	33	49	0	0	1	0	1	1
Mexico	154	94	15	6	5	1	1	1	0
EU	74	51	131	0	1	1	0	1	2
Chinas	17	46	110	1	0	0	4	2	2
Japan	89	52	415	0	0	3	3	2	9
Korea	10	41	3	2	7	0	4	8	3
Other Asian APEC	25	48	626	0	2	23	2	2	3
Malaysia	30	55	84	37	1	4	29	2	2
Singapore	17	49	18	1	10	1	1	7	2
Thailand	27	54	153	1	0	2	3	2	1
ROW	75	36	27	3	0	0	13	2	0

<sup>a</sup> Analysis is for simulation of global liberalisation of TCF trade. Results refer to the effect of a 50 per cent variation in the underlying parameter group. Parameters within the group are assumed to move together according to a triangular distribution.

Source: GTAP model simulations

## 5 SENSITIVITY ANALYSIS

5.2 Sensitivity analysis of unilateral removal of TCF tariffs in Australia: confidence interval expressed as a percentage<sup>a</sup>

Region	Trade parameters			Supply parameters			Demand parameters		
	EV	Allocative component	Terms of trade component	EV	Allocative component	Terms of trade component	EV	Allocative component	Terms of trade component
Australia	140	39	11	2	0	1	7	0	3
NZ	0	34	45	1	1	2	0	1	2
US	8	22	18	6	4	5	4	6	3
Canada	195	10	93	57	6	33	5	12	11
Mexico	8	26	21	0	14	5	1	4	3
EU	3	11	15	6	7	6	0	2	2
Chinas	2	28	13	1	2	0	3	4	3
Japan	4	13	29	9	4	15	5	6	2
Korea	41	38	22	3	2	3	5	3	3
Other Asian APEC	5	32	8	2	3	3	3	5	3
Malaysia	31	62	1	9	3	6	6	5	2
Singapore	13	81	10	3	5	3	1	1	1
Thailand	177	51	18	5	1	1	19	2	4
ROW	8	26	7	4	3	5	4	4	3

<sup>a</sup> Analysis is for simulation of unilateral removal of TCF tariffs in Australia. Results refer to the effect of a 50 per cent variation in the underlying parameter group. Parameters within the group are assumed to move together according to a triangular distribution.

Source: GTAP model simulations

5.3 Sensitivity analysis of unilateral 50% reduction in Australia's TCF tariffs: confidence interval expressed as a percentage<sup>a</sup>

Region	Trade parameters			Supply parameters			Demand parameters		
	EV	Allocative component	Terms of trade component	EV	Allocative component	Terms of trade component	EV	Allocative component	Terms of trade component
Australia	73	40	6	1	0	1	1	0	2
NZ	1	29	23	1	1	1	0	1	1
US	1	27	9	8	5	7	2	6	1
Canada	59	11	845	22	20	690	13	22	227
Mexico	4	29	8	0	12	5	0	4	1
EU	11	28	8	5	4	5	1	2	1
Chinas	5	34	7	1	2	0	2	3	2
Japan	9	26	18	7	3	13	3	4	0
Korea	30	46	14	3	2	3	4	6	2
Other Asian APEC	9	35	3	2	3	4	2	4	2
Malaysia	22	56	3	10	4	6	5	5	2
Singapore	7	11	6	3	3	2	0	2	0
Thailand	123	48	11	6	1	1	14	3	3
ROW	14	31	2	4	3	5	2	3	2

<sup>a</sup> Analysis is for simulation of global liberalisation of TCF trade. Results refer to the effect of a 50 per cent variation in the underlying parameter group. Parameters within the group are assumed to move together according to a triangular distribution.

Source: GTAP model simulations

- For Australia, the overall EV results vary by 66 per cent as a result of the 50 per cent variation in the trade parameters in simulations of global liberalisation. The results are more sensitive to trade parameter values when Australia acts unilaterally, especially in the case of unilateral removal where the total welfare gain could be turned into net loss. Australia's terms of trade losses are higher when it acts unilaterally than in the case of global liberalisation, resulting to higher variation in the total welfare results. This may justify a conservative reform policy when we are not clear about the parameter values.
- The supply and demand parameters generally have a very small effect on the EV results.

## Removal of TCF protection when the US protection level is higher

As discussed in chapter 1, considering non-tariff barriers leads to much higher tax-equivalent rates on the clothing imports in the US. In this section we present simulations of TCF protection removal when the US clothing protection rates are 46 per cent for imports from Asian countries except Japan, *ceteris paribus*.

### 5.4 Welfare effects of removing Australia's TCF tariffs: higher US clothing protection

Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	130	383	-249	-3
NZ	-27	-16	-12	1
US	-24	-6	-19	2
Canada	0	0	0	0
Mexico	2	1	2	0
EU	41	20	23	-2
Chinas	184	46	141	-4
Japan	46	28	18	-1
Korea	15	-4	19	0
OthASAPEC	31	9	20	2
Malaysia	3	-1	4	0
Singapore	3	0	3	0
Thailand	2	-3	5	0
ROW	89	39	45	4
<b>Total APEC</b>	<b>364</b>	<b>436</b>	<b>-69</b>	<b>-3</b>
<b>World</b>	<b>494</b>	<b>495</b>	<b>-1</b>	<b>0</b>

Source: GTAP simulation

The simulations proceed as follows. First, using ALTERTAX facility, the export tax rate of clothing from Asian countries except Japan to US are changed so that the combined tariff rate and tax rate equal to 46 per cent,

and consequently, the database is adjusted. Then, various TCF liberalisation schemes are simulated against the new database. Results are reported in tables 5.4 to 5.9.

### 5.5 Welfare effects of removing US TCF tariffs: higher US clothing protection

Changes in equivalent variation and components

	<b>Total</b>	<b>Allocative efficiency</b>	<b>Terms of trade</b>	<b>Price of capital</b>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	21	-28	31	18
NZ	6	-7	15	-2
US	22854	5805	16937	112
Canada	1260	607	657	-4
Mexico	-643	-371	-321	49
EU	3758	1754	2144	-140
Chinas	5964	19321	-13118	-240
Japan	-38	159	73	-270
Korea	-62	-193	125	6
OthASAPEC	-478	330	-944	135
Malaysia	-138	12	-108	-42
Singapore	-48	-28	-48	27
Thailand	-180	269	-440	-9
ROW	-3910	457	-4731	364
<b>Total APEC</b>	<b>28517</b>	<b>25876</b>	<b>2860</b>	<b>-220</b>
<b>World</b>	<b>28364</b>	<b>28087</b>	<b>273</b>	<b>4</b>

Source: GTAP simulation

### 5.6 Welfare effects of removing the EU TCF tariffs: higher US clothing protection

Changes in equivalent variation and components

	<b>Total</b>	<b>Allocative efficiency</b>	<b>Terms of trade</b>	<b>Price of capital</b>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	24	-13	40	-3
NZ	2	-2	6	-2
US	-735	-229	-626	121
Canada	31	-4	65	-29
Mexico	43	16	49	-22
EU	704	2190	-1591	104
Chinas	2662	2506	303	-148
Japan	-321	-13	-112	-196
Korea	105	-38	164	-21
OthASAPEC	1269	723	416	130
Malaysia	76	61	45	-30
Singapore	-23	-6	-21	5
Thailand	183	84	113	-14
ROW	2509	1259	1144	105
<b>Total APEC</b>	<b>3316</b>	<b>3084</b>	<b>441</b>	<b>-210</b>
<b>World</b>	<b>6528</b>	<b>6533</b>	<b>-5</b>	<b>0</b>

Source: GTAP simulation

### 5.7 Welfare effects of removing China TCF tariffs: higher US clothing protection

Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	92	54	35	3
NZ	13	10	3	0
US	924	384	445	94
Canada	98	65	36	-3
Mexico	-51	-5	-49	3
EU	485	243	230	12
Chinas	2674	4721	-2042	-6
Japan	1860	824	1152	-117
Korea	713	133	590	-10
OthASAPEC	-174	-81	-96	3
Malaysia	-49	-23	-23	-2
Singapore	31	-2	29	4
Thailand	-80	-43	-37	1
ROW	-617	-358	-276	17
<b>Total APEC</b>	<b>6052</b>	<b>6038</b>	<b>43</b>	<b>-29</b>
<b>World</b>	<b>5920</b>	<b>5922</b>	<b>-3</b>	<b>0</b>

Source: GTAP simulation

### 5.8 Welfare effects of TCF liberalisation in APEC region: higher US clothing protection

Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	263	395	-146	14
NZ	21	53	-31	-1
US	28414	6461	21519	434
Canada	1632	949	692	-10
Mexico	-336	321	-722	64
EU	3869	1895	2270	-296
Chinas	6376	21390	-14727	-287
Japan	2343	2086	576	-319
Korea	1460	285	1205	-30
OthASAPEC	628	1488	-1150	290
Malaysia	-141	157	-237	-61
Singapore	150	-16	131	35
Thailand	85	622	-528	-9
ROW	-2951	5429	-8560	180
<b>Total APEC</b>	<b>40894</b>	<b>34192</b>	<b>6582</b>	<b>120</b>
<b>World</b>	<b>41813</b>	<b>41517</b>	<b>292</b>	<b>4</b>

Source: GTAP simulation

### 5.9 Welfare effects of global TCF liberalisation: higher US clothing protection

Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>
	US\$ million	US\$ million	US\$ million	US\$ million
Australia	294	391	-106	9
NZ	24	53	-26	-3
US	28023	6403	21189	431
Canada	1654	957	725	-28
Mexico	-313	334	-698	51
EU	309	2333	-1806	-218
Chinas	8051	22347	-13925	-371
Japan	2044	2084	414	-454
Korea	1599	300	1350	-51
OthASAPEC	2135	2228	-495	401
Malaysia	-42	222	-185	-80
Singapore	167	-13	146	35
Thailand	271	698	-408	-18
ROW	1790	7353	-5861	298
<b>Total APEC</b>	<b>43907</b>	<b>36003</b>	<b>7981</b>	<b>-77</b>
<b>World</b>	<b>46005</b>	<b>45688</b>	<b>314</b>	<b>3</b>

Source: GTAP simulation

Several points are evident from these results.

- As the US protection is now higher in the baseline, any policies involving the US liberalisation of TCF trade result in higher global welfare gains. For example, the US unilateral removal of TCF tariffs leads to a global welfare improvement of US\$28 364 million, while the welfare gain was US\$10 444 million when the lower US clothing protection presented in chapter 3.
- Similarly, APEC and global liberalisation of TCF trade result in welfare gains of US\$41 813 million and US\$46 005 million, respectively, compared with the previous gains of US\$24 443 million and US\$34 117 million, respectively.
- However, these increased welfare gains are not evenly allocated to country regions. It seems that some gains are transferred from Asian countries to the US. This is understandable because the quota rents which was accumulated to exporting countries now disappear after removing import quotas.
- Despite the magnitudes of welfare changes, the qualitative results derived from the simulations presented in the previous three chapters still hold.

## Alternate closure

In tables 5.10 and 5.11 we present the results of global liberalisation of TCF trade using an alternate model closure. This closure (initially suggested by Francois et al 1996) assumes a fixed savings rate in each region, but allows the capital stock to vary according to investment allocated to each region.

As table 5.10 indicates, there is now an additional component to the change in EV: the endowment effect, which is the contribution to increased income of the additional capital put in place in each region. The endowment effect may either add or subtract from the overall welfare results.

Australia will experience capital outflows under this closure, leading to significant endowment losses which almost offset all the allocative efficiency gains. Together with terms of trade losses, Australia has net welfare losses in this situation.

China is the largest winner with additional endowment effect of US\$5 826 million.

**5.10 Welfare effects of global TCF liberalisation: alternate closure** Changes in equivalent variation and components

	<i>Total</i>	<i>Allocative efficiency</i>	<i>Terms of trade</i>	<i>Price of capital</i>	<i>Endowment effect</i>
	US\$ million	US\$ million	US\$ million	US\$ million	US\$ million
Australia	-199	330	-65	8	-472
NZ	-19	47	-25	-1	-40
US	4451	4357	6809	182	-6897
Canada	1445	929	708	2	-196
Mexico	-4083	-245	-600	65	-3304
EU	-4047	2295	1934	-44	-8232
Chinas	15124	13975	-4338	-338	5826
Japan	-1012	1453	330	-320	-2475
Korea	2554	458	1390	-45	752
OthASAPEC	6829	2339	-352	369	4473
Malaysia	-8	220	-125	-74	-29
Singapore	230	1	143	29	58
Thailand	1454	794	-225	-17	902
ROW	-3283	5703	-5489	186	-3683
<b>Total APEC</b>	<b>26767</b>	<b>24658</b>	<b>3651</b>	<b>-140</b>	<b>-1402</b>
<b>World</b>	<b>19437</b>	<b>32657</b>	<b>95</b>	<b>1</b>	<b>-13317</b>

Source: GTAP simulation

## 5.11 Global TCF liberalisation: macroeconomic and sectoral results by region: alternative closure Per cent change from baseline

	Australia	NZ	US	Canada	Mexico	EU	Chinas	Japan	Korea	Other ASAPPEC	Malaysia	Singapore	Thailand	ROW
<b>Macroeconomic results</b>														
GDP	-0.10	0.00	-0.10	0.10	-1.10	-0.10	1.70	-0.10	0.30	2.60	0.20	0.10	1.20	0.00
Income	-0.10	0.00	0.10	0.30	-1.20	-0.10	1.30	0.00	0.60	2.40	0.00	0.30	1.10	-0.10
Investment	-0.40	-0.20	-0.30	-0.10	-1.90	-0.40	1.80	-0.30	0.60	4.00	-0.10	0.20	1.00	-0.30
Exports	3.60	2.30	5.90	2.00	3.10	1.10	18.00	4.10	4.70	15.20	2.70	-0.20	6.70	6.40
Imports	3.40	2.30	5.60	2.50	3.10	1.20	17.70	4.70	5.60	14.20	2.80	0.00	6.80	5.50
GDP deflator	-0.40	-0.50	-0.50	-0.70	-1.30	-0.50	1.90	-0.10	1.30	2.10	0.10	0.40	-0.20	-0.60
Terms of trade	-0.08	-0.15	0.64	0.32	-0.52	0.08	-0.92	-0.01	0.83	-0.23	-0.18	0.13	-0.32	-0.46
Prices received	-0.13	-0.28	-0.43	-0.39	-0.86	-0.41	-0.83	0.01	0.80	-0.13	0.00	0.29	-0.27	-0.74
Prices paid	-0.05	-0.13	-1.07	-0.71	-0.34	-0.49	0.08	0.03	-0.03	0.10	0.18	0.17	0.04	-0.28
<b>Sectoral output</b>														
Capital goods	-0.40	-0.22	-0.31	-0.13	-1.88	-0.37	1.81	-0.29	0.64	4.00	-0.07	0.25	0.99	-0.26
Crops	1.05	1.61	0.39	1.20	0.51	0.23	-0.47	0.18	-0.19	-1.39	-0.05	-0.24	-0.11	0.09
Livestock	0.80	-0.05	0.51	0.84	-0.11	0.39	1.77	0.51	-0.22	2.05	-0.09	0.43	-0.31	-0.11
Forestry & mining	0.58	0.97	0.41	0.73	0.67	0.50	-4.04	0.06	-1.98	-3.82	-0.76	-0.84	-0.45	0.24
Food processing	0.72	1.90	0.23	0.77	-0.37	0.20	-2.04	0.09	-0.45	-1.43	-0.86	1.67	-1.01	0.12
Textile	-19.91	-23.18	-21.04	-38.13	-31.15	-18.01	33.92	24.29	67.33	59.75	47.50	31.23	24.09	-3.67
Clothing	-43.38	-56.71	-40.16	-79.41	-63.77	-47.25	122.82	-9.04	0.11	105.37	49.79	-0.67	18.61	-6.50
Leather	-22.56	-18.11	-7.81	-52.19	-33.21	-22.74	28.58	-41.28	44.10	254.01	1090.75	89.94	29.72	-21.55
Paper products	-0.07	0.83	0.14	0.61	-1.11	-0.06	-3.73	-0.05	-0.15	-4.22	-0.76	-0.35	0.48	0.00
Chemicals etc	0.48	0.51	-0.21	0.56	-2.74	-0.07	-3.27	0.29	2.75	-0.24	-1.09	3.22	0.68	-0.03
Other manufactures	1.95	2.10	1.63	3.31	3.10	1.05	-6.64	0.09	-3.14	-7.58	-1.44	-0.70	-1.43	0.86
Ferrous metals	1.32	1.34	1.11	2.49	3.38	1.16	-9.15	0.25	-4.42	-5.89	-0.83	-0.19	-1.18	0.59
Motor vehicles	0.19	0.91	1.02	2.12	6.45	0.94	-11.01	-2.31	-8.44	-14.25	-2.62	-1.51	-0.40	0.26
Transport nec	0.65	0.04	2.64	3.40	1.58	3.32	-14.23	-1.13	-15.59	-10.61	-6.25	-2.26	-8.08	1.41
Electrical	1.42	2.26	2.72	4.61	9.74	2.49	-13.99	0.28	-6.35	-8.81	-1.95	-1.75	-2.98	1.17
Other equipment	0.82	1.04	1.22	2.17	7.32	1.57	-10.03	0.24	-5.88	-6.79	-3.54	-1.56	-2.81	0.37
Utilities & construct	-0.27	-0.07	-0.19	0.07	-1.99	-0.24	1.15	-0.25	0.90	3.79	0.23	0.26	1.03	-0.17
Trade & transport	0.05	0.39	0.16	0.47	-1.03	0.54	-1.71	0.00	0.49	0.72	-0.17	1.29	0.40	0.46
Services	-0.17	-0.04	-0.09	0.22	-0.64	-0.12	-0.63	-0.15	-0.30	-1.96	-1.49	-1.28	-0.51	-0.11

Source: GTAP simulation

# A

## Appendix: technical simulation details

### Model aggregation

Tables A.1 and A.2 summarise the sectoral and regional aggregation used in this report.

#### A.1 Sectoral aggregation

<b>Code</b>	<b>Old sector</b>	<b>New sector</b>	<b>Code</b>	<b>Old sector</b>	<b>New sector</b>
pdr	Paddy rice	Crops	lum	Wood products	ForfishMin
wht	Wheat	Crops	ppp	Paper products, publishing	Paperprods
gro	Cereal grains nec	Crops	p_c	Petroleum, coal products	Chempetrol
v_f	Vegetables, fruit, nuts	Crops	crp	Chemical,rubber,plastic prods	Chempetrol
osd	Oil seeds	Crops	nmm	Mineral products nec	Othermanuf
c_b	Sugar cane, sugar beet	Crops	i_s	Ferrous metals	Ferrousmeta
pfb	Plant-based fibers	Crops	nfm	Metals nec	Othermanuf
ocr	Crops nec	Crops	fmp	Metal products	Ferrousmeta
ctl	Cattle,sheep,goats,horses	Livestock	mvh	Motor vehicles and parts	MVandparts
oap	Animal products nec	Livestock	otn	Transport equipment nec	Transnex
rmk	Raw milk	Livestock	ele	Electronic equipment	Electrical
wol	Wool, silk-worm cocoons	Livestock	ome	Machinery and equipment nec	Othequip
for	Forestry	ForfishMin	omf	Manufactures nec	Othermanuf
fsh	Fishing	ForfishMin	ely	Electricity	Elegswtrcon
col	Coal	ForfishMin	gdt	Gas manufacture, distribution	Elegswtrcon
oil	Oil	ForfishMin	wtr	Water	Elegswtrcon
gas	Gas	ForfishMin	cns	Construction	Elegswtrcon
omn	Minerals nec	ForfishMin	trd	Trade	Tradetrans
cmt	Meat: cattle,sheep,goats,horse	Foodproces	otp	Transport nec	Tradetrans
omt	Meat products nec	Foodproces	wtp	Sea transport	Tradetrans
vol	Vegetable oils and fats	Foodproces	atp	Air transport	Tradetrans
mil	Dairy products	Foodproces	cmn	Communication	CommServ
pcr	Processed rice	Foodproces	ofi	Financial services nec	CommServ
sgr	Sugar	Foodproces	isr	Insurance	CommServ
ofd	Food products nec	Foodproces	obs	Business services nec	CommServ
b_t	Beverages and tobacco products	Foodproces	ros	Recreation and other services	CommServ
tex	Textiles	Textiles	osg	PubAdmin/Defence/Health/Educat	CommServ
wap	Wearing apparel	Clothing	dwe	Dwellings	CommServ
lea	Leather products	Leather			

## A.2 Regional aggregation

<b>Code</b>	<b>Old region</b>	<b>New region</b>	<b>Code</b>	<b>Old region</b>	<b>New region</b>
aus	Australia	Australia	fin	Finland	EU
nzl	New Zealand	NZ	fra	France	EU
chn	China	Chinas	deu	Germany	EU
hkg	Hong Kong	Chinas	gbr	United Kingdo	EU
jpn	Japan	Japan	grc	Greece	EU
kor	Korea	Korea	irl	Ireland	EU
twm	Taiwan	Chinas	ita	Italy	EU
idn	Indonesia	OthASAPPEC	lux	Luxembourg	EU
mys	Malaysia	Malaysia	nld	Netherlands	EU
phl	Philippines	OthASAPPEC	prt	Portugal	EU
sgp	Singapore	Singapore	esp	Spain	EU
tha	Thailand	Thailand	swe	Sweden	EU
vnm	Vietnam	OthASAPPEC	che	Switzerland	ROW
bgd	Bangladesh	ROW	xef	Rest of EFTA	ROW
ind	India	ROW	hun	Hungary	ROW
lka	Sri Lanka	ROW	pol	Poland	ROW
xsa	Rest of South	ROW	xce	Rest of Centr	ROW
can	Canada	Canada	xsu	Former Soviet	ROW
usa	United States	US	tur	Turkey	ROW
mex	Mexico	Mexico	xme	Rest of Middl	ROW
xcm	Central Ameri	ROW	mar	Morocco	ROW
col	Colombia	ROW	xfn	Rest of North	ROW
per	Peru	ROW	bwa	Botswana	ROW
ven	Venezuela	ROW	xsc	Rest of SACU	ROW
xap	Rest of Andea	ROW	mwi	Malawi	ROW
arg	Argentina	ROW	moz	Mozambique	ROW
bra	Brazil	ROW	tza	Tanzania	ROW
chl	Chile	ROW	zmb	Zambia	ROW
ury	Uruguay	ROW	zwe	Zimbabwe	ROW
xsm	Rest of South	ROW	xsf	Other Souther	ROW
aut	Austria	EU	uga	Uganda	ROW
bel	Belgium	EU	xss	Rest of Sub-S	ROW
dnk	Denmark	EU	xrw	Rest of World	ROW

## Solution method

For all simulations we used GEMPACK's automatic accuracy facility. The base set up is a 2, 4, 6 step Gragg with 2 subintervals. Automatic accuracy was set to achieve 80 percent of results with accuracy of 4 figures (using both data and solution as criteria). The minimum subinterval size was set at  $10^{n-3}$ .

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