REPORT

CENTRE FOR INTERNATIONAL ECONOMICS

Barriers to wool fibre products trade

Costs to US consumers and Australian woolgrowers

A joint study by the
Centre for International Economics, Canberra & Sydney, and
The Trade Partnership, Washington DC

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The Centre for International Economics is a private economic research agency that provides professional, independent and timely analysis of international and domestic events and policies.

The Trade Partnership is a Washington (USA) based economic consulting firm with particular expertise in textile and apparel issues.

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About this study

THIS STUDY WAS INITIATED by Wool Council of Australia and was funded by Australian wool growers.

THE STUDY WAS CONDUCTED jointly by the Centre for International Economics (CIE) and the Trade Partnership.

The Trade Partnership, a Washington based economic consulting firm with particular expertise in textile and apparel issues, undertook the analysis of the effects of the agreed schedule of liberalisation of multifibre arrangements on the barriers to US imports of yarns, fabrics and apparel. The results of this analysis are reported in chapter 2 and appendixes A and B.

The CIE undertook the modelling analysis of the implications of these changes in barriers for US production and imports of fibre specific yarns, fabrics and apparel, US consumer expenditure on textiles and clothing, and Australian wool production and income. The results of this analysis are reported in chapters 3 and 4, and appendixes C, D and E.

The Trade Partnership provided assistance with the data and parameter requirements of the model.

Summary

- Under the Multifibre Arrangement (MFA) the US has for many years imposed fibre specific quotas on imports of textiles and clothing. As a result, US consumers are denied cheaper access to textiles and clothing and fibre producers in the US and elsewhere are disadvantaged.

- Under the WTO Agreement on Textiles and Clothing (ATC) – signed in the Uruguay Round – the US and other parties to the MFA agreed to phase out their MFA quotas over a ten year period from January 1995.

- The ATC has wider product coverage than the MFA and other (non–MFA) import restrictions. Products previously not subject to MFA–style restrictions are now included in the ATC phase out. The broader product coverage allows importing restraining countries to defer liberalisation of MFA restrictions until the end of the phaseout period.

- Because of the broader coverage, the US and the EU managed to meet their ATC obligations in Stages 1 and 2 of the phase out without actually liberalising (or integrating) many restrained products. Research by the International Textiles and Clothing Bureau shows that in Stages 1 and 2 the trade accounted for by products freed of quota restrictions represented only about 6 per cent (US) and less than 5 per cent (EU) of total restrained imports.

- If the ATC is implemented to schedule the influence of quotas will wane during the transition period. By 1 January 2005 the only protective barrier will be the tariff. Of particular interest is how the barriers will change under the ATC phase out and the implications of the phase out and faster liberalisation for US textile and clothing consumers and Australian wool producers.

- For yarns import quotas to the US are not projected to restrict trade over the ten year ATC phase out period. The total barrier to imports is the tariff which will fall slightly from 8 to 7 per cent (cotton yarn), 8 to 6 per cent (wool and wool blend yarn) and 9 to 7 per cent (other fibre yarn) between 1996 and 2006.

- Import quotas to the US for fabrics are also unlikely to be restrictive over the ATC phase out. Tariffs will fall from 9 to 8 per cent (cotton

fabric), 25 to 18 per cent (wool and wool blend fabric) and 11 to 8 per cent (other fibre fabric).

- Quotas on imports to the US for cotton apparel, wool and wool blend apparel and other fibre apparel are likely to stay restrictive over the ten year ATC phase out. The total protective barrier (tariff plus tariff equivalent of quota) is projected to fall from 47 to 15 per cent (cotton apparel), 33 to 15 per cent (wool and wool blend apparel) and 70 to 20 per cent (other fibre apparel) between 1996 and 2005.

- For wool and wool blend apparel the protective barrier is projected to remain virtually unchanged for the first nine years of the ATC phase out. All of the fall in import protection occurs in year ten. US consumers of wool and wool blend apparel will not have access to cheaper imports until that year.

- Elimination of tariffs and quotas on US imports of yarns, fabrics and apparel in 1999 delivers major gains to US consumers. Consumers are able to increase their consumption of textiles and clothing by switching to cheaper imports and still have US$20 billion left over to spend on other goods and services. US production of apparel falls substantially and imports increase. Australia's wool production is projected to increase by about 0.3 per cent and Australian wool producer income improves by A$17 million per year. The percentage increase in Australia's cotton production is nearly three times that for wool. Cotton producer income increases by A$15 million per year.

- US import quota liberalisation now with tariffs remaining in place delivers gains to US consumers of about 60 per cent of the gains from elimination of both quotas and tariffs. The gain in Australian wool industry income is about half the gain achievable liberalisation by the US of both quotas and tariffs.

- Step by step quota liberalisation in the first nine years of the ten year phase out slightly worsens the position of wool apparel relative to cotton and other fibre apparel in the US market because of a faster rate of decline in the tariff equivalent of quotas on cotton and other fibre apparel relative to wool apparel. This leads to a very small decline (less than 1 per cent) in Australian wool industry income over this period.

- All of the gains to the Australian wool industry from step by step quota liberalisation occur in the last year — to January 2005. This result highlights the importance to the Australian wool industry of achieving complete removal of US import quotas as soon as possible and certainly by the end of the ATC.

1 Introduction

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 (EU), 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. On average, around 30 exporting countries have been signatories to the arrangement though many more countries have had restrictions imposed on their exports under the Arrangement.

The product and country coverage, and trade restrictiveness of the MFA have increased over time. All clothing and textiles of wool, cotton and synthetic fibres have been included since 1974. Each importing country used its own product classification for specification of restrictions and the set of products for which restrictions were specified varied between exporting countries. Under the MFA the US imposed fibre–specific textile and clothing quotas.

These restrictions have resulted in higher prices of textiles and clothing to consumers in developed countries, reduced textiles production in both exporting and importing countries and reduced prices and incomes of raw fibre producers.

The MFA has also changed the composition of textiles and clothing, and fibre demand and production. Consumer demand has shifted toward less restricted (and hence cheaper) categories of textiles and clothing. Depending on the fibre composition of these categories, the restrictions, while disadvantaging all fibre producers, disadvantaged some categories of fibres relative to others.

Replacement of the MFA with the ATC

The WTO Agreement on Textiles and Clothing (ATC) was negotiated during the GATT Uruguay Round of multilateral trade negotiations. Under the ATC, members of the WTO, which includes all developed countries imposing MFA sanctioned restrictions against textile and clothing imports

from developing countries, agreed to progressively bring the textiles and clothing trade under WTO disciplines, and in particular to phase out their MFA restrictions over a ten year period from 1 January 1995. That is, all textiles and clothing products will be progressively integrated into the GATT 1994 (which forbids the imposition of quotas) and quota growth rates for products not yet integrated will be increased.

Under the ATC all MFA quotas and other restrictions in force on 31 December 1994 had to be notified to the WTO. Notified restrictions are regarded as the only restrictions being maintained by WTO members against other WTO members (i.e. if the restrictions were not notified they became WTO–illegal). WTO importing restraining members (the US, the EU, Canada and Norway) were further required to accelerate MFA quota growth rates by an agreed annual percentage during each stage of the ATC phase out program.

Both the percentage of total 1990 import volume of products to be integrated at each stage of the phase out, and the quota growth rate acceleration factor are minimum requirements. That is, importing restraining countries are required by the ATC to increase the percentage of products integrated and the quota growth rates at each stage by not less than the agreed percentage. There are specific provisions in the ATC which encourage faster integration and unilateral liberalisation.

The phase out program is in four stages, during which the coverage of products for which import quotas are eliminated will be progressively expanded. Importing countries are free to determine which products will be included in each stage of the integration process as long as they include products from each of the four groupings: tops and yarns; fabrics; made up textile products; and clothing. At the conclusion of the transition period, all quotas on textiles and clothing will be eliminated between WTO members.

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 products are dominated by clothing. With clothing left until last in this sequencing and with imported inputs to clothing manufacture (yarns, fabrics, etc.) becoming cheaper through earlier liberalisation, incentives to expand domestic clothing production will increase. US manufacturers of textiles and clothing face the prospect of significant disruption to their business in the last year of the adjustment period — which could be avoided with a smoother transition path. And by delaying and compressing the adjustment there is a real danger that political pressures, driven by protectionist forces within the US, will lead to abandonment of the textile and clothing import liberalisation program with

adverse consequences for US consumers and retailers of clothing and textiles, developing country exporters and fibre producers.

This study

The focus of this study is on the impact of the ATC phase out on wool, cotton and other fibre textile and clothing production, consumption and imports in the US and the implications for wool, cotton and other fibre producers. The US is the largest importer of wool apparel. US policies toward wool apparel imports are therefore likely to be important in shaping prospects for wool producers and processors, and retailers of wool based clothing and textiles in the US and throughout the world.

Our study is concerned with:

- the costs to US consumers of a continuation of barriers to imports of clothing and textiles;
- the effects of these barriers on the global wool market;
- the impact of the US phase out program under the ATC on sales of wool based clothing in the US;
- the extent to which the US phase out program discriminates between wool and other fibres; and
- the benefits to US consumers and retailers – and Australian wool and cotton growers – from a faster rate of liberalisation than that currently proposed by the US Government.

2 How barriers to US imports of textiles and clothing will change as the ATC is implemented

THE ATC'S FOUR STAGE PHASE OUT requires that a specified share of total 1990 imports covered (but not necessarily restricted) by the ATC are to be integrated into GATT 1994 (i.e. have their import quotas and other restrictions removed) at each stage (table 2.1). However, importing restraining countries can include on the list for integration imports which have never been subject to MFA import quotas. Canada, the EU and the US all watered down the first stage of adjustment on 1 January 1995 by employing this tactic. In the case of the US, imports previously unrestricted by quota which have been included on the list represent about 37 per cent of 1990 textile and clothing imports (estimate by Bagchi 1994). In stage 1, the US did not integrate any apparel products that were subject to quota and in stage 2 only 4 per cent were integrated. A further 7 per cent will be integrated in stage 3. The remaining 89 per cent will not be integrated until 1 January 2005.

It was assumed that China and Taiwan become members of the WTO in 2000 and that they enter the stages and phase out terms of the ATC at the same point as other suppliers in that year.

2.1 **The ATC phase out program**

Stage	*Integration: minimum share of total 1990 import volume of products covered by the ATC*		*Minimum rate of expansion of residual quotas relative to base quota expansion rate agreed under last MFA*
	Share	*Cumulative*	
	%	%	%
Stage I (1 January 1995)	16	16	16 per cent faster (for example, a 5 per cent annual expansion becomes 5.8 per cent)
Stage II (1 January 1998)	17	33	25 per cent faster than in stage I (5.8 per cent becomes 7.25 per cent)
Stage III (1 January 2002)	18	51	27 per cent fast than in stage II (7.25 per cent becomes 9.21 per cent)
Completion (1 January 2005)	49	100	

Source: Francois, McDonald and Nordström (1995).

It is clear from table 2.1 that many US textile and clothing imports will be subject to import quotas for most of the transition period. In order to calculate the likely cost of these quotas to US consumers and retailers of textiles and clothing, we first need to establish the degree to which the quotas will continue to restrict each category of imports over the life of the ATC. The degree to which the quota restricts imports can be measured by its tariff equivalent — the extent to which the quota causes the domestic price of imports to increase above the cif import price. This in turn will depend on the size of the import quota relative to the demand for imports at the start of the period and the rate at which the import quota is expanding relative to the rate of increase in consumer demand for the product.

For example, if the import quota for a particular product is expanding more rapidly than the growth in demand by US consumers for that imported product, then the restrictive effect of the quota will decline. This will be reflected in a falling gap between the domestic price of imports and the cif import price, as the imported product becomes less scarce. If, by contrast, the growth in demand for the product exceeds the rate of expansion in quota, then the restrictive effect of the quota will increase. This will be reflected in a rising local price of imports relative to the price at the border in order to ration sales to consumers.

Measuring the size of the barriers

A key issue for our analysis is how the size of the barrier to imports of different types of clothing and textiles into the US will change as the ATC phase out proceeds. The size of the barrier to imports represents the tariff equivalent of the quota plus the tariff. The influence of quotas will wane during the transition period as products are integrated into GATT 1994. By 1 January 2005 the only protective barrier will be the tariff.

We have estimated for yarns, fabrics and apparel, on a fibre specific basis, the size of the barrier to imports in each year of the transition period. Details of the methodology are set out in appendix A. In brief, it involves the following steps.

- Determine whether the quotas restrict trade in the base year 1996. If quotas are not restrictive (that is, the import quota exceeds the desired volume of imports), then the quota is having no effect on the price of imports — the only barrier is the tariff. (This involved analysis of data on import quotas and imports for each of 147 three digit textile and apparel commodity classifications.)

- Compare the rate of growth of import quota over the transition period relative to the projected rate of growth in demand for the imported product into the US. A formal economic model is used to determine import demand growth. This model takes into account production conditions in the US and exporting countries (which determine how relative prices between goods sourced overseas and goods produced in the US are likely to change over the period) and the extent to which US consumers will switch their purchases between US produced and imported textiles and clothing as the relative prices between them change. The demand growth projections for each type of yarn, fabric and apparel are shown in appendix B.

We consider in turn the US barriers for yarns (table 2.2), fabrics (table 2.3) and apparel (table 2.4). Each table contains four columns of tariff equivalent estimates for each commodity and year as follows.

- Tariff equivalent of quota on target imports — the protection provided by the quantitative restrictions on target countries (those assigned an import quota) only.
- Tariff equivalent of quota across all imports — the protection provided by the quantitative restrictions across all countries, that is the weighted sum across quota and non-quota countries (say, *a*).
- Trade weighted average tariff — the weighted sum of the ad valorem equivalent of duty payable across all countries (say, *b*).
- Total barrier to imports. This is calculated by multiplying the power of the tariff equivalent of the quota by the power of the tariff $(1+a/100)(1+b/100)$.

The barriers for yarns

For the three categories of yarns distinguished — cotton yarn, wool yarn, other yarn — quotas were not restrictive. In all cases, quota volumes greatly exceeded desired imports. And, in all cases, quota is expected to grow at a faster pace than demand for these products. For quotas to become restrictive, imports would have to surge by several multiples of their current levels. The barrier to imports of yarns into the US over the term of the ATC is therefore the projected tariff rate. This is shown in table 2.2.

The total barrier facing imports is similar for each type of yarn. Small reductions in tariffs on yarns, fabrics and apparel were agreed to in the Uruguay Round of trade negotiations. The tariff for cotton yarn is projected to move from 7.6 to 6.8 per cent over the period. For wool and wool blend yarn the movement is from 8.2 per cent to 5.8 per cent compared with 8.7 to 7.3 per cent for the other yarn category.

2.2 **Projected barriers for yarns**

Year	*Tariff equivalent of quota on target imports*	*Tariff equivalent of quota across all imports*	*Trade weighted average tariff*	*Total barrier to imports*
	%	%	%	%
Cotton yarn				
1996	0	0	7.6	7.6
1997	0	0	7.5	7.5
1998	0	0	7.4	7.4
1999	0	0	7.3	7.3
2000	0	0	7.2	7.2
2001	0	0	7.1	7.1
2002	0	0	7.0	7.0
2003	0	0	6.9	6.9
2004	0	0	6.8	6.8
2005	0	0	6.8	6.8
2006	0	0	6.8	6.8
Wool and wool blend yarn				
1996	0	0	8.2	8.2
1997	0	0	7.9	7.9
1998	0	0	7.6	7.6
1999	0	0	7.3	7.3
2000	0	0	7.0	7.0
2001	0	0	6.7	6.7
2002	0	0	6.4	6.4
2003	0	0	6.1	6.1
2004	0	0	5.8	5.8
2005	0	0	5.8	5.8
2006	0	0	5.8	5.8
Other fibre yarn				
1996	0	0	8.7	8.7
1997	0	0	8.6	8.6
1998	0	0	8.4	8.4
1999	0	0	8.2	8.2
2000	0	0	8.0	8.0
2001	0	0	7.8	7.8
2002	0	0	7.7	7.7
2003	0	0	7.5	7.5
2004	0	0	7.3	7.3
2005	0	0	7.3	7.3
2006	0	0	7.3	7.3

Source: The Trade Partnership.

The barriers for fabrics

The story for fabrics is similar to that for yarns. Import quotas are underfilled on each category as a whole and quota volumes are expected to grow faster than demand for imports. This results in the tariff barriers shown in table 2.3.

The barrier to imports of wool and wool blend fabric (the tariff) is more than double the barrier to imports of cotton fabric and other fibre fabric.

2.3 **Projected barriers for fabrics**

Year	*Tariff equivalent of quota on target imports*	*Tariff equivalent of quota across all imports*	*Trade weighted average tariff*	*Total barrier to imports*
	%	%	%	%
Cotton fabric				
1996	0	0	8.9	8.9
1997	0	0	8.8	8.8
1998	0	0	8.7	8.7
1999	0	0	8.6	8.6
2000	0	0	8.5	8.5
2001	0	0	8.4	8.4
2002	0	0	8.3	8.3
2003	0	0	8.2	8.2
2004	0	0	8.1	8.1
2005	0	0	8.1	8.1
2006	0	0	8.1	8.1
Wool and wool blend fabric				
1996	0	0	25.0	25.0
1997	0	0	24.1	24.1
1998	0	0	23.2	23.2
1999	0	0	22.4	22.4
2000	0	0	21.5	21.5
2001	0	0	20.6	20.6
2002	0	0	19.7	19.7
2003	0	0	18.8	18.8
2004	0	0	17.9	17.9
2005	0	0	17.9	17.9
2006	0	0	17.9	17.9
Other fibre fabric				
1996	0	0	11.1	11.1
1997	0	0	10.7	10.7
1998	0	0	10.3	10.3
1999	0	0	10.0	10.0
2000	0	0	9.6	9.6
2001	0	0	9.2	9.2
2002	0	0	8.8	8.8
2003	0	0	8.4	8.4
2004	0	0	8.0	8.0
2005	0	0	8.0	8.0
2006	0	0	8.0	8.0

Source: The Trade Partnership.

The barriers for apparel

Cotton, wool, wool blend and other fibre apparel quotas were all restrictive in 1996 and are likely to remain so over the term of the ATC. The estimated tariff equivalent of these quotas in 1996 across all imports is 26.4 per cent (cotton apparel), 12.8 per cent (wool apparel) and 40.1 per cent (other apparel). The tariff equivalent for all apparel imports into the US is estimated at 30.4 per cent.

2.4 **Projected barriers for apparel**

Year	*Tariff equivalent of quota on target imports*	*Tariff equivalent of quota across all imports*	*Trade weighted average tariff*	*Total barrier to imports*
	%	%	%	%
Cotton apparel				
1996	41.7	26.4	16.3	47.0
1997	40.9	25.9	16.1	46.2
1998	39.3	24.9	16.0	44.9
1999	37.7	23.9	15.8	43.5
2000	35.8	22.7	15.6	41.8
2001	33.8	21.4	15.5	40.2
2002	30.5	19.3	15.3	37.6
2003	27.0	17.1	15.2	34.9
2004	23.8	15.1	15.0	32.4
2005	0.0	0.0	15.0	15.0
2006	0.0	0.0	15.0	15.0
Wool and wool blend apparel				
1996	35.9	12.8	17.8	32.9
1997	37.0	13.3	17.5	33.1
1998	38.2	13.7	17.2	33.3
1999	39.4	14.1	16.9	33.4
2000	40.5	14.5	16.6	33.5
2001	41.5	14.9	16.3	33.6
2002	42.3	15.2	16.0	33.6
2003	43.1	15.5	15.7	33.6
2004	43.9	15.8	15.4	33.6
2005	0.0	0.0	15.4	15.4
2006	0.0	0.0	15.4	15.4
Other fibre apparel				
1996	59.7	40.1	21.2	69.8
1997	57.7	38.7	21.0	67.8
1998	54.9	36.8	20.8	65.3
1999	52.3	35.1	20.7	63.1
2000	49.3	33.1	20.5	60.4
2001	46.3	31.1	20.3	57.7
2002	42.1	28.3	20.1	54.1
2003	37.8	25.4	20.0	50.5
2004	33.8	22.7	19.8	47.0
2005	0.0	0.0	19.8	19.8
2006	0.0	0.0	19.8	19.8

These results are consistent with estimates made by others. For example, Hufbauer and Elliott (1994) estimated the tariff equivalent of US apparel quotas in 1990 to be 29 per cent. Cline (1987) calculated a tariff equivalent of US apparel quotas in 1986 of 30 per cent. The tariff equivalents reported above for 1996 reflect just one year of ATC liberalisation — no integration benefits because the US integrated no products subject to quota in stage 1 and just one year of accelerated growth rates. It is not surprising that the overall tariff equivalent for 1996 — 30.4 per cent — is so similar to tariff equivalents estimated by others for earlier years in which no quota liberalisation occurred. It is likely that demand growth was strong enough in 1996 to outweigh any liberalisation of apparel quotas that came from the accelerated growth rates of the quotas in that year.

Table 2.4 shows how the barriers to imports of apparel to the US are likely to change during the period of ATC liberalisation.

The ATC starting point import barriers are highest for other fibre apparel, followed by wool apparel then cotton apparel. Over the ATC liberalisation period those barriers are projected to fall from 47 to 15 per cent for cotton apparel, from 33 to 15 per cent for wool and wool blend apparel and from 70 to 20 per cent for other fibre apparel. For cotton and other fibre apparel, there is some progress on reducing barriers to 2004. But for wool apparel, the protective barrier increases slightly until 2004.

3 *Effects of US liberalisation options*

THE NEXT STEP IS TO ANALYSE the effects of removing barriers to US imports of textiles and clothing on US consumers and on Australian wool producers. To do this requires a framework that tracks the fibre content of apparel back to fibre producers and recognises that the United States is linked to other regions by trade. Box 3.1 summarises the features of the MFA model especially developed for this analysis.

Our approach

We have taken a two step modelling approach involving:

- using a framework developed by the Trade Partnership to forecast the tariff equivalents of current and future barriers to US textile and clothing imports over the ATC phase out period — as detailed in chapter 2 and appendixes A and B; and
- simulating with the MFA model the effects of removing these tariff equivalents — which is the focus of this chapter.

The strength of our two step modelling approach is that it permits the maximum detail to be incorporated into the forecasts of tariff equivalents for the US. These are important information in their own right as well as key inputs into our second step MFA model used to analyse effects. The potential weakness of a two step approach is that the two models may not be entirely consistent.

A theoretically more appealing approach would involve conducting the forecasting of future tariff equivalents and the effects of their removal within an internally consistent framework. This approach is, however, impractical. It would involve the development of an extremely detailed forecasting model together with a scenario describing the dynamics of demographic changes, income changes, changes in fashion and tastes, and changes in production technologies and input requirements for each level of activity throughout the textile and clothing chain in each of the three regions distinguished.

3.1 The MFA model

The MFA model is an Armington style input–output model of production, consumption and trade in fibres, textiles and apparel. The model covers:

- Australia, the US and the rest of the world
- apparel wool fibre and cotton fibre
- wool, cotton and other yarns
- wool, cotton and other fabrics
- wool, cotton and other apparel.

The 'other' activity includes both synthetic fibres and other natural fibres such as silk, jute and flax.

The model is based on an integrated set of input–output accounts, which shows how fibre producers are linked to final users of apparel through each stage of the value added chain.

Other features of the model are:

- its comparative–static nature —it analyses the effects of a policy change while holding constant all other factors;
- its partial equilibrium nature — focusing only on each fibre specific yarn, fabric and apparel chain; and
- its differentiated product nature — goods from different regions are recognised as imperfect substitutes for each other so that farm or factory prices can move independently between regions.

The structure of the model is detailed in full in appendix A. The model is non-linear and solved using GEMPACK software.

We took a number of steps to minimise inconsistency between the two models — by using the same base data for 1996 and using similar elasticity estimates for the US region of the MFA model as the Trade Partnership. However, some differences remain between the two models. In particular, in its forecasting framework the Trade Partnership distinguishes quota and non-quota suppliers into the US, whereas the MFA model aggregates these suppliers into the rest of the world region — which in turn supplies the US.

Simulations

We have undertaken four groups of simulations with the MFA model as follows.

- Simulation A: complete liberalisation now — the US removes in 1999 all quotas and tariffs on its imports of yarns, fabrics and apparel.

- Simulation B: US quota liberalisation now — all quotas on US imports of yarns, fabrics and apparel are removed in 1999, but tariffs on imports of these items remain.
- Simulation C: US quota liberalisation according to the agreed phase out schedule in each of the years 1999-2000, 2000-01, 2001-02, 2002-03 and 2003-04.
- Simulation D: US quota liberalisation after 2003-04 — the US removes all remaining quotas on imports of yarns, fabrics and apparel according to the ATC schedule.

Simulations C and D together encompass the ATC whereby the US phases out its quotas on textile and clothing imports to achieve their complete removal by January 2005.

The MFA model has a variable depicting the total barrier to imports — which includes both the duty component and the tariff equivalent of the quota restriction. This variable is represented in the model as the power of the total barrier. That is, if the tariff plus tariff equivalent of the quota is 30 per cent, then the starting value for this variable is 1+30/100=1.3. Each simulation involves a change in the value of this variable to include one or both components of the total barrier as appropriate.

Understanding the results

Results of model simulations are shown in table 3.2 (percentage change from base) and table 3.3 (change in values from base). They represent annual changes in model variables as a result of the changes in barriers to imports. The results concentrate on the effects on:

- US consumption of fibres, yarns, fabrics and apparel by type of fibre;
- US imports of fibres, yarns, fabrics and apparel by type of fibre;
- US production of fibres, yarns, fabrics and apparel by type of fibre;
- US expenditure on textiles and clothing; and
- Australia's wool and cotton production, wool exports to the US and Australian wool and cotton industry income.

3.2 Key results for some US textile and clothing liberalisation scenarios (Percentage change from base)

Variable	*Units*	*Base value 1996*	*Simulation A: complete liberalisation (quotas and tariffs) in 1999*[b]	*Simulation B: quota liberalisation in 1999*[a]	*Simulation C: Phase out of quotas year by year*[a]					*Simulation D: quota liberalisation in 2004*[a]
					1999–2000	*2000–01*	*2001–02*	*2002–03*	*2003–04*	
Use of domestic commodities by US apparel chain										
Fibres										
▪ Wool	kt	13.9	-6.4	-1.5	0.0	0.0	-0.1	-0.1	-0.1	-1.2
▪ Cotton	kt	2051.2	-2.2	-0.9	0.0	0.0	-0.1	-0.1	-0.1	-0.7
Yarns										
▪ Wool	kt fibre eq.	32.7	-18.6	-5.3	0.0	0.0	-0.1	-0.1	-0.1	-4.6
▪ Cotton	kt fibre eq.	960.1	-7.0	-3.3	-0.1	-0.1	-0.2	-0.2	-0.2	-2.3
▪ Other	kt fibre eq.	2218.5	-4.6	-1.8	-0.1	-0.1	-0.1	-0.1	-0.1	-1.3
Fabrics										
▪ Wool	kt fibre eq.	26.8	-21.1	-10.4	-0.1	-0.1	-0.2	-0.2	-0.2	-9.1
▪ Cotton	kt fibre eq.	391.3	-20.3	-11.3	-0.4	-0.4	-0.7	-0.8	-0.7	-7.8
▪ Other	kt fibre eq.	432.8	-20.9	-12.3	-0.4	-0.4	-0.7	-0.8	-0.7	-8.4
Final consumption of apparel										
▪ Wool	kt fibre eq.	31.2	-21.1	-11.9	-0.1	-0.1	-0.2	-0.3	-0.2	-10.5
▪ Cotton	kt fibre eq.	434.7	-24.3	-14.7	-0.5	-0.6	-0.9	-1.0	-0.9	-10.0
▪ Other	kt fibre eq.	427.5	-27.3	-16.5	-0.6	-0.6	-0.9	-1.0	-1.0	-11.3
Use of imports by US apparel chain										
Fibres										
▪ Wool	kt	34.2	-9.5	-2.4	0.0	0.0	-0.1	-0.1	-0.1	-2.1
▪ Cotton	kt	176.1	-4.2	-1.9	-0.1	-0.1	-0.1	-0.1	-0.1	-1.3
Yarns										
▪ Wool	kt fibre eq.	7.2	-4.4	-5.7	0.0	0.0	-0.1	-0.1	-0.1	-5.1
▪ Cotton	kt fibre eq.	53.7	8.3	-4.3	-0.2	-0.2	-0.3	-0.3	-0.3	-2.9
▪ Other	kt fibre eq.	204.9	12.1	-3.0	-0.1	-0.1	-0.2	-0.2	-0.2	-2.0
Fabrics										
▪ Wool	kt fibre eq.	10.9	16.1	-10.8	0.0	0.0	-0.2	-0.2	-0.2	-9.6
▪ Cotton	kt fibre eq.	241.5	-0.2	-9.5	-0.4	-0.4	-0.6	-0.7	-0.6	-6.5
▪ Other	kt fibre eq.	315.7	10.3	-6.4	-0.2	-0.2	-0.4	-0.4	-0.4	-4.3
Final consumption of apparel										
▪ Wool	kt fibre eq.	58.9	20.6	6.4	-0.9	-0.9	-1.0	-1.0	-1.0	11.8
▪ Cotton	kt fibre eq.	613.6	40.4	22.9	0.8	1.0	1.5	1.8	1.6	15.3
▪ Other	kt fibre eq.	612.7	80.6	46.0	1.5	1.5	2.2	2.3	2.4	29.6

(Continued on next page)

3.2 **Key results for some US textile and clothing liberalisation scenarios (Percentage change from base)** (continued)

Variable	*Units*	*Base value 1996*	*Simulation A: complete liberalisation (quotas and tariffs) in 1999*[b]	*Simulation B: quota liberalisation in 1999*[a]	*Simulation C: Phase out of quotas year by year*[a]					*Simulation D: quota liberalisation in 2004*[a]
					1999–2000	*2000–01*	*2001–02*	*2002–03*	*2003–04*	
Reduction in US expenditure	$US million	315120	-6.4	-3.8	-0.1	-0.1	-0.2	-0.2	-0.2	-2.7
US production										
Fibres										
▪ Wool	kt	13.6	-1.5	-0.3	0.0	0.0	0.0	0.0	0.0	-0.2
▪ Cotton	kt	4124.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Yarns										
▪ Wool	kt fibre eq.	51.4	-9.3	-2.3	0.0	0.0	-0.1	-0.1	-0.1	-2.0
▪ Cotton	kt fibre eq.	1969.6	-2.6	-1.1	0.0	0.0	-0.1	-0.1	-0.1	-0.8
▪ Other	kt fibre eq.	3298.3	-1.6	-0.6	0.0	0.0	0.0	0.0	0.0	-0.4
Fabrics										
▪ Wool	kt fibre eq.	37.4	-14.5	-4.8	0.0	0.0	-0.1	-0.1	-0.1	-4.2
▪ Cotton	kt fibre eq.	986.9	-5.7	-2.8	-0.1	-0.1	-0.2	-0.2	-0.2	-1.9
▪ Other	kt fibre eq.	2378.3	-3.2	-1.6	-0.1	-0.1	-0.1	-0.1	-0.1	-1.1
Apparel										
▪ Wool	kt fibre eq.	35.1	-14.8	-8.8	0.0	0.0	-0.2	-0.2	-0.2	-7.7
▪ Cotton	kt fibre eq.	496.0	-17.6	-10.7	-0.4	-0.4	-0.6	-0.7	-0.7	-7.3
▪ Other	kt fibre eq.	492.2	-19.3	-11.8	-0.4	-0.4	-0.7	-0.7	-0.7	-8.1
Australian production										
▪ Wool	kt	447.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.2
▪ Cotton	kt	429.0	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.2
Australian wool industry income										
Total	A$m	1749.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.6
Farm price	$/kg clean	4.9	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.2
Australian cotton industry income										
Total	A$m	674.8	2.2	1.1	0.0	0.0	0.1	0.1	0.1	0.7
Australia's wool exports to the US										
▪ As wool	kt	24.0	-9.3	-2.4	0.0	0.0	-0.1	-0.1	-0.1	-2.1
▪ In wool yarns, fabrics and apparel	kt	0.2	16.6	-5.3	0.0	0.0	0.0	-0.1	0.0	-6.2

[a] Remove tariff equivalent of the quota arrangements. [b] Remove tariff equivalent of the quota arrangements and duty payable.

Source: MFA model.

3.3 Key results for some US textile and clothing liberalisation scenarios (change in values from base)

Variable	*Units*	*Base value 1996*	*Simulation A: complete liberalisation (quotas and tariffs) in 1999*[b]	*Simulation B: quota liberalisation in 1999*[a]	*Simulation C: Phase out of quotas year by year*[a]					*Simulation D: quota liberalisation in 2004*[a]
					1999–2000	*2000–01*	*2001–02*	*2002–03*	*2003–04*	
Use of domestic commodities by US apparel chain										
Fibres										
▪ Wool	kt	13.9	-0.9	-0.2	0.0	0.0	0.0	0.0	0.0	-0.2
▪ Cotton	kt	2051.2	-45.4	-19.3	-0.7	-0.7	-1.1	-1.2	-1.2	-13.6
Yarns										
▪ Wool	kt fibre eq.	32.7	-6.1	-1.7	0.0	0.0	0.0	0.0	0.0	-1.5
▪ Cotton	kt fibre eq.	960.1	-67.6	-31.4	-1.1	-1.2	-1.9	-2.1	-2.0	-21.7
▪ Other	kt fibre eq.	2218.5	-102.1	-39.7	-1.4	-1.5	-2.3	-2.6	-2.5	-27.8
Fabrics										
▪ Wool	kt fibre eq.	26.8	-5.7	-2.8	0.0	0.0	-0.1	-0.1	-0.1	-2.4
▪ Cotton	kt fibre eq.	391.3	-79.6	-44.2	-1.6	-1.7	-2.7	-3.0	-2.9	-30.4
▪ Other	kt fibre eq.	432.8	-90.5	-53.0	-1.9	-1.9	-3.0	-3.3	-3.2	-36.5
Final consumption of apparel										
▪ Wool	kt fibre eq.	31.2	-6.6	-3.7	0.0	0.0	-0.1	-0.1	-0.1	-3.3
▪ Cotton	kt fibre eq.	434.7	-105.8	-63.9	-2.3	-2.5	-3.9	-4.3	-4.1	-43.6
▪ Other	kt fibre eq.	427.5	-116.6	-70.7	-2.5	-2.5	-4.0	-4.3	-4.2	-48.4
Use of imports by US apparel chain										
Fibres										
▪ Wool	kt	34.2	-3.3	-0.8	0.0	0.0	0.0	0.0	0.0	-0.7
▪ Cotton	kt	176.1	-7.4	-3.3	-0.1	-0.1	-0.2	-0.2	-0.2	-2.3
Yarns										
▪ Wool	kt fibre eq.	7.2	-0.3	-0.4	0.0	0.0	0.0	0.0	0.0	-0.4
▪ Cotton	kt fibre eq.	53.7	4.4	-2.3	-0.1	-0.1	-0.1	-0.2	-0.2	-1.6
▪ Other	kt fibre eq.	204.9	24.8	-6.1	-0.2	-0.2	-0.3	-0.4	-0.4	-4.1
Fabrics										
▪ Wool	kt fibre eq.	10.9	1.8	-1.2	0.0	0.0	0.0	0.0	0.0	-1.1
▪ Cotton	kt fibre eq.	241.5	-0.6	-23.0	-0.9	-0.9	-1.5	-1.7	-1.6	-15.8
▪ Other	kt fibre eq.	315.7	32.6	-20.2	-0.7	-0.7	-1.1	-1.2	-1.2	-13.6
Final consumption of apparel										
▪ Wool	kt fibre eq.	58.9	12.2	3.8	-0.5	-0.5	-0.6	-0.6	-0.6	7.0
▪ Cotton	kt fibre eq.	613.6	247.8	140.3	5.1	6.0	9.4	11.0	10.1	93.7
▪ Other	kt fibre eq.	612.7	493.7	281.9	9.2	8.9	13.7	14.2	14.5	181.6

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3.3 **Key results for some US textile and clothing liberalisation scenarios (change in values from base)** (continued)

Variable	*Units*	*Base value 1996*	*Simulation A: complete liberalisation (quotas and tariffs) in 1999*[b]	*Simulation B: quota liberalisation in 1999*[a]	*Simulation C: Phase out of quotas year by year*[a]					*Simulation D: quota liberalisation in 2004*[a]
					1999–2000	*2000–01*	*2001–02*	*2002–03*	*2003–04*	
Reduction in US expenditure	$US million	315120	-20164.8	-11959.1	-423.8	-447.9	-705.1	-775.7	-751.5	-8358.0
US production										
Fibres										
▪ Wool	kt	13.6	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
▪ Cotton	kt	4124.1	10.4	5.6	0.2	0.3	0.4	0.5	0.5	3.3
Yarns										
▪ Wool	kt fibre eq.	51.4	-4.8	-1.2	0.0	0.0	0.0	0.0	0.0	-1.0
▪ Cotton	kt fibre eq.	1969.6	-51.4	-22.6	-0.8	-0.9	-1.3	-1.5	-1.4	-15.6
▪ Other	kt fibre eq.	3298.3	-53.5	-19.0	-0.7	-0.8	-1.2	-1.3	-1.3	-13.6
Fabrics										
▪ Wool	kt fibre eq.	37.4	-5.4	-1.8	0.0	0.0	0.0	0.0	0.0	-1.6
▪ Cotton	kt fibre eq.	986.9	-56.3	-27.9	-1.0	-1.1	-1.7	-1.8	-1.8	-19.2
▪ Other	kt fibre eq.	2378.3	-75.6	-37.8	-1.3	-1.4	-2.2	-2.4	-2.3	-26.2
Apparel										
▪ Wool	kt fibre eq.	35.1	-5.2	-3.1	0.0	0.0	-0.1	-0.1	-0.1	-2.7
▪ Cotton	kt fibre eq.	496.0	-87.1	-53.2	-1.9	-2.1	-3.2	-3.6	-3.4	-36.4
▪ Other	kt fibre eq.	492.2	-95.1	-58.3	-2.0	-2.1	-3.3	-3.6	-3.5	-40.0
Australian production										
▪ Wool	kt	447.4	1.4	0.7	-0.1	-0.1	-0.1	-0.1	-0.1	0.9
▪ Cotton	kt	429.0	3.5	1.7	0.1	0.1	0.1	0.2	0.1	1.1
Australian wool industry income										
Total	A$m	1749.1	17.3	8.2	-0.6	-0.7	-0.7	-0.7	-0.8	11.0
Farm price	$/kg clean	4.90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Australian cotton industry income										
Total	A$m	674.8	15.0	7.1	0.2	0.3	0.5	0.6	0.5	4.6
Australia's wool exports to the US										
▪ As wool	kt	24.0	-2.2	-0.6	0.0	0.0	0.0	0.0	0.0	-0.5
▪ In wool yarns, fabrics and apparel	kt	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[a] Remove tariff equivalent of the quota arrangements. [b] Remove tariff equivalent of the quota arrangements and duty payable.

Source: MFA model.

Key factors shaping the results in tables 3.2 and 3.3 are:

- the changes in import prices into the US of yarns, fabrics and apparel under quota phase out and removal, and removal of quotas and tariffs — in particular, the import price relativities between each fibre category of yarns, fabrics and apparel (see table 3.4);
- the importance of US consumption of each fibre category in world fibre markets (see table 3.5); and

3.4 Changes in import prices under various US liberalisation scenarios

	Trade weighted average tariff	*Tariff equivalent target imports*	*Tariff equivalent total imports*	*Total tariff equivalent*	*Change in power of tariff[a] (import price)*		*Year on year changes*
					ATC liberalisation (quotas only)	*Complete liberalisation (tariffs and quotas)*	
	%	%	%	%	%	%	%
Cotton apparel							
1996	16.3	41.7	26.4	47.0	-20.9	-32.0	0
1997	16.1	40.9	25.9	46.2	-20.6	-31.6	0
1998	16.0	39.3	24.9	44.9	-19.9	-31.0	0
1999	15.8	37.7	23.9	43.5	-19.3	-30.3	0
2000	15.6	35.8	22.7	41.8	-18.5	-29.5	-0.8
2001	15.5	33.8	21.4	40.2	-17.6	-28.7	-0.9
2002	15.3	30.5	19.3	37.6	-16.2	-27.3	-1.4
2003	15.2	27.0	17.1	34.9	-14.6	-25.9	-1.6
2004	15.0	23.8	15.1	32.4	-13.1	-24.5	-1.5
2005	15.0	0.0	0.0	15.0	0.0	-13.0	-13.1
2006	15.0	0.0	0.0	15.0	0.0	-13.0	
Wool and wool blend apparel							
1996	17.8	35.9	12.8	32.9	-11.3	-24.7	0
1997	17.5	37.0	13.3	33.1	-11.7	-24.9	0
1998	17.2	38.2	13.7	33.3	-12.0	-25.0	0
1999	16.9	39.4	14.1	33.4	-12.4	-25.0	0
2000	16.6	40.5	14.5	33.5	-12.7	-25.1	0.3
2001	16.3	41.5	14.9	33.6	-13.0	-25.2	0.3
2002	16.0	42.3	15.2	33.6	-13.2	-25.2	0.2
2003	15.7	43.1	15.5	33.6	-13.4	-25.2	0.2
2004	15.4	43.9	15.8	33.6	-13.6	-25.2	0.2
2005	15.4	0.0	0.0	15.4	0.0	-13.3	-13.6
2006	15.4	0.0	0.0	15.4	0.0	-13.3	
Other fibre apparel							
1996	21.2	59.7	40.1	69.8	-28.6	-41.1	0
1997	21.0	57.7	38.7	67.8	-27.9	-40.4	0
1998	20.8	54.9	36.8	65.3	-26.9	-39.5	0
1999	20.7	52.3	35.1	63.1	-26.0	-38.7	0
2000	20.5	49.3	33.1	60.4	-24.9	-37.7	-1.1
2001	20.3	46.3	31.1	57.7	-23.7	-36.6	-1.1
2002	20.1	42.1	28.3	54.1	-22.1	-35.1	-1.7
2003	20.0	37.8	25.4	50.5	-20.3	-33.5	-1.8
2004	19.8	33.8	22.7	47.0	-18.5	-32.0	-1.8
2005	19.8	0.0	0.0	19.8	0.0	-16.5	-18.5
2006	19.8	0.0	0.0	19.8	0.0	-16.5	

[a] Power of the tariff is defined as one plus the tariff rate *t*, that is, 1+(*t*/100).

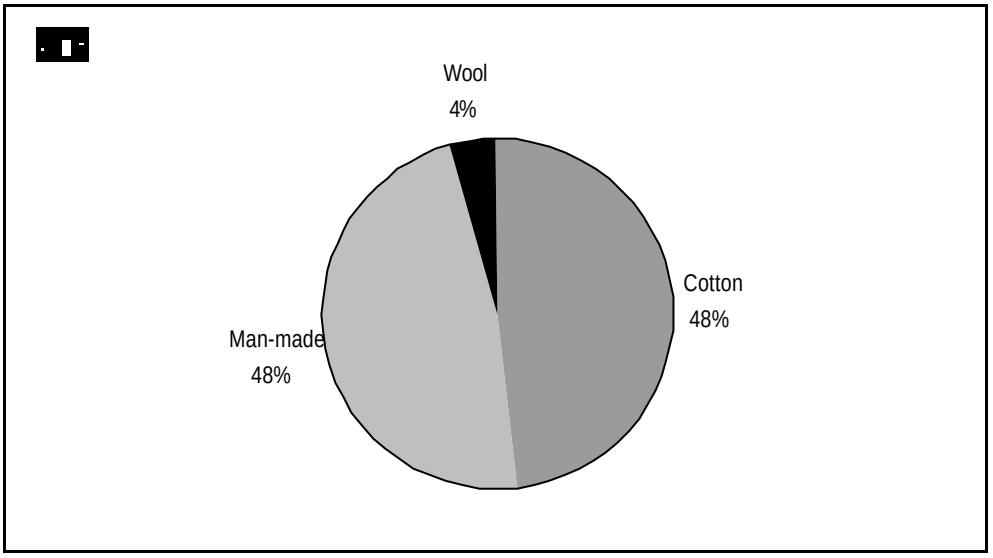
- how US total fabric and apparel consumption is shared between consumption of wool fabrics and apparel, cotton fabrics and apparel, and other (mainly man-made) fabrics and apparel (see chart 3.6).

3.5 **Importance of the US market in the world fibre market**

Fibre type	*World consumption*	*US consumption*	*US share*
	kt fibre equivalent	kt fibre equivalent	%
Wool and wool blend	1 009.0	121.7	12.1
Cotton	17 280.1	2 740.6	15.9
Other	21 308.0	3 834.4	18.0

Source: CIE estimates.

3.6 **Fibre composition of US apparel consumption** Fibre equivalent weight basis



Source: CIE estimates.

Consider, for example, simulation A (complete liberalisation in 1999). Table 3.4 shows that this will result in reductions in US import prices of apparel of 30.3 per cent for cotton apparel, 25 per cent for wool and wool blend apparel and 38.7 per cent for other fibre apparel. Thus, while all imported apparel into the US will be substantially cheaper, cotton and man-made fibre apparel will be cheaper still relative to wool apparel. This is because, although tariffs on woollen apparel in 1999 are slightly higher than on cotton and other fibre apparel, the tariff equivalent of the quota on wool based apparel imports is lower.

Table 3.5 shows that US final consumption of wool fibre in fabrics and apparel accounts for 12 per cent of world consumption. In the case of cotton and man-made fibres, US consumption by fibre is significantly higher (16 per cent for cotton and 18 per cent for other). Changes in the demand for

apparel in the US are therefore likely to have a greater influence on world apparel demand in the case of cotton than in the case of wool.

Chart 3.6 shows that, on a fibre equivalent basis, US apparel consumption is dominated by cotton (48 per cent) and man-made fibres (47.7 per cent). Wool accounts for only 4.3 per cent of US apparel consumption. Hence, increases in US apparel consumption through cheaper imports will lead to much bigger increases in the demand for cotton and man-made fibres by the US than is the case for wool.

Simulation A: complete liberalisation now

The results show how much current US barriers to imports of yarns, fabrics and apparel penalise US textile and clothing consumers, and raw fibre producers. They provide a measure of the maximum gains achievable for US consumers and for Australian wool producers from US liberalisation.

Key points to note are as follows.

- US consumers increase their apparel consumption significantly but switch strongly from domestically produced to imported apparel — imports of wool based apparel increase by 21 per cent, imports of cotton apparel increase by 40 per cent and imports of other apparel increase by 81 per cent.
- Expenditure by US consumers on textiles and clothing falls by US$20 billion. This provides a guide to how much better off US consumers would be if current restrictions on US imports of textiles and clothing were to be removed. Import liberalisation would allow US consumers to consume more of the now much cheaper textiles and clothing and still have US$20 billion left over to spend on other goods and services.
- US production of apparel falls substantially — by 15 per cent (wool), 18 per cent (cotton) and 19 per cent (other).
- As a result of the switch from domestic apparel production to apparel imports US imports of yarns and fabrics decrease substantially. Imports of woollen yarns and woollen fabrics are projected to fall by 19 and 22 per cent respectively.
- Australia's raw apparel wool exports to the US are projected to fall by 9 per cent because of the contraction in US production of wool–based yarns, fabrics and apparel. The US obtains its increased requirements for Australian wool through its imports of wool fabrics and apparel. Australia's wool production is projected to increase by about 0.3 per cent (an additional 1.4 kilotonnes) and Australian wool industry

income improves by A$17 million per year. Both in absolute and percentage terms, the increase in Australia's cotton production is nearly three times that for wool.

Simulation B: US quota liberalisation now

Relative to simulation A, the reductions in US import prices are considerably lower. Consider, for example, imports of apparel. The import price of cotton apparel is projected to fall by 19 per cent (compared with 30 per cent in A). For wool apparel the import price is projected to fall by 12 per cent (compared with 25 per cent in A) while the price fall for other fibre apparel is 26 per cent (compared with 39 per cent in A). The increase in US consumption of apparel and the degree of switching from domestically produced to imported apparel are also smaller, though still substantial.

The savings for US consumers are less — US expenditure on textiles and clothing falls by about US$12 billion, which is about 60 per cent of the expenditure reduction in simulation A. The gain in Australian wool industry income is about half of the gain from complete import liberalisation now.

Simulations C and D: Step by step quota liberalisation with all quotas eliminated by the end of 2004

The phase out between 1999-2000 and 2003-04 slightly worsens the position of wool apparel relative to cotton and other fibre apparel in the US market because of a faster rate of decline in the tariff equivalent of quotas on cotton and other fibre apparel relative to wool apparel. Imports of cotton and other apparel increase slightly each year between 1999-2000 and 2003-04, while imports of wool apparel decline slightly. As a consequence, there is a very small decline in Australian wool industry income over this period.

US consumers make steady gains over this period through being able to satisfy their clothing and textile demands with less expenditure. US production of apparel declines by small amounts each year.

But the phase out from 1999-2000 to 2003-04 comes only a fraction of the way to complete liberalisation of quotas at the end of 2005. Most of the action is in the final year (simulation D). About 70 per cent of the total reduction in US expenditure on textiles and clothing from quota liberalisation occurs through liberalisation planned for 2004-05.

All of the gains to the Australian wool industry occur from quota liberalisation during 2004-05. This result highlights the importance to the Australian wool industry of achieving complete removal of US import quotas by the end of the ATC.

4 *Sensitivity analysis*

THE MFA MODEL INCORPORATES considerable detail about economic behaviour in fibre specific textile and clothing chains and the trade flows between each region at each level in the chain. This calls for a large number of behavioural parameters and elasticities. A complete list of parameters and elasticities required by the model is documented in appendix C along with sources. Values for these parameters and elasticities are not known with certainty. In this chapter we look at the sensitivity of results to changes in values assigned to a selection of parameters.

Parameters tested

We use as our base reference point simulation A, complete liberalisation of US import barriers (removal of tariffs and the tariff equivalent of the quantitative restriction). Changes in parameters and elasticities investigated include:

- setting the domestic-import substitution parameter for all commodities in the US to zero (base value of parameter was 2.5);
- setting the domestic-import substitution parameter for all commodities in the US to 5.0 (base value of parameter was 2.5);
- doubling substitution possibilities between apparel of different fibre types in the US (base values were own price elasticities of around 1.0);
- doubling supply elasticities in the US textiles and apparel industries (base elasticities of 1.0);
- doubling supply elasticities of wool and cotton in Australia (base elasticities of 0.8 and 1.0).

Results

Selected results are shown in table 4.7. They show that the gains to US consumers (measured in terms of reduction in expenditure on textiles and

4.1 Selected results of the sensitivity analysis (percentage changes from base)

	Units	*Reference simulation A (standard parameter set) Complete US liberalisation from 1999*	*US domestic import parameter equals 0.0*	*US domestic-import parameter equals 5.0*	*Double cross-price elasticities in US apparel consumption*	*Double US textiles and apparel supply elasticities*	*Double Australian wool and cotton supply elasticities*
United States							
Final consumption of domestic apparel							
▪ Wool	kt fibre eq.	-21.1	7.9	-32.2	-22.3	-24.6	-21.0
▪ Cotton	kt fibre eq.	-24.3	4.5	-39.8	-26.5	-26.9	-24.2
▪ Other	kt fibre eq.	-27.3	8.4	-49.5	-24.8	-29.9	-27.1
Final consumption of imported apparel							
▪ Wool	kt fibre eq.	20.6	7.9	23.8	17.4	22.5	20.6
▪ Cotton	kt fibre eq.	40.4	4.5	57.1	34.7	42.6	40.1
▪ Other	kt fibre eq.	80.6	8.4	115.5	86.7	82.4	79.1
Reduction in US expenditure	$US billion	-6.4	-4.0	-7.3	-6.4	-6.0	-6.4
Australia							
Wool production	kt	0.3	0.6	0.3	0.3	0.2	0.4
Wool industry income	$A million	1.0	1.9	1.1	0.8	0.7	0.8

Source: MFA model.

clothing), the adjustment burden on US apparel producers (measured in terms of the degree of switching from domestically produced to imported apparel) and the gains to Australian wool producers are most sensitive to changes in the domestic-import substitution parameter for yarns, fabric and apparel.

Under the assumption of no substitution between domestic and imported yarns, fabrics and apparel in the US, the US textile and clothing industry benefits from liberalisation as consumers increase their total apparel consumption in response to cheaper imports. Because consumers cannot switch between sources, consumption of domestically produced apparel increases by the same percentage as consumption of imported apparel. Whereas in the reference simulation US consumption of domestically produced apparel declines by 15 to 19 per cent as consumers switch to cheaper imports, with no substitution possible US consumption of domestically produced apparel expands by between 5 and 8 per cent. Increased US production of wool apparel also leads to bigger demands by the US for Australian raw wool. However, a zero value for domestic-import substitution is extreme. It implies that quota restrictions would not be binding.

Increasing the import-domestic substitution elasticity from 2.5 to 5.0 results in a greater reduction in US consumption of US produced apparel and a bigger increase in US consumption of imported apparel. The gains to US consumers in terms of reduced expenditure on textiles and clothing are a little higher than in the reference simulation. The gains to Australian wool growers remain unchanged.

Doubling cross-price elasticities in US apparel consumption has a small effect on US production, imports, expenditure, and Australian wool production. Doubling US textile and apparel supply elasticities also has only a small effect on these outcomes, as does doubling Australian wool and cotton supply elasticities.

Appendixes

A *Estimated tariff equivalents of textile and apparel quotas, 1996–2006*

Laura M Baughman
The Trade Partnership

THE CENTRE FOR INTERNATIONAL ECONOMICS in Canberra asked The Trade Partnership to estimate the tariff equivalents of US yarn, fabric and apparel quotas from 1996-2006, disaggregated as follows: cotton yarn, fabric and apparel; wool yarn, fabric and apparel; wool blend yarn, fabric and apparel; and other yarn, fabric and apparel. These estimates provide a measure of the degree to which quota protection can be expected to continue to restrict imports over the term of the ATC (that is, through 2004), followed by tariff protection in 2005 and 2006. Said differently, they measure how much the US plan for implementing the ATC in fact liberalises quotas relative to growing market demand.

The results, shown in table A.1, reveal that — Agreement on Textiles and Clothing liberalisation notwithstanding — US apparel producers are likely to continue to benefit from significant apparel quota protection through the end of 2004, and relatively high tariffs thereafter. In the cases of wool and wool blend apparel, in particular, this protection could actually increase because US quota growth does not keep pace with growth in market demand over the term of the ATC[1]. Fabric and yarn protection is expected to be confined to the effects of prevailing tariffs, which decline only marginally.

[1] The ATC permits importing countries to accelerate textile and apparel liberalisation at any time during the phase-out. Thus, the United States could help its producers avoid these 'cliffs' of protection in 2004 by preparing them better in advance for a quota-free trading environment. One obvious way to do this would be to integrate more quota-covered trade into the GATT during Stages 2 and 3 than the United States has already provided for.

A.1 **Summary results: tariff equivalents of US textiles and apparel quotas, 1996–2006** Per cent

	Trade weighted average tariff	*Tariff equivalent – target imports*[a]	*Tariff equivalent – total imports*
Cotton yarn			
1996	7.6	0	0
1997	7.5	0	0
1998	7.4	0	0
1999	7.3	0	0
2000	7.2	0	0
2001	7.1	0	0
2002	7.0	0	0
2003	6.9	0	0
2004	6.8	0	0
2005	6.8	0	0
2006	6.8	0	0
Wool and wool blend yarn			
1996	8.2	0	0
1997	7.9	0	0
1998	7.6	0	0
1999	7.3	0	0
2000	7.0	0	0
2001	6.7	0	0
2002	6.4	0	0
2003	6.1	0	0
2004	5.8	0	0
2005	5.8	0	0
2006	5.8	0	0
Other yarn			
1996	8.7	0	0
1997	8.6	0	0
1998	8.4	0	0
1999	8.2	0	0
2000	8.0	0	0
2001	7.8	0	0
2002	7.7	0	0
2003	7.5	0	0
2004	7.3	0	0
2005	7.3	0	0
2006	7.3	0	0
Cotton fabric			
1996	8.9	0	0
1997	8.8	0	0
1998	8.7	0	0
1999	8.6	0	0
2000	8.5	0	0
2001	8.4	0	0
2002	8.3	0	0
2003	8.2	0	0
2004	8.1	0	0
2005	8.1	0	0
2006	8.1	0	0

(Continued on next page)

A.1 **Summary results: tariff equivalents of US textiles and apparel quotas, 1996–2006** Per cent (continued)

	Trade weighted average tariff	*Tariff equivalent – target imports*[a]	*Tariff equivalent – total imports*
Wool and wool blend fabric			
1996	25.0	0	0
1997	24.1	0	0
1998	23.2	0	0
1999	22.4	0	0
2000	21.5	0	0
2001	20.6	0	0
2002	19.7	0	0
2003	18.8	0	0
2004	17.9	0	0
2005	17.9	0	0
2006	17.9	0	0
Other fibre fabric			
1996	11.1	0	0
1997	10.7	0	0
1998	10.3	0	0
1999	10.0	0	0
2000	9.6	0	0
2001	9.2	0	0
2002	8.8	0	0
2003	8.4	0	0
2004	8.0	0	0
2005	8.0	0	0
2006	8.0	0	0
Cotton apparel			
1996	16.3	41.7	26.4
1997	16.1	40.9	25.9
1998	16.0	39.3	24.9
1999	15.8	37.7	23.9
2000	15.6	35.8	22.7
2001	15.5	33.8	21.4
2002	15.3	30.5	19.3
2003	15.2	27.0	17.1
2004	15.0	23.8	15.1
2005	15.0	0.0	0.0
2006	15.0	0.0	0.0
Wool and wool blend apparel			
1996	17.8	35.9	12.8
1997	17.5	37.1	13.3
1998	17.2	38.3	13.7
1999	16.9	39.5	14.1
2000	16.6	40.6	14.5
2001	16.3	41.7	14.9
2002	16.0	42.5	15.2
2003	15.7	43.3	15.5
2004	15.4	44.1	15.8
2005	15.4	0.0	0.0
2006	15.4	0.0	0.0

(Continued on next page)

A.1 **Summary results: tariff equivalents of US textiles and apparel quotas, 1996–2006** Per cent (continued)

	Trade weighted average tariff	*Tariff equivalent – target imports*[a]	*Tariff equivalent – total imports*
Other fibre apparel			
1996	21.2	59.7	40.1
1997	21.0	57.7	38.7
1998	20.8	54.9	36.8
1999	20.7	52.3	35.1
2000	20.5	49.3	33.1
2001	20.3	46.3	31.1
2002	20.1	42.1	28.3
2003	20.0	37.8	25.4
2004	19.8	33.8	22.7
2005	19.8	0.0	0.0
2006	19.8	0.0	0.0

[a] Target imports are imports subject to quotas.

Source: The Trade Partnership.

The balance of this paper describes the methodology and data sources used to estimate the tariff equivalents in table A.1.

Methodology

The first step in estimating the tariff equivalents of US textile and apparel quotas on import prices is to ascertain whether the quotas are restrictive[2]. If quotas are not restrictive, it is the tariff, not the quota, that drives up import prices. For a 1996 base year[3], The Trade Partnership collected **quota** and **target import** data for each of 147 three–digit textile and apparel commodity classifications[4]. (The calculation of variables in boldface type is described in detail at the end of this section.) Imports from countries subject to quota (target imports) for each individual category were compared with quota for that category. For most individual apparel categories, quotas were restrictive and, consequently, quotas were restrictive at the aggregated level of cotton apparel, wool apparel[5] and other apparel.

[2] The trade generally considers a quota filled (or restrictive) when imports reach 85 per cent or more of available quota.

[3] 1996 was selected as the base year because at the time the project was begun it was the most recent year for which US production data were available.

[4] The United States assesses quotas on the basis of a three digit category structure. It assigns each textile and apparel harmonised tariff system number to one of 147 categories, segregated for the most part by fibre (some 200 series categories cover both cotton and man-made fibre products).

[5] The US quotas applicable to wool cover wool blends as well as pure wool. Therefore, it was not possible to disaggregate the quota data, and, consequently,

Yarns and fabrics told a different story. In some instances, quotas were restrictive for individual three-digit categories of yarns or fabrics. For example, the polyester filament and other synthetic filament fibre fabric quota (category 619/620) was 100 per cent filled in 1996, and cotton and man-made fibre pile and tufted fabric quota (category 224) was 92 per cent filled. In contrast, woven man-made fibre (MMF) and wool blend fabric quota (category 624) was only 4 per cent filled, cotton and MMF special weave quota (category 220) only 2 per cent filled. But, because underfilled quota generally vastly outweighed filled quota, the overall weighted average quota premia for the broader classifications (cotton yarn, wool yarn, other yarn, cotton fabric, wool fabric and other fabric) are therefore probably very small and assumed to be zero. Moreover, one would not expect the quotas to become restrictive over the term of the ATC because, as the charts and data in appendix B show, in all cases quota is expected to grow at a faster pace than demand for these products. For non-restrictive quotas to become restrictive, imports would have to surge by several multiples of their current levels. Therefore, the tariff equivalent facing US imports of yarns and fabrics over the term of the ATC is the relevant projected **tariff rate**[6]. Table A.1 reports the results.

To estimate the tariff equivalents of US cotton, wool, wool blend and other apparel quotas (all of which, again, were restrictive in 1996[7]) over the term of the ATC, The Trade Partnership used a partial equilibrium model developed by the US International Trade Commission (ITC). Two country groups were included in the model: target imports (all countries subject to quota) and non-target imports (all countries not subject to quota). The model is a quota-variant of the Commercial Policy Analysis System (COMPAS) model developed by Joseph Francois and Keith Hall at the ITC to measure the effects on various US industries and consumers of tariffs. Based on Armington (1969), it posits that imported and domestically-produced goods are imperfect substitutes for each other. It is a log-linear model incorporating constant own- and cross-price elasticities of demand[8].

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the tariff equivalent estimates, for wool blends and for pure wool. All references hereafter to wool apparel apply equally to wool blend apparel.

6 The analysis thus assumes that most individual yarn and fabric quotas remain non-binding over the course of the ATC.

7 Similarly, the analysis assumes that the apparel quotas remain binding over the term of the ATC.

8 For the specific equations used, see chapter 5 of Francois, JF and Hall, KH 1995, 'Partial Equilibrium Modeling,' in Francois, JF and Reinert, KA (eds), *Applied Methods for Trade Policy Modeling,* Cambridge University Press.

The model requires the following data, all exclusive of the distorting effects of existing quotas:

- Annual volume and value of US production, 1996–2004.
- Annual volume and value (cif plus duties) of target imports, 1996–2004.
- Annual volume and value (cif plus duties) of **non-target imports,** 1996–2004.
- **Elasticities** of substitution between target imports and domestic production, non-target imports and domestic production, and target and non-target imports, an elasticity of aggregate demand, and elasticities of domestic and import supply.

Thus, before the model could be used, tariff equivalents needed to be estimated for 1996 so that 1996 production and import data (and, consequently, all data projected from it) could be 'purged' of the influence of the quotas).

Calculating base year tariff equivalents

The Trade Partnership used an indirect method for calculating apparel tariff equivalents for 1996, first developed by Morkre (1984) and Hamilton (1986) and modified later by Yang (1994). Basically, the price of imports (tariff and tariff equivalent inclusive) in a given country is equal to the foreign cost of production multiplied by the tariff rate and the tariff equivalent. Morkre used Hong Kong quota prices as a starting point for estimating tariff equivalents. Hamilton postulated that with perfect competition in the import market, if tariff equivalents for one country are known (for example, Hong Kong), those for other can be inferred given ratios of supply prices, tariffs and import prices:

$$(1) \qquad \frac{C_a}{C_b} * \frac{1+TE_a}{1+TE_b} * \frac{1+t_a}{1+t_b} = \frac{P_a}{P_b}$$

where C_a and C_b are supply prices of restricted products in exporting countries 'a' and 'b,' respectively, TE_a and TE_b are tariff equivalents of quotas for the two exporting countries, respectively, in the same export market, t_a and t_b are tariffs facing the two countries in the same export market, and P_a and P_b are prices (tariff and tariff equivalent inclusive) of imports from the two exporting countries at the border of the same importing country.

Since the tariffs facing various exporting countries to the same import market are the same, t_a and t_b can be dropped from the above equation. He

then suggests that the ratio of apparel supply prices be calculated from import prices in the Japanese market. Yang argues that, since Japan does not impose quotas on apparel imports, relative unit values of apparel imports into Japan provide reasonable estimates of relative supply prices at the margin across exporting countries.

> Consequently, any differences between the restricted (United States) and unrestricted (Japanese) markets with respect to *relative* import prices (tariff equivalent inclusive) among exporters result from the different tariff equivalents of (Multifibre Arrangement) quotas they face, assuming that the same tariffs are applied to all exporters. (Yang 1994, p. 898)

The Trade Partnership used the Morkre, Hamilton and Yang approaches to calculate the US tariff equivalents of apparel quotas by fibre for 1996. Because Hong Kong quota premia for the US apparel market (TEa in equation (1)) are available, all of the variables in equation (1) are known except TEb, the tariff equivalent in the US market for all countries subject to quota other than Hong Kong. **Foreign cost** (Ca / Cb) was calculated as the ratio of the unit value of Japan's 1996 imports from Hong Kong to the unit value of imports from a sample of other countries. The US import price (Pa / Pb) was calculated as the ratio of the unit value of US imports from Hong Kong in 1996 to the unit value of total imports from a sample of countries subject to quota. The **tariff equivalent facing Hong Kong** (TEa) was calculated from disaggregated quota price data for 1996.

The equation was then solved for TE_b, the tariff equivalent for all sample exporters to the United States subject to quota. A weighted average was computed between TE_a and TE_b to get the total tariff equivalent facing all imports subject to quota in 1996. This process was conducted separately for cotton apparel, wool apparel, and other apparel. The results for 1996 are shown in table A.2.

A.2 **Estimated tariff equivalents for apparel, 1996** Per cent

	Target imports	*Total imports*[a]
Cotton apparel	41.7	26.4
Wool apparel	35.9	12.8
Other apparel	59.7	40.1
Total apparel	48.7	30.4

[a] Target imports tariff equivalent weighted by customs value.

Source: The Trade Partnership.

The analysis necessitated a few simplifying assumptions, none of which is believed to bias the results to any significant degree. As Yang notes, the approach assumes that tastes and other non-price factors play an insignificant role in the determination of relative prices of imports from various exporting countries. And the use of the particular Japanese data available,

which provides import values inflated by insurance and freight charges, could distort the relative cost comparisons (C_a / C_b). However, the countries chosen for C_b were all approximately as far from Japan as Hong Kong (C_a) so differences in insurance and freight charges should not unduly distort the results, if at all. In addition, the use of Japan as the surrogate quota free economy assumes that no other non-tariff barriers limit imports in any way that would distort relative cost comparisons.

The results are consistent with estimates made by others. For example, Hufbauer and Elliott (1994) estimated the tariff equivalent of US apparel quotas in 1990 to be 29.0 per cent. Cline (1987) calculated a tariff equivalent of US apparel quotas in 1986 of 30.0 per cent. The tariff equivalents reported in table A.2 reflect only one year of ATC liberalisation -- no integration benefits because the United States integrated no products subject to quota in Stage 1, and only one year of accelerated growth rates. It is not surprising that the overall tariff equivalent for 1996 -- 30.4 per cent -- is so similar to tariff equivalents estimated by others for earlier years in which no quota liberalisation occurred. It is likely that demand growth was strong enough in 1996 to outweigh any liberalisation of apparel quotas that came from the accelerated growth rates of the quotas in that year.

Revising 1996 base year data — projecting future data

Using these 1996 tariff equivalents, the base 1996 values for production and imports were 'purged' of the effects of 1996 quotas as follows. An Armington model similar to the COMPAS model was benchmarked using data for 1996 and the elasticity values specified earlier. This model was then used to solve for the counterfactual 1996 values for imports and domestic production that would have been observed absent the quotas.

The resulting values were projected through 2004 by first projecting **market demand** through 2004 and then deriving production and imports from projected market demand on the basis of those variables' shares of 1996 market demand. The Trade Partnership relied on earlier research conducted for the International Textiles and Clothing Bureau by Baughman (1997), in which market demand was projected for individual textile and apparel products relying on expected changes in US demographics and other factors that would influence demand. The results are reported in appendix B. Once the market demand projections were calculated, target and non-target imports and US production were projected using their 1996 market shares. Using 1996 market shares holds relative technology, productivity, and quality constant. Of course, over time producers in, say, China would be expected to upgrade product and shift more heavily into the production of higher-

grade products. However, attempting to incorporate some estimate of these relative shifts between suppliers would have required assumptions too arbitrary to justify.

Calculating projected tariff equivalents

The resulting projected data, plus projected **quota** volume over the term of the ATC, was then inputted year by year into the ITC model to obtain the estimated tariff equivalents through 2004. Quotas are scheduled to be eliminated on 1 January 2005, so from 2005 on the relevant restraint is the tariff. The results are shown in table A.1 above.

Detailed data descriptions (listed alphabetically)

Elasticities

The Trade Partnership obtained all required apparel elasticities from Cline (1987). Cline (and others[9]) suggests a domestic supply elasticity of 1 and an infinite import elasticity of supply; elasticities of substitution between target imports and domestic production, between non-target imports and domestic production, and between target and non-target imports of -2.5; and an aggregate demand elasticity of -0.5.[10]

Foreign cost

The calculations of relative supply prices -- Hong Kong to other target countries -- used a Laspeyres-type index. To calculate the relative cost of imported cotton, wool and other apparel in the Japanese market in 1996, nine digit HTS import data from the Japan Tariff Association (Japan Exports and Imports: Commodity by Country, 1996) were allocated to the relevant three digit US apparel category classification using a 1996 correlation published by the US Department of Commerce, Office of Textiles and Apparel.[11] The differing category volume data (some in

9 Hufbauer, Berliner and Elliott (1986).

10 Cline, WR 1987, *The Future of World Trade in Textiles and Apparel,* Institute for International Economics, Washington DC. See pages 307 and 308 for his analysis of why these elasticities are appropriate.

11 The Japanese data are only provided at a comparable level to US data at the six digit HTS level, and the US concordance is at the ten digit level, so for some categories the matching is not as precise as the US concordance would require. There would be some overlap between categories, resulting in distorted unit

dozens, some in kilograms) were converted to square meter equivalents using US conversion factors designed for this purpose so they could be aggregated to the broader commodity groupings. Value data in yen were converted into US dollars using a 1996 exchange rate published by the International Monetary Fund. Data in 200 series categories (cotton and/or man-made fibres) were divided equally between cotton and other apparel.

Unit values were calculated for selected HTS items within a given category classification for Hong Kong and each of five sample countries: Korea, China, Taiwan, the Philippines and Indonesia.[12] The goal was to calculate relative unit values for products and countries that were as representative of the broader category as possible. For each category, a representative sample of six digit HS items was selected (attempting to choose HTS items that most closely represented, in both volume and unit value terms) the overall US category. For example, US category 237, 'play suits and sunsets', is largely composed of children's wear (although there are significant amounts of children's wear included in other categories as well). But Japanese import data do not break out children's wear in any way. Therefore, to calculate representative unit values for imports into Japan in category 237, The Trade Partnership chose those HTS items within that category that yielded unit values most consistent with children's clothing.

Unit values were calculated for each HTS selected for the five countries as a group. The total unit values for sample group *and* for Hong Kong were calculated by weighting the individual unit values for each category by the quantity of imports from Hong Kong for that category into the United States (the Laspeyres weights). In all cases unit values were converted into US dollars per square meter equivalent.

Import price (US)

US customs value and quantity data for imports for consumption were used to calculate the unit value of imports from Hong Kong and 'other' target countries into the US market for each of the three digit category groupings within the broader apparel group. The overall unit value for Hong Kong is the sum of the values of these categories divided by the sum

values relative to unit values calculated for US imports (some will be too high; others too low).

12 It was assumed that cif charges included in the Japanese import values did not distort unduly the unit values because the five countries chosen are relatively close to Japan relative to Hong Kong (thus reducing the cif bias). (The exercise was also done for just Korea, China and Taiwan, on the theory that cif charges mattered more for the Philippines and Indonesia, to see if there was indeed a bias, and there was no difference in the results.)

of the volumes (again, converted into square meter equivalents). The overall unit value of the 'other' target countries is the individual unit values weighted by the quantity of imports from Hong Kong into the US market. It should be noted that the definition of 'other' target countries here is broader than above: it includes **all** countries subject to quota (a specific limit or SL) in 1996 for a given category, not just the five sample countries selected above for foreign costs calculations.

Market demand

1996 data

The volume and value of market demand were calculated by adding production, target and non-target imports. Unfortunately, because adequate data in most cases do not exist, exports could not be subtracted, but this does not distort the results because market demand data were used solely to derive future production and import data.

1997-2004 data

In a study for the International Textiles and Clothing Bureau, Baughman (1997) projected market demand through 2004 for individual textile and apparel products largely on the basis of trends in the volume of US consumption of these products between 1987 and 1995, adjusted as necessary by expected changes in US demographics over the 1995-2005 period. A linear 'least squares fit' regression trend line was calculated for available historical data for each product, future annual demand levels and growth rates were calculated using an equation derived from the trend line.

In this study, as many individual projections as possible from the ITCB study were aggregated into the cotton apparel, wool apparel and other apparel classifications. In most cases, the number of projections at the individual category level represented the bulk of categories within the broader fibre grouping. Year-to-year growth of the resulting aggregations was computed. These growth rates were applied to the base market data for 1996, projecting future market demand through 2005. The results are shown in appendix B.

Non-target imports

1996 data

The value of non-target imports (both customs value and value including duties and cif charges) and the volumes of these imports were calculated as the difference between total imports of the relevant textile or apparel category and target imports. 'Non-target imports' includes trade subject to guaranteed access levels. Data sources included the US International Trade Commission and the US Department of Commerce, International Trade Administration, Office of Textiles and Apparel, *Major Shippers* (both by volume and by value). Information from these sources was collected at the individual category level, by individual country supplier; volume data were converted from category units to square meter equivalents. Data in the 200 category series (cotton and/or man-made fibres) were divided equally between 'cotton' and 'other' yarn, fabric and apparel. The category data were then aggregated to the broader category classifications.

1997-2004 data

The 1996 market share for non-target imports at the broader product grouping level with the effects of the quotas deleted was calculated and then applied to projected market demand over the period to yield projected non-target import volume and value.

Production

1996 data

Data for the volume of US production came from two sources: (1) US Department of Commerce, Bureau of the Census, *Current Industrial Reports: Apparel (MQ23A)*, 1996 (issued July 9, 1997), and (2) US Department of Commerce, International Trade Administration, Office of Textiles and Apparel (OTEXA), *US Imports, Production, Markets, Import Production Ratios and Domestic Market Shares for Textile and Apparel Product Categories*, Quarterly Report (September 1998). Data at the three digit category level were converted from category units to square meter equivalents and aggregated to the broader product groupings. However, because the OTEXA publication covers most but not all categories making up cotton apparel, wool apparel and other apparel, these totals were compared with similar estimates derived from the *Current Industrial Report* and adjustments, if necessary, were made to ensure as complete coverage as possible.

The value of US production by fibre is not available from any source. Therefore, The Trade Partnership estimated production value using US production volume data and the unit value of US imports from a country with apparel production similar to the United States: the United Kingdom. The customs value and volume of US imports from the United Kingdom, by three digit category, were used to calculate unit values by three digit category for 1996. Those unit values were multiplied by US production volume for the same three digit categories to estimate production value, and the results aggregated to the broader category groupings.

Production data in the 200 category series (cotton and / or man-made fibres) were divided equally between cotton and other apparel.

1997-2004 data

The 1996 market share for US production with the effects of the quotas deleted was calculated, and then applied to projected market demand over the period.

Quota

Using 1996 as the base year (and quota prevailing in 1996), The Trade Partnership applied the ATC's accelerated quota growth rates for each individual country subject to quota (a Specific Limit only) within a given category -- country by country, category by category. Small suppliers received extra growth (advanced stage growth, per the ATC). We assumed that China and Taiwan become World Trade Organization (WTO) members in the year 2000 and receive whatever accelerated growth factor prevails for other major suppliers in that and subsequent years. *If China and Taiwan do not become WTO members until sometime after 2000, the tariff equivalents presented in this study would be understated for those years from 2000 on during which China and Taiwan remained outside the WTO*. The Trade Partnership assumed that several countries do not become WTO members over the period, and their quota grows annually by the base growth rate only: Oman, Nepal, Laos and the United Arab Emirates (they either have not yet applied for WTO membership at all, or applications are dormant).

To simplify the analysis, The Trade Partnership ignored all quotas facing Mexico, the tariff preference levels facing Canada, any three year quotas imposed as a result of calls and integration of products over the ATC term. It would have been too arbitrary to project trade changes resulting from the elimination of these quotas during the phase out period. Ignoring integration does not unduly bias the results because very little US apparel is

scheduled to be integrated into the GATT before 2005. In addition, The Trade Partnership ignored guaranteed access levels (the '807A' quotas) as they are not restrictive.

The resulting quota volumes in category units (again, by country, by category) were converted to square meter equivalents and aggregated to the broader product groupings. In instances where quota is merged across fibres,[13] the full amount of the quota was allocated to each fibre grouping, downward biasing the results. In other words, if one quota volume covered imports of cotton and man-made fibre underwear (category 352/652), 100 per cent of that volume was allocated to cotton underwear (category 352) and 100 per cent to man-made fibre underwear (category 652) before the aggregations to cotton apparel and other apparel were calculated. Also, quota in 200 series categories (cotton and/or man-made fibres) was allocated in its entirety to *both* cotton apparel and other apparel.

Because the resulting quota levels in 1996 were much higher than the actual level of target imports (again, because 100 per cent of cross-fibre quota was attributed to each fibre product group), and it was known (because of the existence of tariff equivalents for 1996) that the apparel quotas were restrictive, the actual level of target apparel imports was assumed to be the 'quota level' for 1996. The ratio of target imports in 1996 to 1996 quota was applied to projected quota through 2004 to get the quota level inputted into the ITC model.

Target imports

1996 data

Target import data reflect only that trade for which a 'specific limit' applied. Thus, if a given country faced US quotas in one three digit category but not in another, its trade was included among the target import total in the former case but in the non-target total in the latter case. Trade subject to guaranteed access level limits is not included as target imports.[14]

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13 Many US quotas cover merged categories, both within a given fibre or across fibres. For example, cotton knit shirts are combined with man-made fibre knit shirts. Exporting countries can ship either one under the same quota category limit. Thus, to fairly distribute the quota by fibre, 100 per cent of such a merged quota should be allocated to each fibre.

14 The United States operates a special import program for countries in the Caribbean generally known in the trade as '807A' after its classification in the old tariff schedule of the United States. (The new official designation is '9082' trade). Briefly, this program permits relatively large quantities of selected apparel products to be exported to the United States from these countries only essentially

The Trade Partnership used data from the US International Trade Commission and the US Department of Commerce, International Trade Administration, Office of Textiles and Apparel, *Major Shippers* (both by volume and by value). Information from these sources was collected at the individual category level, by individual country supplier. Data in the 200 category series (cotton and/or man-made fibres) were divided equally between 'cotton' and 'other' yarn, fabric and apparel. The individual data were converted to square meter equivalents (in the case of volumes) and then aggregated to the broader category classifications.

1997-2004 data

The 1996 market share for target imports with the effects of the quotas deleted was calculated, and then applied to projected market demand over the period to estimate projected target imports over the 1997-2004 period.

Tariff equivalent facing Hong Kong

The Federation of Hong Kong Garment Manufacturers provided monthly prices for US apparel quota by three digit category classification for 1996 (in Hong Kong dollars per category unit). The Trade Partnership averaged the monthly data to get an annual average, then weighted each category's premium expressed in US dollars per square meters by the US customs value of imports from Hong Kong (absent the quota premium) to get a total for each apparel fibre category.

Tariff rates

Projected tariff rates were obtained from an unpublished US Department of Commerce, Office of Textiles and Apparel, table of US textile and apparel tariff cuts, 1994 to 2005 (prepared by the Trade Data Division, 4 January, 1994). The table provides 1994 and projected 2005 tariff rates by product grouping by fibre. Year-to-year changes were calculated and reported in table A.1 as the tariff equivalent expected to face yarns and fabrics over the term of the ATC (through 2004), plus the additional two years requested by the Centre for International Economics.

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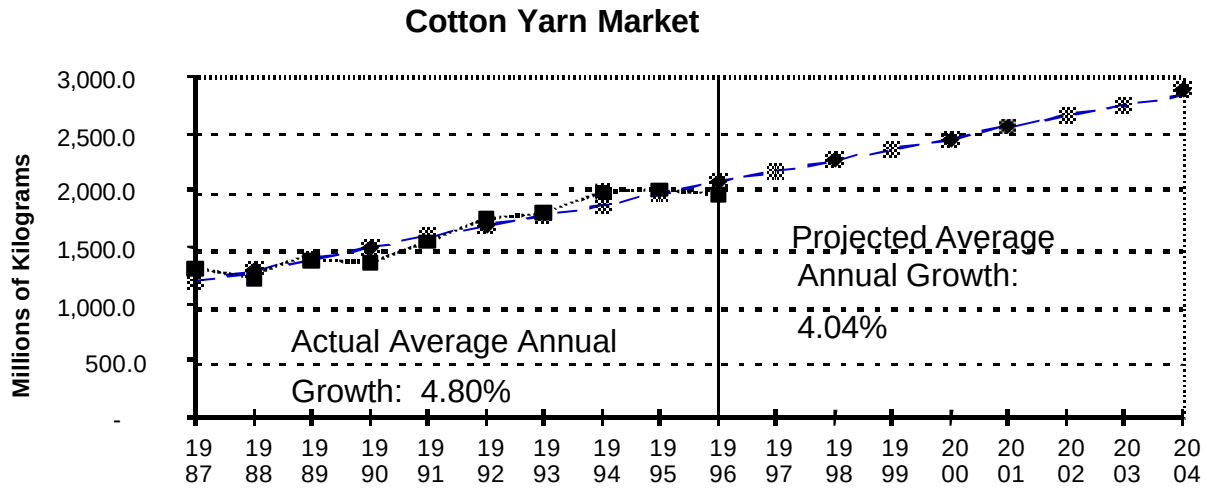
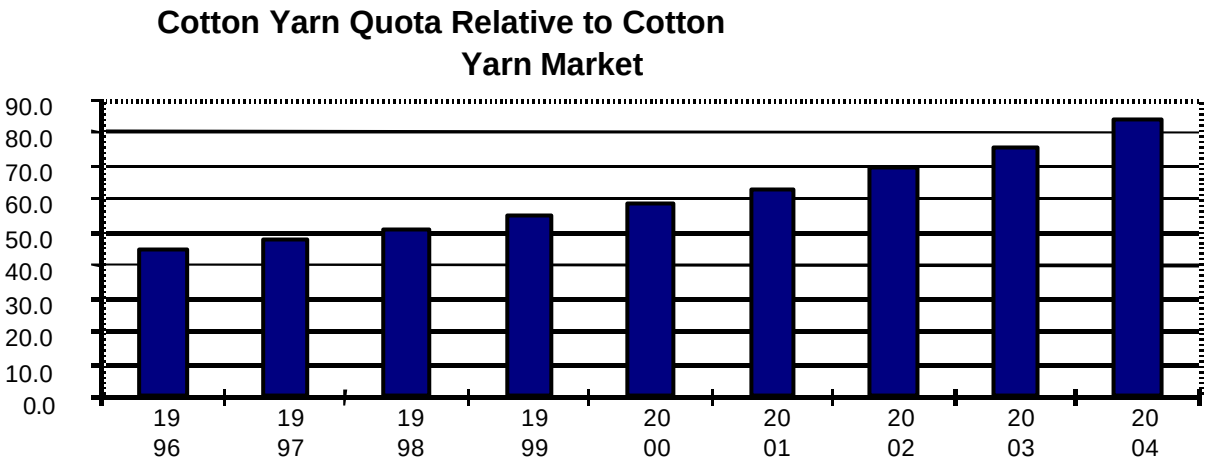
quota free — the '807A' quotas, called 'guaranteed access levels' (GALs), are as their name implies meant to be non-restrictive. Thus, for example, while the Dominican Republic may be subject to quotas on some products and therefore a quota covered country, if it had no quotas relevant to a particular category or those quotas were only GALs, the Dominican Republic was included in the non-target import classification for the relevant category. Thus, the list of target and non-target countries varies by category.

B *Projected market and quota results*

THIS APPENDIX REPORTS MARKET demand projections relative to projected quota over the term of the ATC.

It covers cotton and other (non-wool) fibre yarns (wool yarns are not reported because the US imposes no quotas (specific limits) on wool yarns for which tariff equivalents were estimated); cotton, wool and man-made fibre fabric; and cotton, wool and man-made fibre apparel.





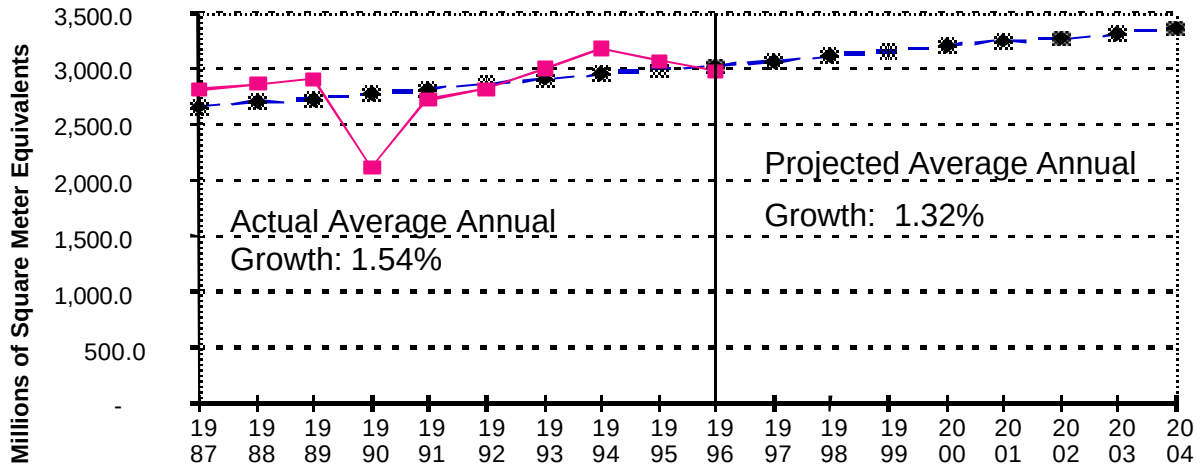
Cotton yarn: projected market demand and quota (Millions of kilograms)

	Market	*Quota*
1996	1 961.8	45.2
1997	2 165.5	47.8
1998	2 261.9	51.3
1999	2 358.3	55.1
2000	2 454.8	59.3
2001	2 551.2	63.8
2002	2 647.7	69.9
2003	2 744.1	76.7
2004	2 840.5	84.3

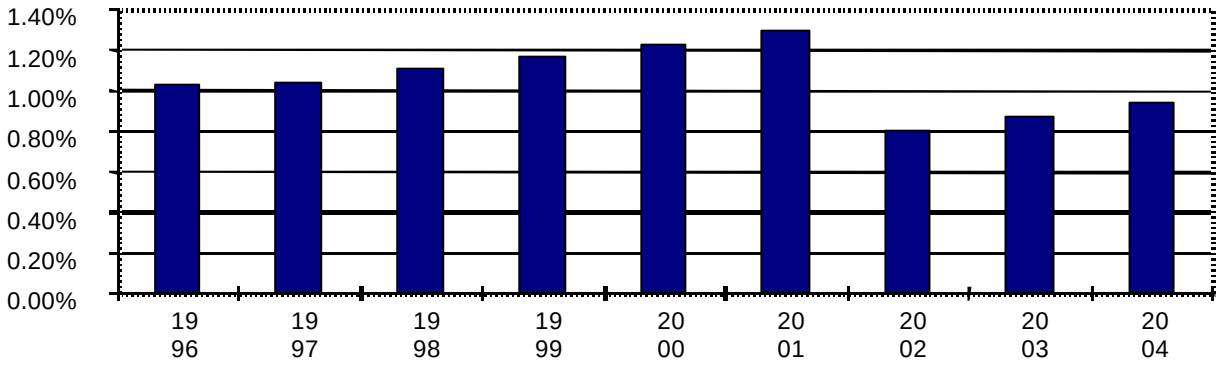
Special notes to cotton yarn charts and table.

1. Market demand was projected on the basis of actual demand trends from 1987–96 (as reported by the Bureau of the Census in various *Current Industrial Report* issues for cotton yarns). The cotton yarn market (the volume of production less exports plus imports) grew at an average annual rate of 4.8 per cent over this period.
2. Cotton quota includes 100 per cent of quota that will be available in all 200-series yarn categories (cotton and man-made fibres combined). It thus assumes that all available quota in these categories is used to export cotton yarn to the United States. Potentially, this is possible; however, it is more likely that this quota will be shared with man-made fibre yarns.

Other Fibre Yarn Market



Other Fibre Yarn Quota Relative to Other Fibre Yarn Market



Other fibre yarn: projected market demand and quota (Millions of kilograms)

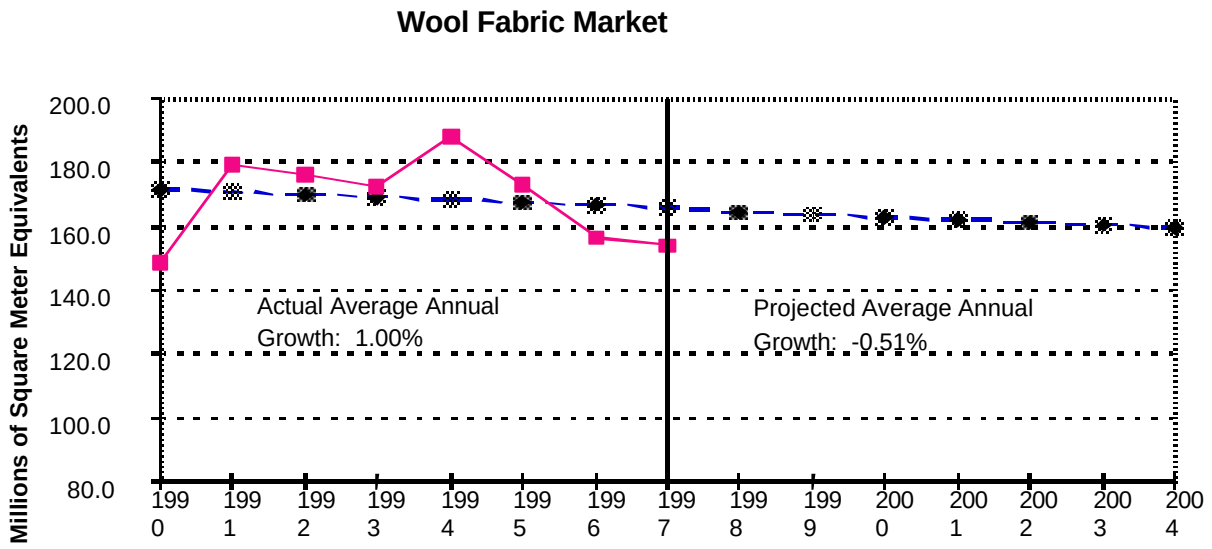
	Market	*Quota*
1996	2 968.2	30.8
1997	3 072.8	32.5
1998	3 114.6	34.6
1999	3 156.4	36.9
2000	3 198.3	39.4
2001	3 240.1	42.2
2002	3 281.9	26.7
2003	3 323.7	29.2
2004	3 365.5	31.9

Special notes to other fibre yarns charts and table.

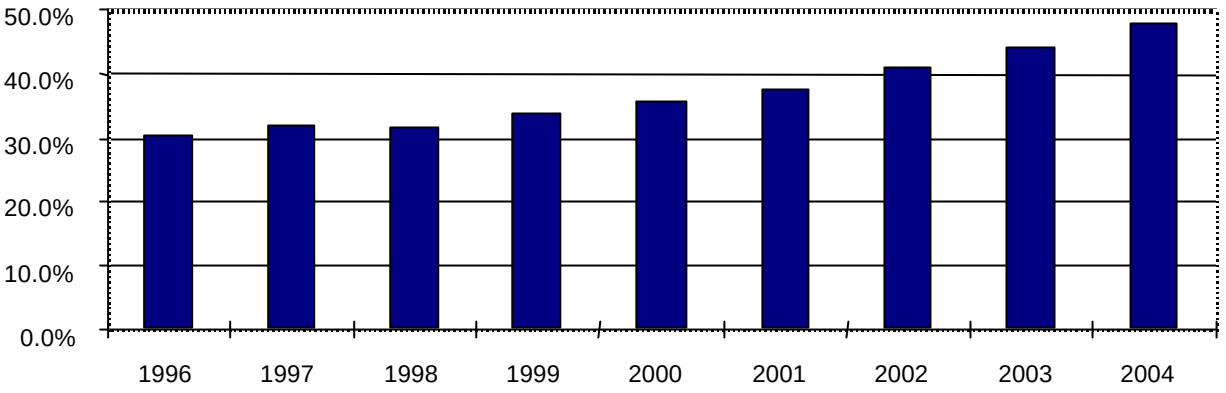
3. Market demand was projected on the basis of actual demand trends from 1987–96 (as reported by the Bureau of the Census in various *Current Industrial Report* issues for man-made fibre yarns). The man-made fibre yarn market (the volumes of production less exports plus imports) grew at an average annual rate of 1.5 per cent over this period.

4. Other fibre quota includes 100 per cent of quota that will be available in all 200-series yarn categories (cotton and man-made fibres combined). It thus assumes that all available quota in these categories is used to export other (non-cotton, non-wool) fibre yarn to the United States. Potentially, this is possible; however, it is more likely that this quota will be shared with cotton fibre yarns.

5. The drop in quota in 2002 is due to the integration in that year of US quotas on 'other man-made fibre staple yarns' (Category 607).



Wool Fabric Quota Relative to Wool Fabric Market



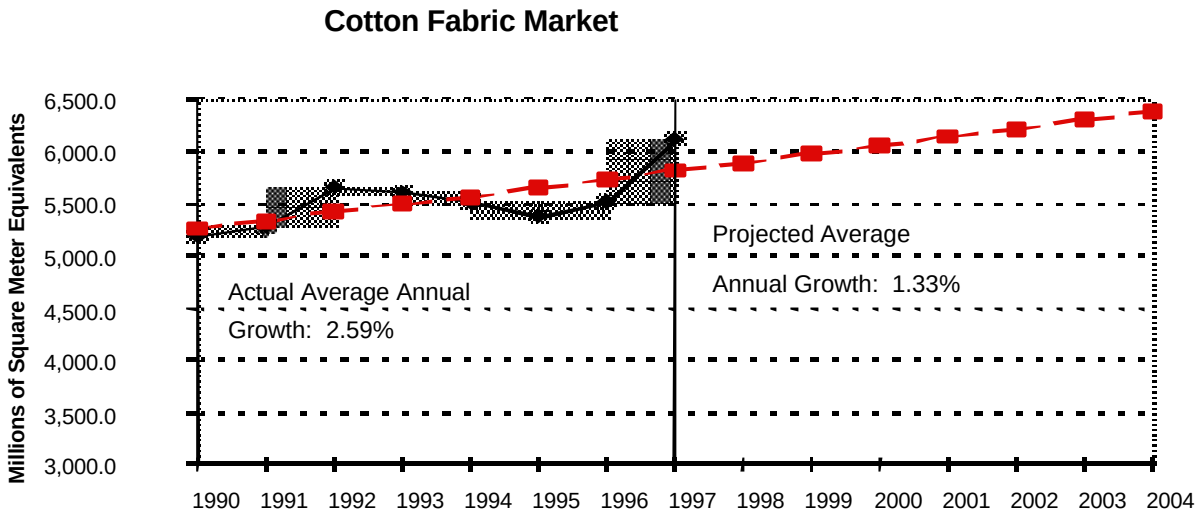
Wool fabric: projected market demand and quota (Millions of square meters)

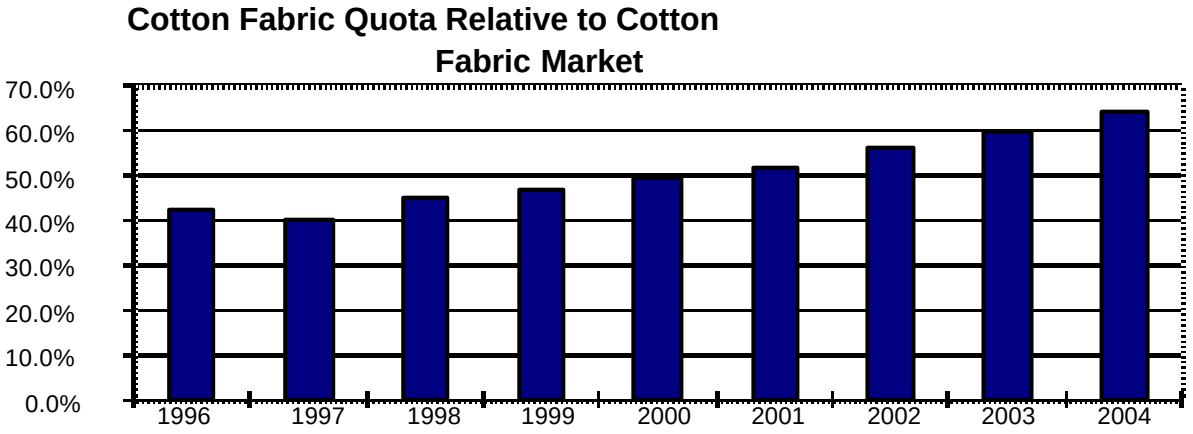
	Market	***Quota***
1996	156	48
1997	155	50
1998	165	53
1999	164	55
2000	163	58
2001	162	62
2002	162	66
2003	161	71
2004	160	77

Special notes to wool fabric charts and table.

1. Market demand was projected on the basis of actual demand trends from 1991–97 (as reported by the Bureau of the Census in various *Current Industrial Report* issues for wool fabric). This was the longest time series available that included US production of both chiefly-wool and wool blend fabrics. The wool fabric market (the volumes of production less exports plus imports) grew at an average annual rate of 1.5 per cent over this period.

6. Wool quota includes Categories 410 (woven fabrics of wool and wool-blends) and Category 624 (woven fabrics, 15-36 per cent wool).





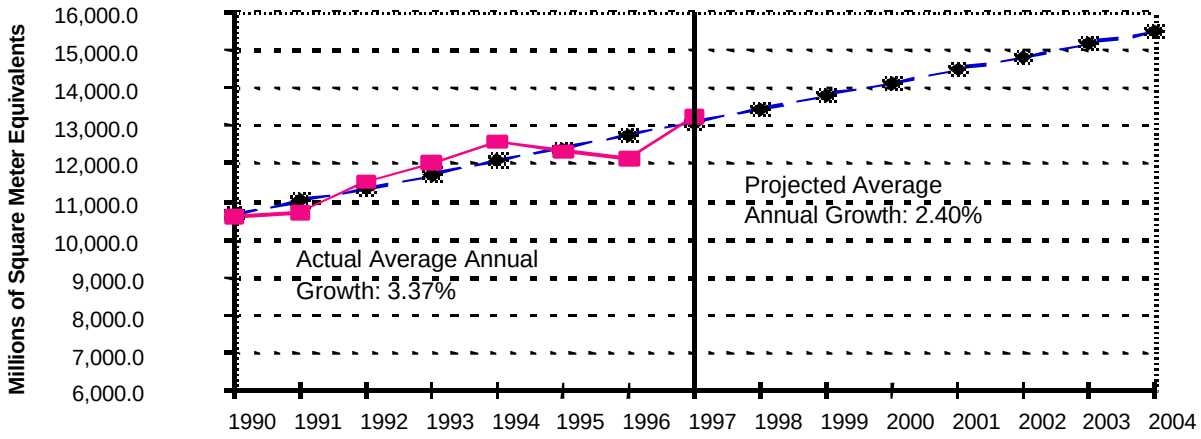
Cotton fabric: projected market demand and quota (Millions of square meters)

	Market	*Quota*
1996	5 530	2,371
1997	6 125	2,498
1998	5 902	2,657
1999	5 983	2,829
2000	6 064	3,019
2001	6 145	3,223
2002	6 226	3,498
2003	6 307	3,800
2004	6 388	4,137

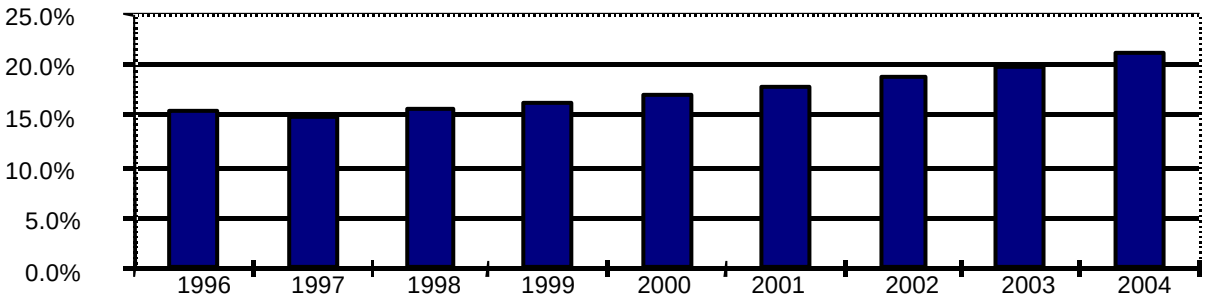
Special notes to cotton fabric charts and table.

1. Market demand was projected on the basis of actual demand trends from 1990–97 (as reported by the American Textile Manufacturers Institute, *Textile Hilights*, various issues). This was the longest time series available. The cotton fabric market (the volumes of production plus imports) grew at an average annual rate of 2.6 per cent over this period.
2. Cotton fabric quota includes 100 per cent of quota that will be available in all 200-series fabric categories (cotton and man-made fibres combined). It thus assumes that all available quota in these categories is used to export cotton fabric to the United States. Potentially, this is possible; however, it is more likely that this quota will be shared with man-made fibre fabric.

Other Fibre Fabric Market



Other Fibre Fabric Quota Relative to Market

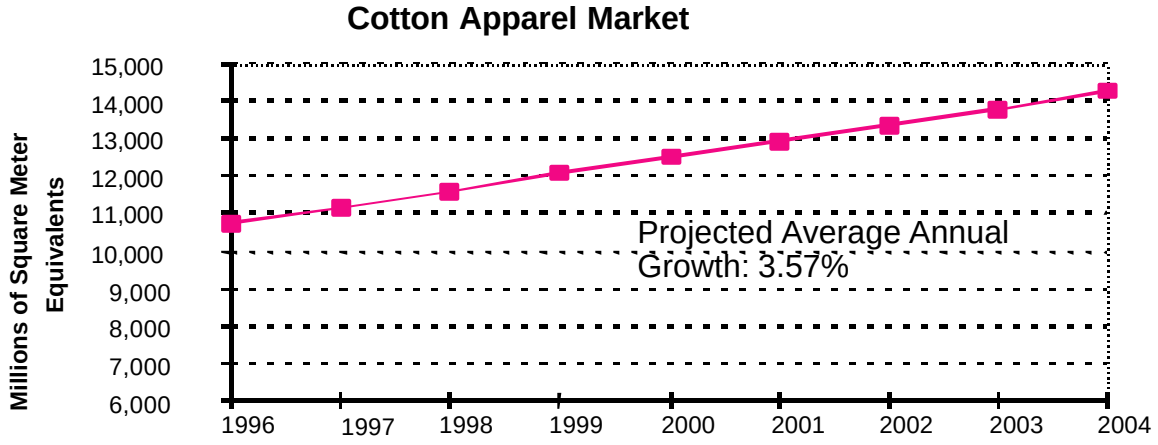


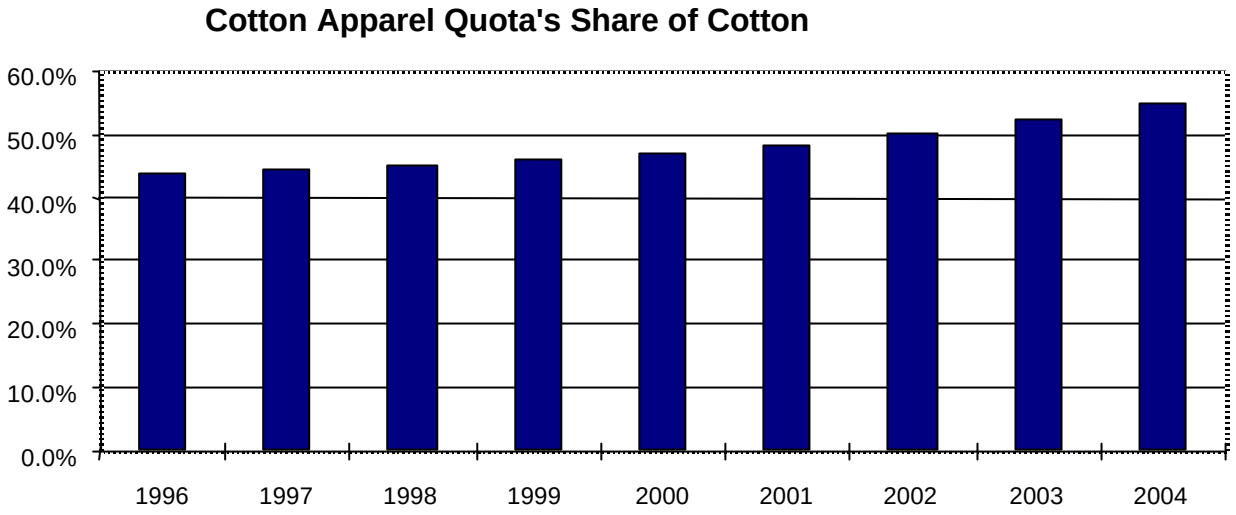
Other fibre fabric: projected market demand and quota (Millions of square meters)

	Market	*Quota*
1996	12 141	1 898
1997	13 259	1 999
1998	13 450	2 129
1999	13 797	2 269
2000	14 143	2 422
2001	14 489	2 588
2002	14 836	2 813
2003	15 182	3 060
2004	15 529	3 335

Special notes to other fibre fabric charts and table.

1. Market demand was projected on the basis of actual demand trends from 1990–97 (as reported by the American Textile Manufacturers Institute, *Textile Hilights*, various issues). This was the longest time series available. The other fabric market (the volumes of production plus imports) grew at an average annual rate of 3.4 per cent over this period.
2. Other fibre fabric quota includes 100 per cent of quota that will be available in all 200-series fabric categories (cotton and man-made fibres combined). It thus assumes that all available quota in these categories is used to export man-made fibre fabric to the United States. Potentially, this is possible; however, it is more likely that this quota will be shared with cotton fibre fabric.





Cotton apparel: projected market demand and quota (Millions of square meters)

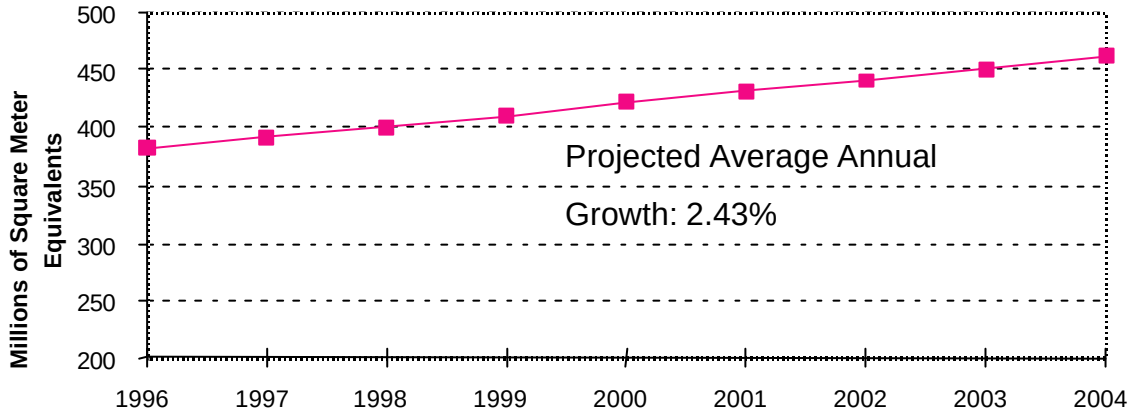
	Market	*Quota*
1996	10 778	4 737
1997	11 186	4 963
1998	11 610	5 247
1999	12 060	5 553
2000	12 499	5 888
2001	12 940	6 248
2002	13 382	6 736
2003	13 827	7 273
2004	14 274	7 836

Special notes to cotton apparel charts and table.

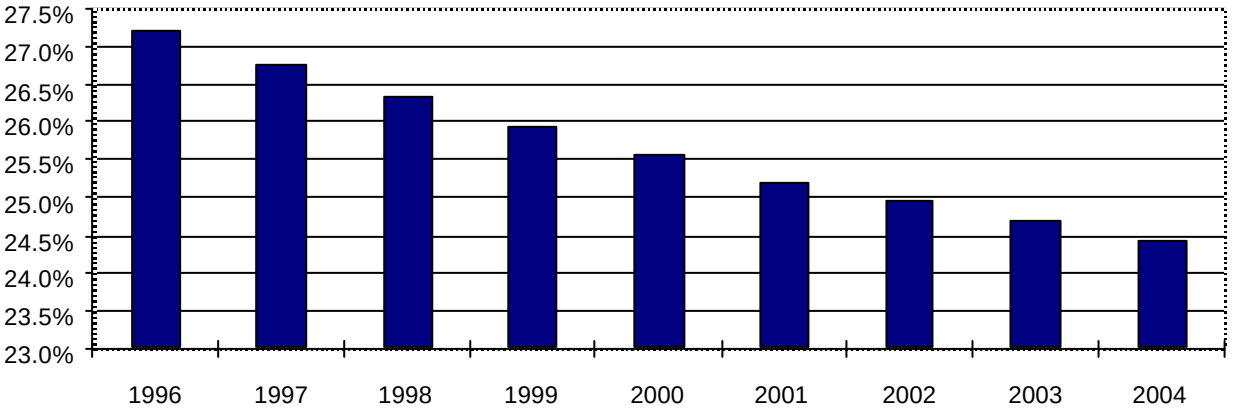
1. Market demand for cotton apparel was projected largely on the basis of trends in the volume of US consumption of these products between 1987 and 1995, adjusted as necessary by expected changes in US demographics over the 1995–2005 period. A linear 'least squares fit' regression trend line was projected through the year 2005 for each product, and future annual demand levels and growth rates were calculated using an equation derived from the trend line. As many individual cotton apparel product projections as possible were aggregated. Year-to-year growth of the resulting aggregations was computed. These growth rates were applied to the base market data for 1996, projecting future market demand through 2005.

2. Cotton apparel quota includes 100 per cent of quota that will be available in all 200-series fabric categories (cotton and man-made fibres combined). It thus assumes that all available quota in these categories is used to export cotton apparel to the United States. Potentially, this is possible; however, it is more likely that this quota will be shared with man-made fibre fabric.

Wool Apparel Market



Wool Apparel Quota Relative to Wool Apparel Market

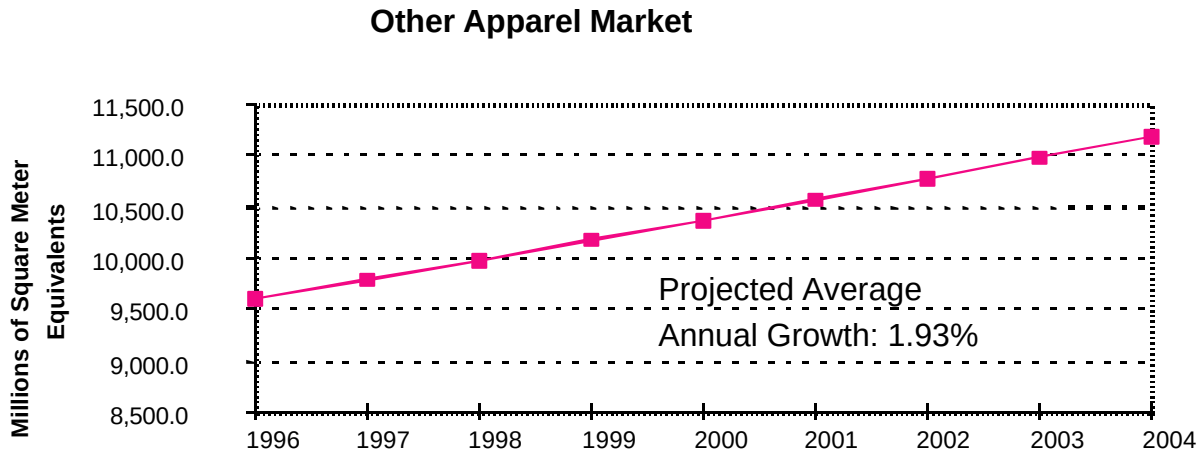


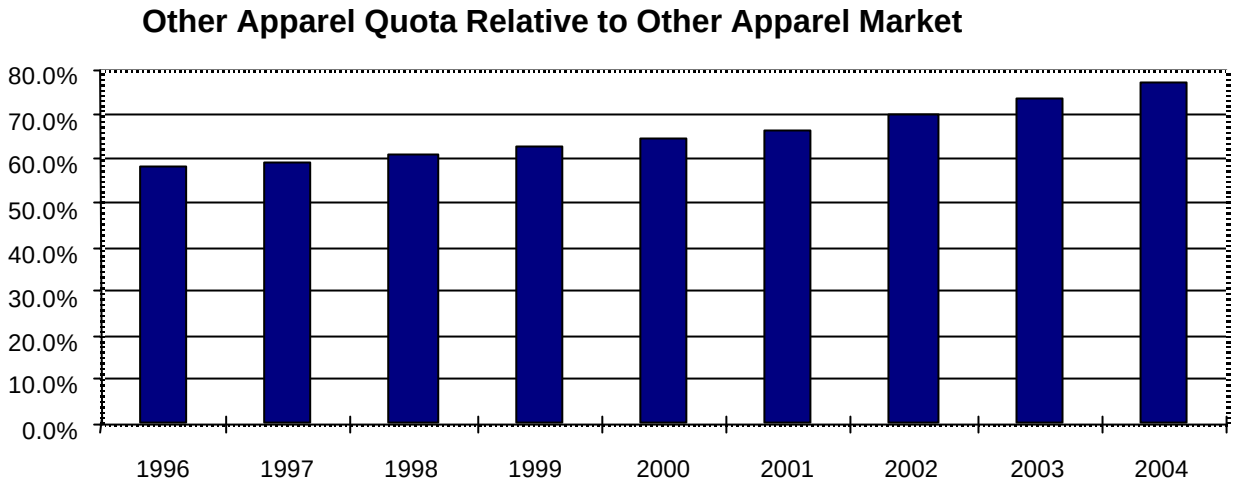
4.3 **Wool apparel: projected market demand and quota** (Millions of square meter equivalents)

	Market	*Quota*
1996	380.9	103.6
1997	390.7	104.6
1998	400.7	105.6
1999	410.8	106.6
2000	420.9	107.7
2001	431.1	108.7
2002	441.3	110.1
2003	451.4	111.5
2004	461.7	112.9

Special note to wool apparel charts and table.

1. Market demand for wool apparel was projected largely on the basis of trends in the volume of US consumption of these products between 1987 and 1995, adjusted as necessary by expected changes in US demographics over the 1995–2005 period. A linear 'least squares fit' regression trend line was projected through the year 2005 for each product, and future annual demand levels and growth rates were calculated using an equation derived from the trend line. As many individual wool apparel product projections as possible were aggregated. Year-to-year growth of the resulting aggregations was computed. These growth rates were applied to the base market data for 1996, projecting future market demand through 2005.





4.4 **Other fibre apparel: projected market demand and quota** (Millions of square meters)

	Market	*Quota*
1996	9 603	5 592
1997	9 783	5 815
1998	9 967	6 096
1999	10 176	6 399
2000	10 374	6 731
2001	10 575	7 086
2002	10 777	7 568
2003	10 981	8 097
2004	11 187	8 652

Special notes to other fibre apparel charts and table.

1. Market demand for other fibre apparel was projected largely on the basis of trends in the volume of US consumption of these products between 1987 and 1995, adjusted as necessary by expected changes in US demographics over the 1995–2005 period. A linear 'least squares fit' regression trend line was projected through the year 2005 for each product, and future annual demand levels and growth rates were calculated using an equation derived from the trend line. As many individual other fibre apparel product projections as possible were aggregated. Year-to-year growth of the resulting aggregations was computed. These growth rates were applied to the base market data for 1996, projecting future market demand through 2005.

2. Other fibre apparel quota includes 100 per cent of quota that will be available in all 200-series fabric categories (cotton and man-made fibres combined). It thus assumes that all available quota in these categories is used to export other fibre apparel to the United States. Potentially, this is possible; however, it is more likely that this quota will be shared with cotton fibre fabric.

CHAPTER

C MFA model

THIS APPENDIX DESCRIBES THE STRUCTURE OF THE MODEL of production, consumption and trade between Australia, the United States and the rest of the world for raw fibres, yarns, fabrics and apparel. The model has two key components. The first is an integrated set of input–output accounts which shows how fibre producers (wool, cotton) in Australia and other countries are linked through downstream processing and trade across regions and across stages of processing to intermediate users and consumers of fibre specific yarns, fabrics and apparel in the US. The second component addresses how economic decisions are made. To provide this, we use conventional economic theory to explain the behaviour of firms, markets and consumers.

First, we look at the general features of the model. Then we consider the detailed structure of the model.

General features of the model

Features of the model are:

- its capacity to track how quota arrangements in the US for yarns, fabrics and apparel can affect consumers in the US and producers back down the textile chain and clothing in the US and the rest of the world;
- its 'what if' focus — it analyses the effects of a policy change while holding constant all other factors that shape the outcomes for the fibre producing and downstream textiles and clothing industries; and
- its partial equilibrium nature — it tells a story about production demand and trade for raw fibres, fibre processing, and fabrics and apparel on a fibre specific basis, but does not consider production demand and trade for other activities in each region.

Comparative–statics

The model is comparative–static. This means that it compares two different situations at the same point in time, not how they evolve over time. The way in which comparative–static models work is illustrated in chart C.1. Path AB shows the underlying time path of a particular variable, say total imports of apparel by the US, that results from a range of evolving

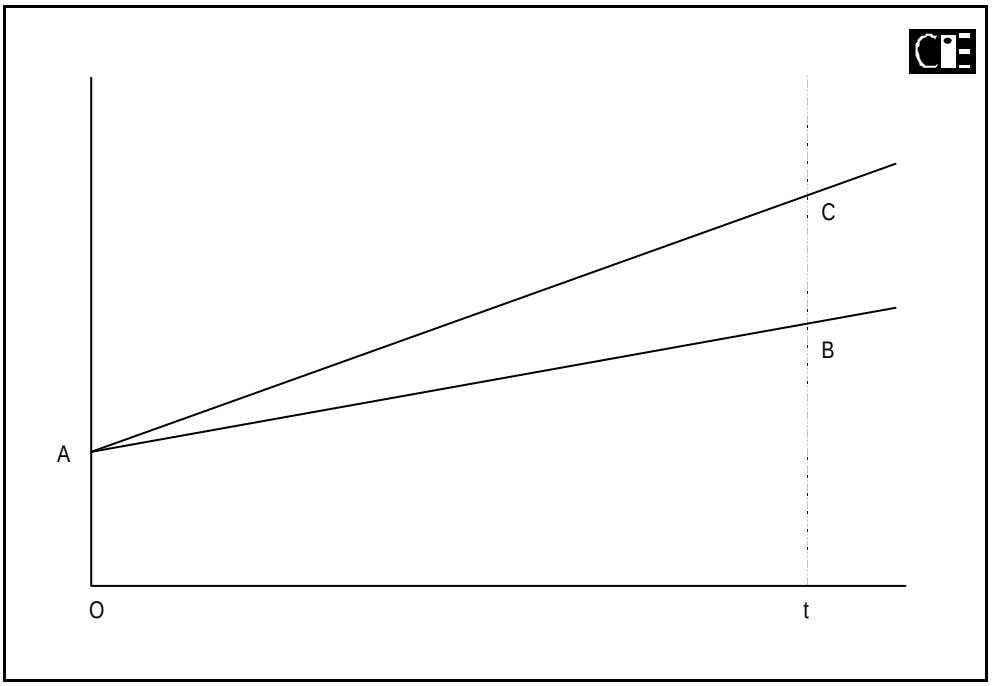
economic conditions over time. Suppose that at time 0, a shock is introduced, which leads to an increase in US imports. Then at time t, after model industries have fully adjusted to this change, imports would have reached C. Comparative analysis is concerned only with the size of the gap between B and C, and not the time dependent paths AB and AC.

Not a forecasting model

Forecasting the path of the model variables in a multiregional model would be a complex task. We would need to make projections concerning a range of model variables that are typically exogenous. For example, the level of US imports would depend on relative changes in US demand and supply. Changes in US demand over time would depend on demographics, incomes, fashion and taste changes in additional to changes in relative prices. On the supply side, relative changes in productivity between the United States and overseas could have a large impact on imports in addition to such factors as upgrading of the quality mix from quota suppliers. The time dynamics of the ATC phase out is imposed through changes in the tariff equivalent of the quota calculated by The Trade Partnership. These tariff equivalents were calculated using a model that made assumptions about changes in these exogenous factors.

Commodity and regional detail

C.1 **Interpretation of comparative–static**



The model covers:

- three regions (Australia, US, rest of world);
- two categories of raw fibre in each region (apparel wool, cotton);
- three categories of yarns in each region (apparel wool, cotton, other);
- three categories of fabrics in each region (wool, cotton, other); and
- three categories of final consumption of apparel in each region (wool and wool blends, cotton and other).

The model therefore identifies 11 activities (cotton fibres, apparel wool, cotton yarns, wool yarns, other yarns, cotton fabrics, wool fabrics, other fabrics, cotton apparel, wool and wool blend apparel, other apparel) through the four stages of the value added chain (fibre production, yarn production, fabric–textile production, apparel–clothing production) in the three regions. Final consumption of fibres takes place through the consumption of the various categories of clothing and textile products.

In the commodity detail, the 'other' activity includes both synthetic and other natural fibres, which include silk, jute and flax. Synthetic fibres dominate world production and trade of this fibre group. We adopted this convention primarily to be consistent with the classification used in the calculation of the US tariff equivalents by The Trade Partnership.

We have not identified an activity for synthetic and other at the raw fibre level. This is because of the significant data restrictions on differentiation between synthetic top and yarn in production. Synthetic fibre production is most often reported on a yarn basis because of the close integration between synthetic fibre production (extrusion) and spinning of yarn. Because of factors such as high levels of productivity and excess capacity in the synthetic fibre industry, aggregation of both steps appears reasonable as shifts in demand for the other yarns category is unlikely to affect the price of synthetic fibres. The situation is different in the case of production of wool and cotton. Both are land–based industries. Because of the land constraint, supply elasticities for these fibres are relatively low and different between wool and cotton. Shifts in demand can therefore result in changes in relative prices between stages of the fibre chain.

Model theory

The model uses conventional microeconomic theory to represent industries and consumers making choices as they pursue maximising behaviour. The model also includes fundamental accounting relationships that ensure that total demand for a commodity in each region is equal to total supply —

which determines a regional price for each commodity. Other equations ensure that prices between regions are linked and differentiated by transport costs and trade barriers.

A feature of the model is that it is a differentiated product or Armington style model. That is, a commodity sourced from different producing regions is recognised by users as different products — landed at different prices. Because we break the assumption of homogeneity, farm or factory prices can move independently between regions.

The theoretical structure of the model is explained in detail later in this appendix.

Information requirements

The database is expressed in terms of quantities, prices and values. The database captures the linkages between commodities and industries identified in the value chain. For example, it shows the cost linkage between cotton yarn and the production of cotton fabrics for apparel. It also recognises that cotton yarn can also be exported, imported or consumed by users outside of the apparel industry. The model uses this information to compute cost and sales shares and is combined with model parameters to form coefficients in the equation system.

Input–output database

A schematic representation of the model's input–output database is given in chart C.2 for a particular region *r*. This specifies most of the data matrices required for the model. Elements of each matrix are typically value flows represented in millions of US dollars for the 1996 calendar year. Matrices A and E contain the value of domestically sourced and imported intermediate inputs to production for the 11 activities–industries. For example, it describes the domestic input of cotton fibre into the processing industry that manufactures cotton yarns. Because we assume all industries produce one product only, total sales will equal the total output for each commodity and industry in region *r*.

The database has important adding up properties. The sum across matrices A to D is equal to total sales of domestic production in region *r*. Row sums of matrices E to G are equal to total imports by region *r* on a landed duty paid basis.

Values for primary factors and costs of other inputs are represented in matrices H and I for each industry in region *r*. The column sum of matrices A, E, H and I give total production costs which equals the value of output for each industry.

C.2 **Schematic database for fibre, textiles and clothing in each region**

	Industry inputs	Final consumption	Change in stocks	Exports	Total
Domestic	A	B	C	D	Total domestic production
Imported	E	F	G		Total imports
Other inputs	H				Total other inputs
Labour Capital	I				Total primary factors used
Total costs	Total domestic production	Total final consumption	Total change in stocks	Total exports	Total value of output

	Imports by region
Australia	M_1
US	M_2
Rest of world	M_3
	Total imports

Finally, matrices M1 to M3 identify imports by source country on a landed duty paid basis for each commodity category.

Descriptions of the data sources and database methodology are provided later in this appendix.

Theoretical structure

The model consists of a set of equations to explain production, processing and consumption of each fibre and apparel type in each region and the links between regions through trade. These equations can be classified into eight broad groups.

- Demands for inputs by industry (for fibre, other inputs and primary factors).
- Final demands by commodity.
- Outputs by industry.
- Trade equations.
- Price relationships.
- Zero pure profits.
- Market clearance.
- Other equations.

The model is solved using the GEMPACK suite of programs described in Harrison and Pearson (1996). In box C.3 we present an exhaustive listing of GEMPACK code required to run the MFA model. This input is split into seven sections, which are:

- model defaults and set or range definitions for model variables;
- variable definitions and descriptions;
- reads of selected model variables from the database;
- model parameters and elasticities definitions and descriptions;
- formulae initialising variables not read in from the database;
- calculation of shares and other coefficients used in the model's equation system; and
- equations of the MFA model.

C.3 MFA model equations

```
!
         MFA model
            Prepared by Centre for International Economics
            Canberra
            For Woolmark Australia
            August 1999
!
! Section 1 - Set  and model declarations
!----------------------------------------
equation(default=levels);
variable(default=levels);
formula(default=always);
coefficient(default=non_parameter);

File input # this file contains base data #;

set regions # primary demand regions #
  (Au, Us, Rw);
set com # all model commodities #                                  (c1-c11);
set raw # raw fibre level includes ESP for wool #                   (c1-c2);
set yarns # yarns  #                                                (c3-c5);
set fabrics # fabrics #                                             (c6-c8);
set final # apparel  #                                             (c9-c11);
set otherfin # commodities other than apparel #                     (c1-c8);
subset raw is subset of com;
subset yarns is subset of com;
subset fabrics is subset of com;
subset final is subset of com;
subset otherfin is subset of com;
set factors # primary factors #                                (fixed, lab);

!_____________________________________________________________________________
! Section 2 - Variables
!_____________________________________________________________________________
variable (linear) (all,j,com)(all,r,regions)                          z(j,r)
   # %change in industry activity levels #;
variable (all,i,com)(all,j,com)(all,r,regions)                     INVD(i,j,r)
  # value of inputs used by industry  - domestic  #;
variable (all,i,com)(all,j,com)(all,r,regions)                     INQD(i,j,r)
  # quantity of inputs used by industry - domestic #;
variable (all,i,com)(all,j,com)(all,r,regions)                     INVI(i,j,r)
  # value of inputs used by industry - imported #;
variable (all,i,com)(all,j,com)(all,r,regions)                     INQI(i,j,r)
  # quantity of inputs used by industry - imported #;
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
variable (all,i,com)(all,j,com)(all,r,regions)                    INPD(i,j,r)
  # price of inputs used by industry  - domestic #;
variable (all,i,com)(all,j,com)(all,r,regions)                    INPI(i,j,r)
  # price of inputs used by industry  - imported #;
variable (linear) (all,i,com)(all,j,com)(all,r,regions)           inpa(i,j,r)
  # % change in average price of inputs - domestic and imported #;
variable (all,v,factors)(all,j,com)(all,r,regions)                PRFV(v,j,r)
 # value of primary factors by industry and region #;
variable (all,v,factors)(all,j,com)(all,r,regions)                PRFQ(v,j,r)
 # quantity of primary factors by regions #;
variable (all,v,factors)(all,j,com)(all,r,regions)                  PP(v,j,r)
 # price of primary factors by regions #;
variable (all,j,com)(all,r,regions)                                 OTHV(j,r)
 # value of other cost items #;
variable (all,j,com)(all,r,regions)                                 OTHQ(j,r)
 # quantity demanded of other cost items #;
variable (all,j,com)(all,r,regions)                                   PO(j,r)
 # prices of other cost items #;
variable (all,i,com)(all,r,regions)                                 OUTV(i,r)
  # value of commodity outputs by region #;
variable (all,i,com)(all,r,regions)                                 OUTQ(i,r)
  # quantities of commodity output by region #;
variable (all,i,com)(all,r,regions)                                 OUTP(i,r)
  # farm or factory price by region #;
variable (linear) (all,i,com)(all,r,regions)                        p_PM(i,r)
  # %change in average of import price over sources #;
variable (linear) (all,i,com)(all,r,regions)                       p_TQI(i,r)
  # %change in total quantity of imports #;
variable (all,i,com)(all,r,regions)                                  TQE(i,r)
 # total quantity of exports #;
variable (linear) (all,i,com)(all,r,regions)                       duty1(i,r)
   # %change in general import duty  #;
variable (all,i,com)(all,r,regions)(all,s,regions)                 EXPV(i,r,s)
  # value of exports by region by destination#;
variable (all,i,com)(all,r,regions)(all,s,regions)                 EXPQ(i,r,s)
  # quantity of exports by region by destination #;
variable (all,i,com)(all,r,regions)(all,s,regions)                 EXPP(i,r,s)
  # export fob price by region by destination #;
variable (linear) (all,i,com)(all,r,regions)                        cont(i,r)
# %change in total consumption by commodity by region #;
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
variable (linear) (all,r,regions)                                        ry(r)
   # %change in real income by region #;
variable (linear) (all,r,regions)                                       pop(r)
   # %change in population by region #;
variable (linear) (all,i,com)(all,r,regions)                        tcon(i,r)
   # %change in taste shifter by commodity by region #;
variable (all,i,com)(all,r,regions)                                 RTVD(i,r)
   #  value of final consumption  - domestic #;
variable (all,i,com)(all,r,regions)                                 RTQD(i,r)
   # quantity of final consumption - domestic #;
variable (all,i,com)(all,r,regions)                                 RTVI(i,r)
   #  value of final consumption  - imported #;
variable (all,i,com)(all,r,regions)                                 RTQI(i,r)
   # quantity of final consumption - imported #;
variable (all,i,com)(all,r,regions)                                 RTPD(i,r)
   #  price of final consumption  - domestic #;
variable (all,i,com)(all,r,regions)                                 RTPI(i,r)
   #  price of final consumption  - imported #;
variable (all,i,com)(all,r,regions)                                 STKS(i,r)
   #  change in stocks #;
variable (linear) (all,i,com)(all,r,regions)                        rtpa(i,r)
  # %change in average price of final consumption - domestic and imported #;
variable (linear) (all,r,regions)                                      rtg(r)
  # %change in average retail price of all apparel #;
variable (linear) (all,r,regions)                                  comgart(r)
  # %change in total demands for all apparel #;
variable (all,j,com)(all,r,regions)                               curcap(j,r)
  # industry capital stocks #;
variable (linear) (all,r,regions)                                    fwage(r)
  # % change in the cost of labour by region #;
variable (all,j,com)(all,r,regions)                               VADDED(j,r)
  # value-added by industry #;
!_____________________________________________________________________________
! Section 3 – Model reads
!_____________________________________________________________________________
read OUTV from file input header "OUTV";
read OUTQ from file input header "OUTQ";
read INVD from file input header "INVD";
read INQD from file input header "INQD";
read INVI from file input header "INVI";
read INQI from file input header "INQI";
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
read PRFV from file input header "PRFV";
read OTHV from file input header "OTHV";
read EXPV from file input header "EXPV";
read EXPQ from file input header "EXPQ";
read RTVD from file input header "RTVD";
read RTQD from file input header "RTQD";
read RTVI from file input header "RTVI";
read RTQI from file input header "RTQI";
read STKS from file input header "STKS";
!_____________________________________________________________________________
! Section 4 – Model parameters
!_____________________________________________________________________________

Coefficient (parameter)(all,i,com)(all,r,regions)                    SIGM(i,r)
  # domestic-import CES substitution parameter #;
read SIGM from file input header "P001";
Coefficient (parameter)(all,i,com)(all,r,regions)                    SIGS(i,r)
  # import-source CES substitution parameter#;
read SIGS from file input header "P002";
Coefficient (parameter)(all,j,com)(all,r,regions)                    SIGP(j,r)
  # primary factor CES substitution parameter #;
read SIGP from file input header "P010";
Coefficient (parameter) (all,i,com)(all,r,regions)                   GAMM(i,r)
  # income elasticity of consumption by region #;
read GAMM from file input header "GAMM";
Coefficient (parameter) (all,i,com)(all,r,regions)                   THET(i,r)
  # price elasticity of consumption by region #;
read THET from file input header "THET";
Coefficient (parameter) (all,r,regions)                              Tgarms(r)
  # general price elasticity for consumption of apparel #;
Read Tgarms from file input header "P011";
Coefficient (parameter)all,i,final)(all,k,final)(all,r,regions)  Siggarms(i,k,r)
  # substitution parameters between apparel #;
read Siggarms from file input header "P012";
!_____________________________________________________________________________
! Section 5 - Formulas and Formulas&equations
!_____________________________________________________________________________
! Initialise starting prices !
Formula (initial) (all,v,factors)(all,j,com)(all,r,regions)       PP(v,j,r)=1.0;
Formula (initial) (all,j,com)(all,r,regions)                       PO(j,r)=1.0;
!Initialise starting quantities!
formula&equation OUTQUAN
 # initial commodity prices by region #
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
(all,i,com)(all,r,regions)
OUTP(i,r) = OUTV(i,r)/OUTQ(i,r);
Formula&Equation fact_quan
 # initial quantity of primary factors #
(all,v,factors)(all,j,com)(all,r,regions)
PRFQ(v,j,r) = PRFV(v,j,r) / PP(v,j,r);
Formula&Equation other_costs

 # initial quantity of other costs #
(all,j,com)(all,r,regions)
OTHQ(j,r) = OTHV(j,r) / PO(j,r);
Formula&equation INTQDCAL
 # initial price of inputs by industry - domestic #
(all,i,com)(all,j,com)(all,r,regions)
 INPD(i,j,r) = INVD(i,j,r) / INQD(i,j,r);
Formula&equation INTQICAL
 # initial price of inputs by industry - imported  #
(all,i,com)(all,j,com)(all,r,regions)
 INPI(i,j,r) = INVI(i,j,r) / INQI(i,j,r);
formula&equation RTQDCAL
 #  initial price of final consumption  - domestic #
(all,i,com)(all,r,regions)
RTPD(i,r) = RTVD(i,r) / RTQD(i,r);
formula&equation RTQICAL
 #  initial price of final consumption  - imported #
(all,i,com)(all,r,regions)
RTPI(i,r) = RTVI(i,r) / RTQI(i,r);
formula&equation EXPQCAL
  # price of exports by region and destination #
(all,i,com)(all,r,regions)(all,s,regions)
EXPP(i,r,s) =  EXPV(i,r,s)/ EXPQ(i,r,s);
!_____________________________________________________________________________
! Section 6 - Shares and coefficient calculations
!_____________________________________________________________________________
Coefficient (all,i,com)(all,j,com)(all,r,regions)                    SIND(i,j,r)
 # share of domestic inputs in total cost of input i for industry j#;
Formula (all,i,com)(all,j,com)(all,r,regions)
   SIND(i,j,r) = INVD(i,j,r) / [INVD(i,j,r)+INVI(i,j,r)];
Coefficient
(all,i,com)(all,j,com)(all,r,regions)                                SINI(i,j,r)
 # share of imported inputs in total cost of input i for industry j#;
Formula (all,i,com)(all,j,com)(all,r,regions)
   SINI(i,j,r) = INVI(i,j,r) / [INVD(i,j,r)+INVI(i,j,r)];
zerodivide default 0.5;
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
Coefficient (all,v,factors)(all,j,com)(all,r,regions)                    SP(v,j,r)
 # share of factors in total primary factor cost by industry #;
Formula (all,v,factors)(all,j,com)(all,r,regions)
      SP(v,j,r) = PRFV(v,j,r) / sum(u,factors,PRFV(u,j,r));
zerodivide off;
Coefficient (all,i,com)(all,r,regions)                                   SRTD(i,r)
 # Share of domestic goods in total value of final demands #;
Formula (all,i,com)(all,r,regions)
   SRTD(i,r) = RTVD(i,r) / [RTVD(i,r)+RTVI(i,r)];
Coefficient (all,i,com)(all,r,regions)                                   SRTI(i,r)
 # Share of imported goods in total value of final demands #;
Formula (all,i,com)(all,r,regions)
   SRTI(i,r) = RTVI(i,r) / [RTVD(i,r)+RTVI(i,r)];
zerodivide default 0.3333;
coefficient (all,i,com)(all,r,regions)(all,s,regions)                 SEBD(i,r,s)
   # Share of value of imports by source by, by region #;
formula (all,i,com)(all,r,regions)(all,s,regions)
  SEBD(i,r,s) = EXPV(i,r,s)/sum(k,regions,EXPV(i,r,k));
zerodivide (nonzero_by_zero) default 0.0;
Coefficient (all,i,com)(all,j,com)(all,r,regions)                    SINQI(i,j,r)
 # share of input i in value of total imports of commodity i #;
Formula (all,i,com)(all,j,com)(all,r,regions)
      SINQI(i,j,r) = INQI(i,j,r) / [sum(k,com,INQI(i,k,r)) + RTQI(i,r)];
Coefficient (all,i,com)(all,r,regions)                                   SRTQI(i,r)
 # share of final good i in value of total imports of commodity i #;
Formula (all,i,com)(all,r,regions)
      SRTQI(i,r) = RTQI(i,r) / [sum(k,com,INQI(i,k,r)) + RTQI(i,r)];
zerodivide (nonzero_by_zero) off;
Coefficient (all,i,com)(all,r,regions)                                   RTVT(i,r)
   # Retail value of final demands across sources by region #;
Formula (all,i,com)(all,r,regions)
 RTVT(i,r)  = RTVD(i,r) + RTVI(i,r);
Coefficient (all,i,final)(all,r,regions)                                 SRTVT(i,r)
   # Retail budget share by region #;
Formula (all,i,final)(all,r,regions)
SRTVT(i,r) = RTVT(i,r) / sum(k,final,RTVT(k,r));
Coefficient (all,i,final)(all,k,final)(all,r,regions)          Elasgarms(i,k,r)
  # elasticity matrix for apparel by region #;
Formula (all,i,final)(all,k,final)(all,r,regions)
   Elasgarms(i,k,r) = Siggarms(i,k,r)/SRTVT(i,r);
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
!_____________________________________________________________________________
! Section 7 - Equations
!_____________________________________________________________________________

! Demands for inputs by industries
!---------------------------------
!Equation 1!
equation (linear) dem_imp_inputs
 # demand for imports - inputs #
(all,i,com)(all,j,com)(all,r,regions)
p_INQI(i,j,r) = z(j,r) -
      SIGM(i,r)* [ p_INPI(i,j,r) - inpa(i,j,r)];
!Equation 2!
equation (linear) dem_dom_inputs
 # demand for domestic - inputs #
(all,i,com)(all,j,com)(all,r,regions)
p_INQD(i,j,r) = z(j,r) -
      SIGM(i,r)* [ p_INPD(i,j,r) - inpa(i,j,r)];
!Equation 3!
equation (linear) prim_fac_dem
 # demand for primary factors #
(all,v,factors)(all,j,com)(all,r,regions)
p_PRFQ(v,j,r) =  z(j,r) + a1(j,r) - SIGP(j,r) * (
         p_PP(v,j,r) - sum(u,factors, SP(u,j,r)*p_PP(u,j,r)));
!Equation 4!
equation (linear) oth_cost_dem
 # demands for other costs #
(all,j,com)(all,r,regions)
p_OTHQ(j,r) = z(j,r);

! Final demands by commodity
!---------------------------
!Equation 5!
equation (linear) agg_dem_apparel
 # demand for apparel in total #
(all,r,regions)
comgart(r) - pop(r) = GAMMG(r)*(ry(r)-pop(r)) +
                            Tgarms(r)*rtg(r);
!Equation 6!
equation (linear) dem_apparel
 # final demands for apparel #
(all,i,final)(all,r,regions)
cont(i,r)  = comgart(r) + sum(k,final,Elasgarms(i,k,r)*rtpa(k,r));
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
!Equation 7!
equation (linear) ave_gar_price
 # average retail price of apparel #
(all,r,regions)
rtg(r) = sum(i,final,SRTVT(i,r)*rtpa(i,r));
!Equation 8!
equation (linear) agg_dem_otherfinal
 # final demands for commodities other than apparel #
(all,i,otherfin)(all,r,regions)
cont(i,r) - pop(r) = GAMM(i,r)* ( ry(r) - pop(r) ) +
                        THET(i,r) * rtpa(i,r) + tcon(i,r);
!Equation 9!
equation (linear) dem_imp_rt
 # change in imported price of final consumption #
(all,i,com)(all,r,regions)
p_RTQI(i,r) = cont(i,r) -
      SIGM(i,r)* [ p_RTPI(i,r) - rtpa(i,r)];
!Equation 10!
equation (linear) dem_dom_rt
 # change in domestic price of final consumption #
(all,i,com)(all,r,regions)
p_RTQD(i,r) = cont(i,r) -
      SIGM(i,r)* [ p_RTPD(i,r) - rtpa(i,r)];

! Output by industry
!--------------------
!Equation 11!
equation (linear) out_ind
 # output by commodity  #
(all,i,com)(all,r,regions)
p_OUTQ(i,r) = z(i,r);

! Trade equations
!-----------------
!Equation 12!
equation  (linear) tot_imp
 # change in total imports of inputs #
(all,i,com)(all,r,regions)
p_TQI(i,r) = sum(j,com,SINQI(i,j,r)* p_INQI(i,j,r)) +
                    SRTQI(i,r)*p_RTQI(i,r);
!Equation 13!
equation (linear) dem_imp_sous
 # demand for imports by source #
(all,i,com)(all,r,regions)(all,s,regions)
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
p_EXPQ(i,r,s) = p_TQI(i,r) -
                SIGS(i,r)* [ p_EXPP(i,r,s) - p_PM(i,r)];
!Equation 14!
formula&equation total_exps
 # total exports by region #
(all,i,com)(all,r,regions)
TQE(I,r) = sum(s,regions,EXPQ(i,s,r));

! Price linkages
!----------------
!Equation 15!
equation (linear) DOM_FOB
 # domestic - fob link #
(all,i,com)(all,r,regions)(all,s,regions)

p_EXPP(i,r,s) = p_OUTP(i,s);
!Equation 16!
equation (linear) AVE_CIF
 # average import price before duty #
(all,i,com)(all,r,regions)
p_PM(i,r) = sum(s,regions,SEBD(i,r,s) * p_EXPP(i,r,s));
!Equation 17!
equation (linear) PDINLINK
 # link between domestic and user price #
(all,i,com)(all,j,com)(all,r,regions)
p_INPD(i,j,r) = p_OUTP(i,r);
!Equation 18!
equation (linear) PIINLINK
 # landed price equals cif price plus duty #
(all,i,com)(all,j,com)(all,r,regions)
p_INPI(i,j,r) = p_PM(i,r) + duty1(i,r);
!Equation 19!
equation (linear) av_pr_IN
 # average price of inputs #
(all,i,com)(all,j,com)(all,r,regions)
inpa(i,j,r) =
   SIND(i,j,r)*p_INPD(i,j,r)  + SINI(i,j,r)*p_INPI(i,j,r);
!Equation 20!
equation (linear) AVRETPRD
  # change in price - domestic #
(all,i,com)(all,r,regions)
p_RTPD(i,r) = p_OUTP(i,r);
```

(Continued on next page)

C.3 **MFA model equations** (continued)

```
!Equation 21!
equation (linear) AVRETPRI
  # change in price - imported #
(all,i,com)(all,r,regions)
p_RTPI(i,r) = p_PM(i,r) + duty1(i,r);
!Equation 22!
equation (linear) av_pr_rt
 # average price of inputs #
(all,i,com)(all,r,regions)
rtpa(i,r) = SRTD(i,r)*p_RTPD(i,r)  + SRTI(i,r)*p_RTPI(i,r) ;

! Zero pure profits, revenue = costs
!-----------------------------------
!Equation 23!
equation zero_pure_profits
 # zerp pure profits #
(all,j,com)(all,r,regions)
OUTV(j,r) =  sum(i,com,INVD(i,j,r) + INVI(i,j,r)) +
              sum(v,factors,PRFV(v,j,r)) + OTHV(j,r);

! Market clearance for commodities
!---------------------------------
!Equation 24!
equation mkcl_eq_goods
 # market clearance by commodity and region #
(all,i,com)(all,r,regions)
OUTQ(i,r) = sum(j,com,INQD(i,j,r)) + RTQD(i,r) + TQE(i,r) + STKS(i,r);
!Equation 25!
formula&equation mkcl_eq_capital
 # market clearance for capital #
(all,j,com)(all,r,regions)
curcap(j,r)=PRFQ("fixed",j,r);

! Other equations
!-----------------
!Equation 26!
equation (linear) wage_rates
 # wage rates by region #
(all,j,com)(all,r,regions)
p_PP("lab",j,r) = fwage(r);
!Equation 27!
formula&equation value_added
 # value added by region #
(all,j,com)(all,r,regions)
VADDED(j,r) = sum(v,factors, PRFV(v,j,r));
```

The model's equations are listed in section 7 of box C.3. The model is represented as a series of equations in both levels and percentage change form that explain the various flows outlined in chart C.2. The model forms a system of simultaneous, non-linear equations. While there are a number of ways of solving such systems, we take advantage of the GEMPACK modelling package to do so. GEMPACK allows equations to be expressed either in non-linear form, or in percentage change linearisation, or as a mixture of both. In each case, GEMPACK uses multistep techniques to solve the underlying non-linear system. Generally, behavioural equations are more easily represented and understood in percentage change form, while identities and market clearing relationships are more easily expressed in the underlying levels form.

In understanding the model's notation, we observe the following conventions.

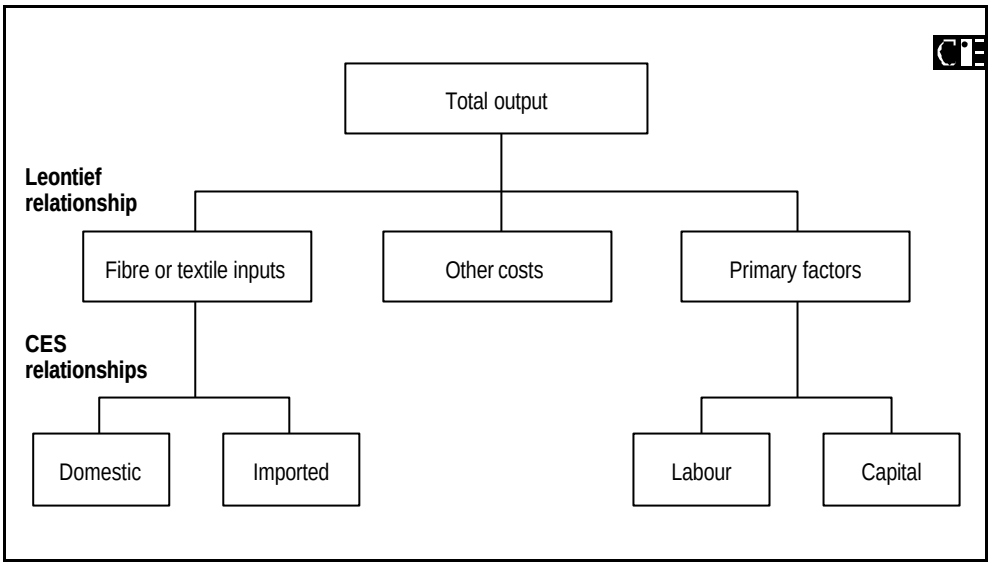
First, a system of variable identifiers is used to specify the dimensions over which the variable ranges. For example, consider the levels variable *INQI(i,j,r)* — which represents the quantity of imported input *i* into production process of industry *j* in region *r*. A typical example of this flow would be the input of imported woollen yarns into the fabric industry in the US.

Second, we make a distinction between levels and percentage change variables. We use lowercase variables or the prefix 'p_' to represent the percentage change in the corresponding upper case or levels variables. The percentage change representation of this variable on the GEMPACK system of equations would be *p_INQI(i,j,r)*. In some instances, percentage change variables are defined with no corresponding levels variables defined from the database and so are identified in all lowercase. For example, *cont(i,r)* represents the percentage change in the total consumption of apparel *i* in region *r*.

Demands for inputs by industry

These demands are described by equations to 1 to 4 in box C.3. An important ingredient in the model structure is the assumed production technology employed by model industries. Industries are assumed to maximise profits by adjusting outputs subject to the relationships represented schematically in chart C.4.

C.4 **Representation of industry cost structure**



To produce a unit of output, each model industry must combine inputs (fibre or textile inputs and other inputs) with primary factors (capital and labour) in a fixed (or Leontief) relationship with output. The starting cost share for each industry is determined by the database. Having determined demand for each aggregate input bundle, the industry can then substitute between inputs to maximise profits. The industry chooses between domestic and import fibre or textile inputs on the basis of relative prices and a substitution parameter. Similarly, the industry can adjust output by substituting labour for capital according to relative prices — namely, the wage rate and the rental or return to capital — and substitution parameters. For spinning industries, we modify the generalised structure to permit substitution between inputs within the fibre and textile input bundle — namely, to permit substitution between different fibres.

Equations 1 and 2 model the flows in matrices A and E of chart C.2. Demand for input *i* by industry *j* in region *r* is represented by a constant elasticity of substitution function (CES) expressed in percentage change form (see box C.5). Demand for domestically produced and imported inputs depends on two effects. The first is the percentage change in the level of output by industry *j* in region *r* (the scale effect). The second is choosing between domestic (p_INQD) and imported inputs (p_INQI) according to relative prices (the substitution effect). This equation contains parameters — shown as SIGM(i,r) describing the degree of substitution possible between domestic and imported inputs.

C.5 The CES functional form

In the construction of the MFA model, we have made extensive use of the constant elasticity of substitution (CES) functional form. This form is typical of an Armington style model. This particular representation has two advantages:

- it reduces the parameter input significantly over a generalised functional form; and
- it is easily represented in model equations in percentage change form.

The CES function is comprised of two components:

- a shift or scale effect
- a substitution effect.

This functional form describes the degree of substitution possible, through a price elasticity, which is determined by a substitution parameter and value shares calculated from the database. This form has the following characteristics.

- The higher the substitution parameter, the greater the substitution possibility:
  - if the CES parameter is set to 1.0 then the equation reduces to a Cobb–Douglas relationship; and
  - if the CES parameter is set to 0.0 then the equation reduces to a Leontief or fixed relationship.
- The higher the value share, given a substitution parameter, the more inelastic will be the resulting elasticity.

Equation 3 models the flows of the value-added component of costs (matrix I of chart C.2). Demands for primary factor *v*, namely labour and capital, by industry *j* in region *r* are also represented by CES functions in percentage change form. As with equations 1 and 2, the change in demand for primary factors depends on changes in industry output *z(j,r)* (the scale effect) and changes in the relative prices of the primary factors (the substitution effect). The change in the primary factor price *PP(v,j,r)*, for labour is the wage rate and for capital is the rate of return or payment to capital. This equation also contains CES parameters specifying the rate of substitution between labour and capital possible. When capital stocks are fixed, then the rate at which it is possible to add hired labour to increase output will determine the industry's supply response to changes in profitability.

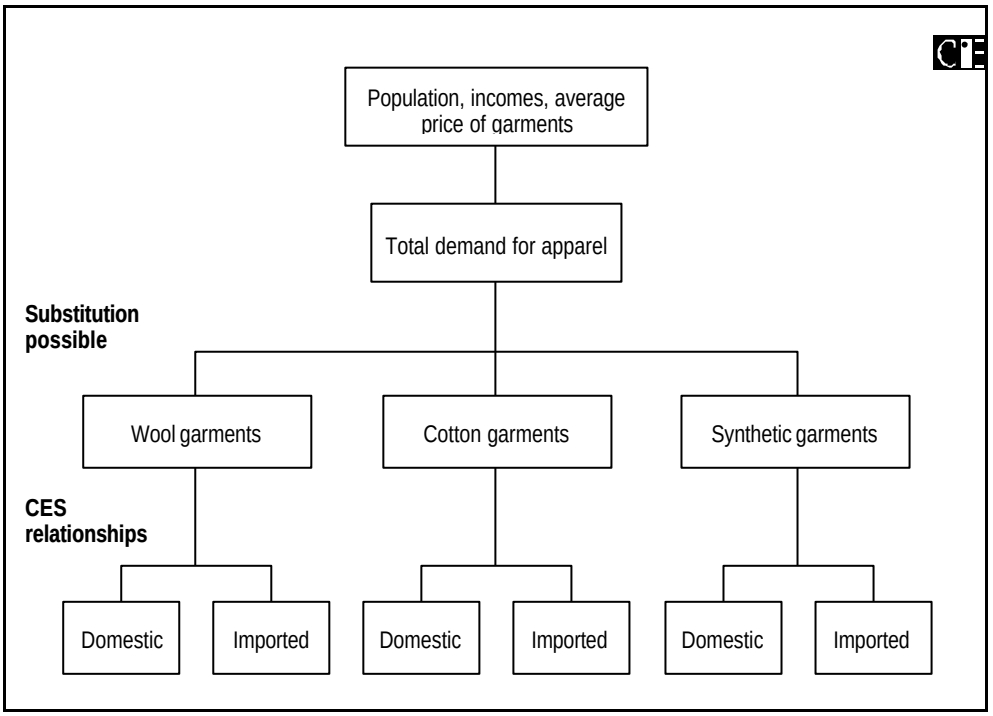
Equation 4 models the demand for 'other inputs' (matrix H of chart C.2), which are those inputs whose price is not explicitly determined by the model. Equation 4 states that, in percentage change terms, changes in the quantity demanded of other inputs will vary in proportion to changes in industry output levels.

Final demands by commodity

These demands are described by equations 5 to 7 of box C.3 and represent the flows in matrices B and F in chart C.2.

The assumed structure of final demands by commodity is critical to the outcome of any MFA phase out. The distinction between apparel and other fibre and textiles is necessary to understand the model theory. Final demands for fibre and textiles include household consumption and demands for inputs by industries outside of the apparel chain — this reflects that not all textiles are consumed by the apparel chain, such as production of bed and bath wear. Final demands for apparel are assumed to be all consumed by households and it is assumed that households can substitute between apparel of different fibre types on the basis of relative prices. The structure of the household decision for apparel is summarised in chart C.6 below.

C.6 **Structure of final demands for apparel**



At the first level of the decision by households, total demand for apparel depends on changes in population, incomes and changes in the average retail price of all apparel. Once this is decided, households can substitute between apparel of different fibres based on changes in relative prices. Preferences and ease of substitution between apparel types will be dictated by a matrix of own and cross price elasticities. At the final level of the

consumer's choice, demand for apparel by fibre is allocated between domestic suppliers and imports on the basis of relative price.

In percentage change terms, equation 5 explains aggregate demand for apparel by region as a function of changes in per person income and a general expenditure elasticity for all clothing, and changes in the average retail price of clothing and a general price elasticity. At the second level of the decision nest in box C.6, total demand for clothing is allocated to apparel by fibre. Equation 6, in percentage change terms, states that the demand for apparel by fibre type will be dependent on changes in demand for all clothing and changes in relative prices by a matrix of own and cross price elasticities. Equation 7 calculates the percentage change in the average retail price of all apparel as a share weighted sum of changes in prices of apparel by fibre — which is used in equation 5.

Equation 8 calculates the percentage change in final demands for commodities other than apparel as a function of changes in per capita income and retail prices. Key elasticities here are income and own price elasticities — we assume no cross price effects outside of the apparel group.

Finally, equations 9 and 10 describe decisions at the bottom of the nest in chart C.6, which allocates purchases of apparel by fibre type between domestically produced and imported sources. These equations use the CES functional form. The percentage change in demand by source depends on changes in total demand by fibre based apparel and changes in relative prices of domestic and imported product.

Output by industry

Equation 11 describes the supply of products by each industry in each region in percentage change terms. Each industry is assumed to produce a single output that changes in proportion with that industry's activity level.

Trade equations

This set of equations contains largely accounting identities that link trade volumes between regions. Equation 12 calculates total demand for imports for commodity *i* by region *r*. The percentage change in total demand for imports of commodity *i* in region *r* is equal to the share weighted sum of changes in demands by each industry and by final users. Equation 13 then determines demands for imports by source region using a CES function. The variable *p_EXPQ(i,r,s)* can be interpreted as the percentage change in demand for commodity *i* by region *r* from source country *s*. Demand by

source depends on changes in total demands for imports (the shift effect) and changes in relative landed prices (substitution effect). The variable *p_EXPP(i,r,s)* represents changes in the landed cost insurance freight (cif) price of imports to region *r* from source *s*. The variable *p_PM(i,r)* represents the change in the average cif price across supplying regions. The model parameter *SIGS(i,r)* determines the degree to which the importing country can switch between import sources. Equation 14 is an accounting identity in levels that calculates total exports by region as the sum of demand for exports by each destination.

Price linkages

Equations 15 to 22 identify price linkages within and between regions in the model. Equation 15 links *p_EXPP(i,r,s)* the free on board (fob) export price in percentage change terms for commodity *i* sold to region *r* from source country *s* to the farm or factory gate price. We assume constant ad valorem margins and taxes between the domestic and fob price. Equation 16 calculates *p_PM(i,r)*, the percentage change in the average landed price of commodity *i* in region *r* across all sources as a share weighted sum of component cost insurance freight (cif) prices.

Equation 17, in percentage changes terms, links the purchaser price of inputs sourced domestically by industry to the local farm or factory gate price. Equation 18, in percentage changes terms, links the purchaser price of imported inputs to the import price cif basis plus tariff or tariff equivalent payable.

Equation 19 calculates the percentage change in the average price of input *i* to industry *j* in region *r* as the share weighted sum of changes in domestic and imported cost of those inputs. This variable is used in the input demand equations 1 and 2.

Equations 20 and 21 link the percentage change in the purchaser's price of goods to satisfy final demands to the respective domestic and imported prices. Finally equation 22, calculates the percentage change in the average price of commodity *i* to final consumers in region *r* as the share weighted sum across domestic and imported goods.

Zero pure profits

Following from the assumption of competitive behaviour and constant returns to scale production technology, profits can only accrue to factors of production. Equation 23 equates, in levels terms, the total value of output

of industry *j* in region *r* to the costs of its production. Total costs of production equal the sum of intermediate input costs — fibre, yarns, fabrics and other inputs costs — and payment to primary factors which are capital and labour. This set of equations determines changes in industry output levels by region in response to changes in each industry's relative cost–price situation. There are no pure profits in the sense that every factor is allocated a return — profits can be thought of as a return to or payment to capital.

Market clearance

Equation 24 determines the prices of each commodity in each region at the farm or factory level by equating supply and demand. In levels form, total demand is equal to that consumed domestically, the sum of export demands across all destinations and any changes in stocks.

Equation 25 identifies the market clearance equation for fixed primary factors of production for each industry. For agricultural industries, namely wool and cotton growing, fixed primary factors of production include payments to land, capital and owner-operator labour. For the manufacturing industries, fixed factors include capital only. This equation determines the price or payment to the fixed factors and is the residual after all other costs have been accounted for.

Other equations

Equation 26 links the cost of labour of industry *j* in region *r* to the general wage rate for that region. This equation is purely to make the model easier to handle. The implicit assume is that the fibre, fabrics and apparel industries cannot affect the labour market in each region so that the cost of labour is exogenous. Finally, equation 27 is an adding up equation that calculates changes in value added by industry as the result of changes in MFA quotas.

Model parameters

The model's theory identifies a number of parameters and elasticities that are required to represent the maximising behaviour of consumers and firms. The choice of parameters is a key factor to model outcomes. These parameters also dictate the implied length of run of the simulation. In this case, we have a medium term focus of around three to five years. Table C.7 provides details for the main parameters and elasticities used in the MFA

C.7 **MFA model parameters and elasticities**

	Australia	*US*	*Rest of world*	*Australia*	*US*	*Rest of world*
	Import substitution parameter			*Supply elasticities*		
Wool – fibre	2.5	2.5	2.5	0.8	0.8	0.8
Cotton – fibre	2.5	2.5	2.5	1.0	1.0	1.0
Wool yarns	2.5	2.5	2.5	2.0	2.0	2.0
Cotton – yarns	2.5	2.5	2.5	2.0	2.0	2.0
Other – yarns	2.5	2.5	2.5	2.0	2.0	2.0
Wool fabrics	2.5	2.5	2.5	2.0	2.0	2.0
Cotton – fabrics	2.5	2.5	2.5	2.0	2.0	2.0
Other – fabrics	2.5	2.5	2.5	2.0	2.0	2.0
Wool apparel	2.5	2.5	2.5	2.0	2.0	2.0
Cotton – apparel	2.5	2.5	2.5	2.0	2.0	2.0
Other – apparel	2.5	2.5	2.5	2.0	2.0	2.0
	Income/expenditure demand elasticity of apparel			*Own price demand elasticity for apparel*		
Wool – fibre	0.0	0.0	0.0	0.0	0.0	0.0
Cotton – fibre	0.0	0.0	0.0	0.0	0.0	0.0
Wool yarns	0.3	0.3	0.3	-0.3	-0.3	-0.3
Cotton – yarns	0.3	0.3	0.3	-0.3	-0.3	-0.3
Other – yarns	0.3	0.3	0.3	-0.3	-0.3	-0.3
Wool fabrics	0.3	0.3	0.3	-0.3	-0.3	-0.3
Cotton – fabrics	0.3	0.3	0.3	-0.3	-0.3	-0.3
Other – fabrics	0.3	0.3	0.3	-0.3	-0.3	-0.3

Source: Cline (1987) and CIE estimates.

model. Following the lead of The Trade Partnership, textile and apparel elasticities taken from Cline (1987) provide a starting point for assigning model parameters.

Trade elasticities

The key trade parameters identified in the model theory are the import substitution parameters and the substitution parameter between alternative sources of supply. The import substitution parameter describes the ease of substitution between domestically produced and imported products. This parameter should reflect the degree of differentiation between sources. That is, if a commodity has little differentiation between sources, then the parameter would be set to a high value. Over the past 30 years, significant studies, based on either econometric or synthetic approaches, have attempted to estimate Armington elasticities for a range of commodities. One of the most extensive research programs was undertaken in Australia to supply parameters for the ORANI model of the Australian economy. Dixon et al. (1982) report high substitution possibilities for man-made fibres and yarns (2.4), cotton fibres and yarns (2.4), knitting mills (2.9) and clothing (3.4). Another comprehensive source of this type of information is the GTAP database, which reports domestic–import substitution elasticities invariant of region. For textiles, McDougall et al. (1998) uses a value of 2.2

for textiles, and for wearing apparel a value of 4.4. Following Cline (1987), we have set the import substitution parameters to 2.5, which is conservative against the available literature.

The CES substitution parameter between source reflects the degree of differentiation for each commodity between imported sources. The literature on such parameters is very small, but common sense would dictate that, if the domestic–import substitution parameter was high, then substitution possibilities between sources would also be high. GTAP follows the convention that the parameters reflecting the sourcing of imports are twice the domestic–import parameter. Here we follow a similar convention and adopt a parameter of 5.0, reflecting that commodities from different regions are close substitutes.

Supply elasticities

The theory listed above does not explicitly identify a supply elasticity for each industry by region but implies a supply response through the interaction of a number of equations. Key equations required to derive the implied supply elasticity are the primary factor demand equation and the zero pure profits equations. With capital stocks fixed, the key components needed to derive the response are the cost shares of labour and the fixed factors in total costs and the CES primary factor substitution parameter. Two general rules are useful in understanding the model's supply response. The higher the share of the payment to capital in total costs, the lower is the supply response. Also, the lower the substitution parameter between labour and capital, the lower the supply response because it is difficult to add more labour to the capital base to increase output. If the substitution parameter is set to zero, then the supply response of the industry will be zero in the presence of a fixed factor.

Our approach was to calibrate the CES primary factor substitution elasticity with cost shares from the database to imply supply elasticities reported in table C.7. Econometric evidence of supply elasticities for textile and apparel industries is difficult to find. The Trade Partnership, in their analysis of tariff equivalents of MFA quotas, followed Cline (1987), which assumed supply elasticities of 1.0 for textiles and apparel industries in the US. Casual observation of these industries indicates that they can adjust output quickly in response to changing economic conditions — even in the short term. We have assumed supply elasticities of 2.0 for textile and apparel industries by region as summarised in table C.7. For wool and cotton industries, reflecting a medium term supply response, we have assumed elasticities of 0.8 and 1.0 respectively.

Final demand elasticities

Table C.7 lists the own price and income–expenditure elasticities used in the MFA model for fibre, yarns and textiles. Following Cline (1987) we use an own price elasticity of -0.3 for all textiles in the United States. The same estimates have been used for Australia and the rest of the world.

The issue of substitution between apparel of different fibre types was identified as significant. In previous studies of this type, consumer behaviour was usually represented by an own price elasticity of demand by fibre — cross price effects were assumed to be negligible. However, many in the industry have recognised that consumers are sensitive to changes in relative prices between apparel of different fibre types at the retail level.

In appendix B we summarise the results from a study by Short and Beare (1990) of retail fibre substitution possibilities in the United States. Formally using the results in the MFA model is very difficult because of the following.

- The study by Short and Beare (1990) identifies substitution possibilities only between those products with which wool competes directly — namely, suits, coats, jackets, and knitwear. It excludes important items included in the MFA analysis including trousers, shirts and nightwear that make up a significant part of apparel demand.
- Short and Beare (1990) base their study on a consumer survey — the correct weights for aggregation of elasticities by category are not available.
- It is not clear if the elasticities presented are compensated or uncompensated and, being estimated by a different model structure, they are not readily compatible with the MFA model.

Rather, we use the results in an informal way, particularly the findings from the study that:

- the own price elasticity of demand for wool and synthetics in various categories of apparel is higher than that for cotton; and
- for various categories of apparel at the retail level, wool and cotton, and wool and synthetics are substitutes, but cotton and synthetics are complements.

Table C.8 lists the consumption elasticities used in the model. In the medium term, consumers are considered to be quite price inelastic for all apparel, with reasonably strong substitution permitted between apparel of

different fibre content. We source the aggregate price and income elasticities for apparel from Dewbre, Vlastuin and Ridley (1986).

Model closure

To solve any set of simultaneous equations, the number of endogenous variables must equal the number of equations. To do this we need to assign model variables as either endogenous or exogenous — this is known as the model closure. In addition to the mathematical requirements of solving the model, the model closure can be interpreted to tell us about the economic environment in which the simulation is conducted.

C.8 **Medium term demand elasticities used**

	Own price	*Income elasticity*
All apparel		
Australia	-0.4	0.6
United States	-0.4	0.6
Rest of world	-0.4	0.6

	Wool	*Cotton*	*Other*
Fibre demand elasticities			
Australia			
Wool	-1.09	0.30	0.79
Cotton	0.09	-0.72	0.63
Other	0.14	0.40	-0.54
United States			
Wool	-1.10	0.30	0.80
Cotton	0.03	-0.79	0.76
Other	0.09	0.82	-0.91
Rest of world			
Wool	-1.05	0.20	0.85
Cotton	0.04	-0.73	0.69
Other	0.13	0.56	-0.68

Source: CIE estimates.

Table C.9 lists variables that are typically exogenous.

The model variable d*uty1(i,r)* is an important policy variable for this study. It represents the tariff or tariff equivalent of an import restriction. To simulate the removal of the quota restriction of the MFA, we reduce the tariff equivalent of the total distortion down to the tariff rate.

Because the model is partial equilibrium, we have to make a number of assumptions about linkages with other sectors of the economy. Principally, we assume that the fibre, fabric and apparel sector is a small part of each economy and is therefore a price taker in the market for labour and other

inputs. Therefore the prices of these inputs, *p_po(j,r)* and fwage*(r)* are held exogenous.

C.9 **Exogenous variables of the MFA model**

Variable name	***Description***
duty1(i,r)	Power of the tariff or equivalent for commodity *i* in region *r*
p_po(j,r)	Price of other inputs for industry *j* in region *r*
ry(r)	Real income in region *r*
pop*(r)*	Population in region *r*
p_CURCAP(j,r)	Capital stock of industry *j* in region *r*
p_STKS(i,r)	Changes in stocks of commodity *i* in region *r*
tcon(i,r)	Preference shifter for consumption of commodity *i* in region *r*
fwage*(r)*	Wage rate in region *r*

Industry capital stocks by region are exogenous. This implies an adjustment environment where industries cannot expand output by investment in additional capacity.

Preference shifts and changes in stocks are also treated as exogenous.

Model database

In principle, the database for each model region is structured as shown in chart C.2. However, there is no single source of information that presents data consistently in this manner, so the database was assembled from a number of disparate sources. We now summarise the primary data sources from which the database was collated. To be consistent with the work completed by The Trade Partnership, data was collected for the base year 1996 where possible.

This section should give the reader an overview of the methodology behind the construction of the database. The text also identifies key difficulties and deficiencies in the database, but provides a robust framework for any further work. Due to their size and complexity, the computer files in spreadsheet format are available on request. These files detail sources of and calculations behind each element of the database.

Trade data

The core trade data set used in the construction of the database was the import and export data reported at six digit from the Harmonised System (HS) trade classification. The data obtained identified three regions — Australia, the United States and the rest of the world, and was reported in US$ millions. Although Australian and US trade data is available at the ten digit level of detail, data for the remainder of the world is only available at the six digit level of detail. This is because countries report their trade at different levels of detail — six digit is the highest detail available that is common across all countries.

A key requirement to use this trade data was to develop a concordance that categorises yarns, fabrics, apparel and other textiles by fibre. For consistency with the work completed by the Trade Partnership, we have used the US Textile and Apparel Category System concordance developed by the US Department of Commerce, Office of Textiles and Apparel (OTEXA). Using this concordance as a starting point, we made modifications to ensure consistency with the 800 or so applicable HS items at the six digit level. A complete listing of the concordance used is presented in appendix E. This concordance permitted the aggregation of trade data values for exports and imports by region.

Another requirement of the concordance was the aggregation of volumes reported in the trade data. This concordance needed to account for the fact that within HS chapters and between regions, the reporting units by HS6 item are not the same. For example, fabric data can be reported in square metres, tonnes, lineal metres and another category. Similarly, trade in apparel could be reported in a variety of units — tonnes, number / dozens of items. The US Textile and Apparel Category System provides a detailed set of conversion factors for these units back to square metre equivalents of fabric — that are based on the US 10 digit HS system. These factors could not be universally applied to the trade data because of the mix of units reported by each region. Therefore judgements were made on appropriate conversion ratios by comparison between regions and with available US ratios where possible. Other sources of conversion factors for textiles and clothing were also identified during the course of the study. The USDA uses a detailed concordance and set of conversion factors to calculate the net domestic availability of the major fibres within the US. However, this concordance has a different classification system to that used by OTEXA and the Trade Partnership and the USDA would not make the information available. The other source of such information is export conversion factors, back to a virgin wool basis, for eight major wool producing and consuming countries. These factors, available at HS6, are used by The Woolmark

Company to calculate net domestic availability of wool by region. Again, there was limited compatibility between these factors and the base OTEXA classification, and these factors were not used extensively.

United States

C.10 **Input–output relationships for United States textiles and clothing chain**

	Units	*Wool*	*Cotton*	*Man-made*	*Total*
Apparel					
Production	SME's	129.8	4216.0	3394.4	7740.3
	$m	2454.3	40948.9	40314.9	83718.1
Input of fabrics	SME's	129.8	4216.0	3394.4	7740.3
Input prices					
United States	$/SME	11.03	2.42	4.24	
Imports	$/SME	8.47	0.97	1.22	
Weighted price	$/SME	10.45	2.13	3.89	
Fabric cost	$m	1357.3	8990.9	13193.6	23541.8
Cost share in output	%	55.30	21.96	32.73	
Textiles					
Production	SME's	0	249.1	0	249.1
	$m	0	2980.0	0	2980.0
Input of fabrics	SME's	0	249.1	0	249.108
Input prices					
United States	$/SME	0	2.42	0	2.42
Imports	$/SME	0	0.97	0	0.97
Weighted price	$/SME	0	2.13	0	2.13
Input of fabrics	$m	0	531.2	0	531.2
Cost share in output	%	0	17.8	0	
Fabrics					
Production	SME's	138.4	8388.2	16402.0	24928.6
	$m	1526.8	20271.3	69550.5	91348.7
Input of yarns	SME's	138.4	8388.2	16402.0	24928.6
Input prices					
United States	$/SME	2.59	0.89	0.77	
Imports	$/SME	3.32	0.65	0.47	
Weighted price	$/SME	2.68	0.89	0.75	
Input of yarns	$m	371.1	7432.0	12318.7	20121.8
Cost share	%	24.3	36.7	17.7	22.0
Yarns					
Production	SME's	190.2	16741.5	22747.0	39678.8
	Grams/m2	270	117.6	145	
	kt	51.4	1969.6	3298.3	5319.3
	$m	493.2	14940.5	17475.1	32908.8
Input of fibre					
Assumed loss to yarns	%	0.90	0.90	0.96	
Raw fibre demand	kt	57.1	2188.4	3435.7	5681.3
Input prices					
United States	$/kg	3.60	2.08	1.75	
Imports	$/SME	4.00	1.70	1.50	
Weighted price	$/SME	3.80	1.70	1.63	
Input of fibres	$m	216.9	3720.3	5583.1	9520.3
Cost share	%	44.0	24.9	31.9	

Source: The Trade Partnership.

As part of their calculation of nominal rates of protection for 1996, The Trade Partnership collected detailed production and import data for yarns, fabrics and apparel by fibre for 1996 on a quantity and value basis. This involved the aggregation of US trade data, available at ten digit HS level of detail and detailed production data. These data were aggregated to a fibre basis using the US Textile and Apparel Category System developed by the US Department of Commerce, Office of Textiles and Apparel (OTEXA). The objective of this classification system was to calculate total import volumes and production using the common units of millions of square metre equivalents (SME) using OTEXA conversion ratios. This concordance, and conversion ratios, covers yarns (including tops), fabrics, apparel and the majority of textile products identified in the HS classification system. In the US, production of and trade in textile products, outside of the apparel sector, are concentrated in cotton based products such as bed and bathroom wear.

Because all quantities are calculated on an SME base, it is possible to establish cost linkages between each processing stage. These cost relationships for the US are summarised in table C.10. Because Trade Partnership data did not identify raw fibre use, it was necessary to make assumptions about fibre loss from the raw fibre to the yarn stage and the average weight of each type of fabric per square metre. Data on production by raw fibre for wool, cotton and synthetics was readily obtained from the USDA and the Fiber Organon.

Australia

Primary data sources for the Australian database were the Australian Bureau of Statistics (ABS), ABARE and The Woolmark Company. Up to date data for production and net trade in wool and cotton up to the early processing stage was readily available and easily incorporated. Data for later stage processing was not readily available for later years due to the relatively small size of the Australian industry and consequent confidentiality problems. ABS data for 1993-94 (the latest year for which the publication was produced) identified production volumes by fibre for yarns and some fabrics reported in a combination of SME's and tonnes. Data is not available on apparel production on a fibre basis. Data is only available on the basis of broad classification of article produced (for example, menswear). We therefore adopted a synthetic approach. Using fabric and trade data quantities, we calculated availability of fabric for apparel manufacture on a square metre equivalent basis. Using unit prices of apparel, primarily from trade data, we calculated the total value of

production of apparel and knitwear to be equal to the total value of production reported in the ABS manufacturing survey.

C.11 **Fibre composition of apparel categories**

An important component of this study is identifying the raw fibre contribution to each apparel category identified in the model. These categories are:

- wool and wool blends
- cotton
- other — mainly synthetics, but including other natural fibres.

In the construction of the database, a key simplifying assumption made was that there is a one-to-one correspondence between each part of the fibre–textile–apparel chain in each region. That is, we do not allow industries to combine different fibres, which may be important at the spinning stage. It is not possible to model fibre substitution for the following reasons:

- the available concordance and conversion factors were not sufficient to establish raw fibre equivalents of pure and blend apparel;
- if these conversion ratios were available, they could only be applied to trade data — because detailed information on production does not exist, estimation of equivalent data for production by region would not be possible; and
- little other information was available.

The International Wool Textile Organisation (IWTO) conducts an annual survey of materials consumed in the wool textile industries of certain countries. This survey covers processors who use wool as an import at the spinning stage. This survey reveals, on a quantity basis, that wool (and noils) accounts for 30 per cent of fibre input, which also includes hair and synthetics. The USDA also collects information for US wool and cotton sectors on fibres consumed — both principally use synthetics in the production of yarns. However, for both of these sources, there was not corresponding information on the composition of these firms' output — how much was predominantly wool and wool blend, and how much yarn would have been synthetic yarns. With more information or the use of a stylised production technology and cost input, fibre substitution could be included into the framework.

Rest of the world

Lack of consistent data beyond the raw fibre level was a significant constraint to the construction of the model database for this region. Again, we use a synthetic approach while ensuring consistency with known data.

Production quantities for wool, cotton and other fibres were readily available from the International Wool Textile Organisation (IWTO), the International Cotton Advisory Committee (ICAC) and the Fiber Organon. However, production of yarns, fabrics and apparel by fibre were made on the basis of a net domestic availability approach after adjusting for trade

volumes (exports and imports with Australia and the United States). Unit values from trade data were then used to calculate relevant values in production and consumption. The net availability approach has a significant disadvantage in calculation of fibres and fabrics used in the apparel chain. This is because we do not know what percentage of fibres and fabrics are used outside of the apparel chain — for example, the production of bathwear represents a significant use of cotton. For this analysis, we have recognised that carpet wool is a significantly different product to apparel wool and so production of carpets from broad wools has been excluded. Therefore for wool, we have assumed that it was sufficient to take a net availability approach.

One source of information for other fibres is ICAC who estimate total global production of cotton yarns and fabrics. These estimates less production in Australia and the United States, were used in production and input usage calculations for the rest of the world for cotton. However, no corresponding estimates for synthetic fibres were available and so the proportion of synthetic fibres used outside of the apparel chain is cannot be estimated. Therefore we have assumed that the ratio of synthetic fibres and yarns that enter the apparel chain for the rest of the world was the same as for cotton, for which we have data.

Another significant problem in the construction of the database for this region was the estimation of total apparel production in the rest of the world. As noted, the net availability approach is a guide but of limited use because of non-apparel uses. To obtain a final estimate of the value and volume of garment production in the rest of the world, we used available GTAP data for the value of global apparel production recorded in US$ million. Using unit values and consumption shares from the available trade data — which aggregates total trade in each commodity within the countries of the rest of the world region — we allocated the total value of the rest of the world production between commodity by fibre.

D *Fibre substitution in apparel consumption*

FIBRE SUBSTITUTION IN RESPONSE to relative price changes can take place at two stages in the apparel pipeline. Consumers choose between apparel with different fibre compositions on the basis of a range of price and non-price attributes. The spinning stage, where raw fibres are spun into yarns, is the other stage at which fibre mix decisions are made. To some extent, the derived demand for fibre is constrained by the consumer's preferences for fibre composition in the final garment. Substitution at the yarn stage depends on the extent to which different fibres can be spun into yarns with similar end-use characteristics.

The degree of fibre substitution possible is a key ingredient in determining the effects of changes in the relative price of fibres that arise from changes in trade barriers. The model's theory identifies the scope for final consumers to substitute between apparel of different fibre types based on changes in relative prices. In addition, fibre substitution is also possible at the yarn level of processing. In this appendix we briefly review the available literature to establish the nature and size of these substitution possibilities.

Empirical estimates

A number of studies have examined fibre substitution at various stages of the fibre-apparel chain. Dewbre, Vlastuin and Ridley (1986) used a two-stage estimation process where aggregate demand for final apparel products was determined at the first stage. Final demand was specified in two parts comprising a short run demand equation, a function of retail prices and incomes, and a stock-depreciation equation. Aggregate apparel fibre demand was then allocated between wool, cotton and synthetics in the second stage as a function of relative prices and cost minimising behaviour. The model used data for 1970 to 1983 from the eight major OECD wool consuming countries and produced short run (one year) and medium term (five years) elasticities. At the retail level, medium term elasticities were found to be lower than in the short term reflecting the asset characteristics of clothing. In the medium term for apparel, using a model that restricts depreciation to five years, elasticities for price and income

were estimated to be 0.41 and 0.6. At the fibre level, wool, cotton and synthetics were found to have own-price elasticities of around –0.2, indicating little scope for substitution in the medium term. Strongest possibilities were between wool and synthetics (table D.1).

D.1 **Medium term fibre substitution estimates, 1973–83** Mean values

Demand for:	*With respect to the price:*		
	Wool	*Cotton*	*Synthetics*
Wool	-0.23	0.09	0.14
Cotton	0.05	-0.24	0.17
Synthetics	0.16	0.06	-0.21

Source: Dewbre, Vlastuin and Ridley (1986).

Ball, Beare and Harris (1989) estimated fibre substitution using a translog approach from a cost minimisation model. As these represent derived demands from retail level consumption, the results (table D.2) are useful for the MFA model.

D.2 **Long run fibre demand elasticities, 1960–87** Mean values

Demand for:	*With respect to the price:*			
	Wool	*Cotton*	*Polyester*	*Rayon*
Wool	-0.70	0.31	0.41	-0.03
Cotton	0.34	-0.77	0.33	0.12
Polyester	0.31	0.22	-0.61	0.08
Rayon	-0.12	0.53	0.52	-0.93

Source: Ball, Beare and Harris (1989).

Short and Beare (1990) estimated fibre substitution possibilities at the retail level of demand between wool, cotton and synthetics, rather than at the raw fibre level. The study used household survey data across several end uses for the United States over the years 1974 to 1986. The end uses selected for men were: jackets, coats and knitwear, and for women were: skirts, jackets, suits with pants and knitwear. Results indicated that, within end uses, own-price estimates of wool and synthetics were found to be elastic with cotton being inelastic, with the exception of knitwear (table D.3). Cross price elasticities indicated that apparel of different fibres were fairly strong substitutes in consumption - except between cotton and synthetics due to the high level of blending between these fibres.

D.3 **Medium term apparel substitution estimates, 1974–86** Mean values

Demand for:	*With respect to the price:*		
	Wool	*Cotton*	*Synthetics*
Men's jackets			
Wool	-1.15	0.15	1.07
Cotton	0.90	-0.73	-1.11
Synthetics	0.36	-0.21	-2.07
Men's coats			
Wool	-1.96	1.77	3.76
Cotton	1.35	-0.74	-1.65
Synthetics	0.82	-0.37	-1.84
Men's suits			
Wool	-1.11	0.32	0.82
Cotton	1.54	-0.67	-2.27
Synthetics	0.82	-0.14	-2.01
Men's knitwear			
Wool	-1.53	0.30	0.57
Cotton	0.89	-1.18	-1.94
Synthetics	0.28	-0.09	-0.81
Women's skirts			
Wool	-0.82	0.61	-3.04
Cotton	0.22	-1.07	0.80
Synthetics	-0.36	0.24	-3.72
Women's jackets			
Wool	-0.78	0.90	-4.36
Cotton	0.41	-1.47	1.53
Synthetics	-0.62	0.47	-5.83
Women's pant-suits			
Wool	-0.78	0.37	-5.33
Cotton	0.08	-1.46	-0.25
Synthetics	-0.10	0.15	-2.04
Women's knitwear			
Wool	-0.88	0.42	-2.17
Cotton	0.23	-1.82	0.35
Synthetics	-0.16	0.16	-2.63

Source: Short and Beare (1990)

Swan Consultants (1992) analysed a range of factors, including fibre substitution, which affect wool demand in the United Kingdom. Mill level data was used for the United Kingdom worsted spinning sector – whose output is principally used to produce apparel. Fibre substitution at the spinning stage was examined using a cost function methodology incorporating the following fibres: crossbred and merino wool, three synthetic types and fine animal hair.

Table D.4 summarises the results from Swan Consultants (1992) for mean conventional input demand elasticities. The own price elasticities for crossbred and merino wools are –0.8 to –0.4 with reasonable cross substitution elasticities. A significant find was that demand for crossbred and merino wool is relatively unaffected by changes in prices of the four other fibres.

D.4 **Mean fibre input demand elasticities for the UK Worsted spinning sector, 1971–90**

Demand for:	*With respect to the price:*					
	Crossbred	***Merino***	***Hair***	***Acrylic***	***Polyester***	***Nylon***
Crossbred	-0.762	0.603	0.058	0.011	0.022	0.067
Merino	0.455	-0.441	-0.005	0.040	0.017	-0.066
Hair	0.097	-0.011	-0.044	-0.014	-0.027	-0.001
Acrylic	0.028	0.128	-0.020	-0.254	-0.068	0.187
Polyester	0.360	0.380	-0.307	-0.457	-0.392	0.419
Nylon	0.657	-0.932	0.040	0.841	0.250	-0.856

Source: Swan Consultants (1992).

However, decreases in wool prices significantly reduce the demand for some synthetics. The conclusion was that major fibre substitution possibilities exist between merino and crossbred wools, and between the synthetic fibre types.

Consistency between studies

The four studies summarised above address basically the same issue — fibre substitution either at the spinning stage or at the retail level — using different approaches and data sets. The evidence from these studies suggests that substitution between fibres is more significant at the retail level than at the spinning stage. At both levels of the processing chain, wool is a greater substitute for synthetics than for cotton.

As noted in appendix A, we have used the key findings that:

- the own price elasticity of demand for wool in apparel is higher than that for cotton; and
- wool and cotton, and wool and synthetics are substitutes, but cotton and synthetics are complements.

E Concordance between HS codes on yarns, fabrics and garments and model categories

E.1 Concordance between six digit HS codes and model categories

HS6	*Description*	*Code*[a]
Chapter 50: Silk including yarns and woven fabric		
500100	Silkworm cocoons suitable for reeling	AMN
500200	Raw silk (not thrown)	AMN
500310	Silk waste, not carded or combed	AMN
500390	Slk wste inc cocoon nsut rel yrn wste garn stk oth	AMN
500400	Slk yrn oth than spun fr slk wste nfor retail sale	YMN
500500	Yarn spun from silk waste not put up retail sale	YMN
500600	Slk yrn & yrn sp sl wst rtl sale worm gut	YMN
500710	Woven fabrics of silk or silk waste - noil silk	YMN
500720	Wov fab ov 85% silk or silk waste except noil slk	YMN
500790	Woven fabrics of silk or silk waste - other nesoi	YMN
Chapter 51: Wool and animal hair including yarns and woven fabric		
510111	Wool, not carded or combed, greasy, shorn	AW
510119	Wool n crd/cmb grsy inc fleece-wshd wool other	AW
510121	Wool n crd/cmb degreased n carbonized, shorn	AW
510129	Wool not crd/cmb degreased not carbonized other	AW
510130	Wool, not carded or combed, carbonized	YW
510210	Fine animal hair, not carded or combed	YW
510220	Fine or coarse animal hair not crd/cmb coarse hair	YW
510310	Waste of wool noils of wool or of fine animal hair	YW
510320	Waste of wool or of fine animal, nesoi	YW
510330	Waste of coarse animal hair, including yarn waste	YW
510400	Garnetted stock of wool/fine or coarse animal hair	YW
510510	Wool tops including combed wool in fragment carded wool	YW
510521	Wool tops, combed, in fragments	YW
510529	Wool tops and other combed wool: other	YW
510530	Fine animal hair, carded or combed	YW
510540	Coarse animal hair, carded or combed	YW
510610	Yarn carded wool not retail sale > 85% by wt wool	YW
510620	Yarn, carded wool, not retail, under 85% wt wool	YW

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
510710	Yarn, combed wool, not retail, not un 85% wt wool	YW
510720	Yarn combed wool not retail sale < 85% by wt wool	YW
510810	Yrn fine animal hr n put up for rtl sale carded	YW
510820	Yarn, fine animal hair, combed, not retail pk	YW
510910	Yarn & fine an hair, retail pk, not un 85% wl or h	YW
510990	Yarn of wl/fah put up for retail sale other	YW
511000	Yarn coarse animal hair put up or not retail sale	YW
511111	Wv fb crd wl/fah >=85% wl/fah weight <=300g/m2	FW
511119	Wov fab crd wl/fah >=85% wl/fah nesoi	FW
511120	Wov fab crded wool/fah oth mixed m/s man-made filt	FW
511130	Wov fab crded wool/fah oth mixed m/s man-made fibr	FW
511190	Woven fabrics carded wool/fine animal hair other	FW
511211	Wv fb cmb wl/fah >=85% wl/fah weight <=200g/m2	FW
511219	Woven fabrics of combed wool or fah >=85% wl/fah o	FW
511220	Woven fab comb mixed mm filaments wool/animal hair	FW
511230	Wov fab comb mixed mm staple fib wool/animal hair	FW
511290	Woven fabrics of cmbd wool/fine animal hair other	FW
511300	Woven fabrics of coarse animal hair or horsehair	FW
Chapter 52: Cotton including yarns and woven fabric+A26		
520100	Cotton, not carded or combed	AC
520210	Cotton yarn waste (including thread waste)	AC
520291	Cotton waste: garnetted stock other than yarn wast	YC
520299	Cotton waste, nesoi	YC
520300	Cotton, carded or combed	YC
520411	Cot sew thrd n retail 85% or more wgt of cotton	YCM
520419	Cot sewing thrd n retail 85% or more wgt of cotton	YCM
520420	Cotton sewing thread, put up for retail sale	YCM
520511	Cot yarn, 85% cot, not retail, not over 14 nm, su	YC
520512	Cot yarn, 85% cot, no retail, ov 14nm not ov 43nm	YC
520513	Cot yarn, 85% cot, no retail, ov 43nm not ov 52nm	YC
520514	Cot yarn, 85% cot, no retail, ov 52nm not ov 80 nm	YC
520515	Cot yarn, 85% cot, not retail, over 80 nm	YC
520521	Cot yrn n swg thrd > 85% wgt cot sngl yrn cmb <14n	YC
520522	Cot yrn n swg thd > 85% wt cot sng yr cm >14nm <43	YC
520523	Cot yrn n swg thd > 85% wgt cot sng yr cm >43nm <5	YC
520524	Cot yrn n swg thd > 85% wt cot sng yr cm >52nm <80	YC
520525	Cot yrn n swg thd > 85% wgt cot sng yrn cmbd > 80n	YC
520531	Cot yrn n swg thd > 85% wgt cot mlt/cbl yrn n >14n	YC
520532	Cot yrn n sw to > 85% wt ct ml/cb yr n >14nm & n>1	YC
520533	Cot yrn n sw td > 85% wt ct ml/cb yr >43nm <52nm	YC
520534	Cot yrn n sw td > 85% wt ct ml/cb yr > 52nm & n >8	YC
520535	Cot yrn n swg thd > 85% wt cot ml/cb yrn > 80nm	YC
520541	Cot yrn n swg thd >85% wt ct ml/cb yr cm n > 14nm	YC

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
520542	Ct yr n sw td > 85% wt ct ml/cb cmb > 14nm & n > 4	YC
520543	Ct yr n sw td > 85% wt ct ml/cb cmb > 43nm & n > 5	YC
520544	Ct yr n sw td > 85% wt ct ml/cb cmb > 52nm & n > 8	YC
520545	Cot yrn n swg thd > 85% wt ct ml/cb cmb > 80nm	YC
520611	Cot yrn n swh thd <85% c nrs sng yr u f <=14nm	YC
520612	3Ot yrn n sg t < 85% cot nrs sg yrn u f >14nm <=43	YC
520613	Cot yrn n sg t <85% cot nrs sg yrn u f > 43nm <=52	YC
520614	Cot yrn n sg t <85% cot nrs sg yrn u f >__52nm<=80	YC
520615	Cot yrn n sg t <85% cot nrs sg yrn u f > 80nm	YC
520621	Cot yrn n sg t < 85% cot nrs sg yrn c f < 14nm	YC
520622	Cot yrn n sg t < 85% cot nrs sg yrn c f > 14nm<=43	YC
520623	Cot yrn n sg t < 85% cot nrs sg yrn c f <43nm <=52	YC
520624	Cot yrn n sg t < 85% cot nrs sg yrn c f> 52nm <=80	YC
520625	Cot yrn n sg t < 85% cot nrs sg yrn c f > 80nm	YC
520631	Cot yrn sg t<85% cot nrs multi yrn uc f<14nm/s yrn	YC
520632	Cot yrn n sg t<85% cot nrs multi yrn uc f>14nm<=43	YC
520633	3Ot yrn n sg t<85% cot nrs multi yrn uc f>43nm<=52	YC
520634	Cot yrn n sg t<85% cot nrs multi yrn uc f>52nm<=80	YC
520635	Cot yrn n sg t <85% cot nrs multi yrn uc >80nm	YC
520641	Cot yrn n sg t<85% cot nrs multi yrn c f<14nm/s yn	YC
520642	Cot yrn n sg t <85% cot nrs multi yrn c f>14nm/s y	YC
520643	Cot yrn n sg t <85% cot nrs multi yrn c f>43nm<=52	YC
520644	Cot yrn n sg t <85% cot nrs multi yrn c f>52nm<=80	YC
520645	Cot yrn n sg t <85% cot nrs multi yrn comb f >80nm	YC
520710	Cotton yarn (n swg thd) retail sale 85% or > wt co	YCM
520790	Cot yrn n swg thd rtl sale oth 85% or > wgt cotton	YCM
520811	Wov cot fab, unbl pl wv nun 85% cot nov 100 g/m2	FC
520812	Wov cot fab, unbl pl wv nun 85%cot ov100nov200g/m2	FC
520813	Wov fab cot con >85% wgt <200g/m2 3-4twl unbleachd	FC
520819	Wov cot fab, unbl wea nesoi nun 85% cot nov200g/m2	FC
520821	Wov cot fab, bl pl wov nun 85% cot nov 100 g/m2	FC
520822	Wov cot fab, bl pl nu 85% cot ov100g/m2 nov200g/m2	FC
520823	Wov fab cot con >85% wgt <200g/m2 3-4twl bleached	FC
520829	Wov cot fab, bl wea nesoi nu 85% cot nov 200 g/m2	FC
520831	Wov cot fab, dye pl wv nun 85% cot nov 100 g/m2	FC
520832	Wov cot fab, dye pl w nun 85% cot ov100nov200g/m2	FC
520833	Wov fab cot con >85% wgt >100g/m2 3-4twl dyed	FC
520839	Wov cot fab, dye wea nesoi nu 85% cot nov 200 g/m2	FC
520841	Wov cot fab, d col yn pl wv nun 85% cot nov100g/m2	FCM
520842	Wov cot fab, dc yn pl wv nun85%cot ov100nov200g/m2	FCM
520843	Wov fab cot wgt <=200g/m2 3-4 thrd twl yr df cl	FC
520849	Wov cot fab, dcy wea nesoi nu 85% cot nov 200 g/m2	FC
520851	Wov cot fab, pr pl wv nun 85% cot nov 100 g/m2	FC

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
520852	Wov cot fab, pr pl wv nun 85% cot ov100nov200g/m2	FC
520853	Wov fab cot con >85% wgt <200g/m2 3-4twl printed	FC
520859	Wov cot fab, pr wea nesoi nun 85% cot nov 200 g/m2	FC
520911	Wov cot fab, unbl pl wv nun 85% cot ov 200 g/m2	FC
520912	Wov cot fab, 85% cot, unb 3-or4-th twill ov200g/m2	FC
520919	Wov cot fab, unbl wea nesoi nu 85% cot ov 200 g/m2	FC
520921	Wov cot fab, bl pl wv nun 85% cot ov 200 g/m2	FC
520922	Wov cot fab, 85% cot, bl 3-or4-th twill ov 200g/m2	FC
520929	Wov cot fab, bl wea nesoi nun 85% cot ov 200 g/m2	FC
520931	Wov cot fab, dye pl wv nun 85% cot ov 200 g/m2	FC
520932	Wov cot fab, 85% cot, dy 3-or4-th twill ov 200g/m2	FC
520939	Wov cot fab, dye wea nesoi nun 85% cot ov 200 g/m2	FC
520941	Wov cot fab, dif col yn pl wv nu 85% cot ov200g/m2	FCM
520942	Wov cot fab, blue denim nun 85% cot ov 200 g/m2	FCM
520943	Wov cot fab, 85% cot, yn dy 3-04-th twil ov200g/m2	FCM
520949	Wov cot fab >85% cot yn dy >200 g/m2 oth fabrics	FCM
520951	Wov cot fab, pr pl wv nun 85% cot ov 200 g/m2	FC
520952	Wov cot fab, 85% cot, pr 3-or4-th twill ov 200g/m2	FC
520959	Wov cot fab, pr wea nesoi nun 85% cot ov 200 g/m2	FC
521011	Wov cot fab, unbl pl wv un85%cot mmf nov200g/m2	FC
521012	Wov fab cot con <85% wgt <200g/m2 3-4twl ubleched	FC
521019	Wov cot fab, unbl wea nesoi un85%cot mmf no200g/m2	FC
521021	Wov cot fab, bl pl wv un85%cot mmf nov200g/m2	FC
521022	Wov fab cot con <85% wgt <200g/m2 3-4 twl bleached	FC
521029	Wov cot fab, bl wea nesoi un85%cot mmf nov200g/m2	FC
521031	Wov cot fab, dye pl wv un85%cot mmf nov200g/m2	FC
521032	Wov fab cot con <85% wgt <200g/m2 3-4twl dyed	FC
521039	Wov cot fab, dy wea nesoi un85%cot mmf nov200g/m2	FC
521041	Wov cot fab un85% cotmmf yndyed plwv nov 200 g/m2	FCM
521042	Wov fab cot <85% cot mx mmf <=200g/m2 ydc 3-4th tw	FCM
521049	Wov cot fab, dc wea nesoi un85%cot mmf nov200g/m2	FCM
521051	Wov cot fab, pr pl wv un85%cot mmf nov200g/m2	FC
521052	Wov fab cot con <85% wgt <200g/m2 3-4twl prtd	FC
521059	Wov cot fab, pr wea nesoi un85%cot mmf nov200g/m2	FC
521111	Wov cot fab, unbl pl wv un85%cot mmf ov200g/m2	FC
521112	Wov cot fab un85% cotmmf unb 3-or4-th tw ov200g/m2	FC
521119	Wov cot fab, unbl wea nesoi un85%cot mmf ov200g/m2	FC
521121	Wov cot fab, bl pl wv un85%cot mmf ov200g/m2	FC
521122	Wov cot fab un85% cotmmf bl 3-or4-th tw ov200g/m2	FC
521129	Wov cot fab, bl wea nesoi un85%cot mmf ov200g/m2	FC
521131	Wov cot fab, dye pl wv un85%cot mmf ov200g/m2	FC
521132	Wov cot fab un85% cotmmf dy 3-or4-th tw ov200g/m2	FC
521139	Wov cot fab, dye wea nesoi un85%cot mmf ov200g/m2	FC

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
521141	Wov cot fab <85% cot mixd mmf yn dy pl wv >200g/m2	FCM
521142	Wov cot fab, blue denim un85%cot mmf ov200g/m2	FCM
521143	Wov cot fab un85% cotmmf yn dy3-or4-thtw ov200g/m2	FCM
521149	Wov cot fab <85% cot m mmf ydc >200g/m2 ot fabrics	FCM
521151	Wov cot fab, pr pl wv un85% cot mmf ov200 g/m2	FC
521152	Wov cot fab un85% cotmmf pr 3-or4-th tw ov200g/m2	FC
521159	Wov cot fab, pr wea nesoi un85% cot mmf ov200g/m2	FC
521211	Wov cot fab un85% cot nesoi, unbl nov 200 g/m2	FC
521212	Wov cot fab un85% cot nesoi, bl nov 200 g/m2	FC
521213	Wov cot fab un85% cot nesoi, dyed nov 200 g/m2	FC
521214	Wov cot fab un85% cot nesoi, yn dy nov 200 g/m2	FC
521215	Wov cot fab un85% cot nesoi, print, nov 200 g/m2	FC
521221	Wov cot fab un85% cot nesoi, unbl ov 200 g/m2	FC
521222	Wov cot fab un85% cot nesoi, bl ov 200 g/m2	FC
521223	Wov cot fab un85% cot nesoi, dyed ov 200 g/m2	FC
521224	Wov cot fab un85% cot nesoi, yn dy ov 200 g/m2	FC
521225	Wov cot fab un85% cot nesoi, print ov 200 g/m2	FC
Chapter 53: Other vegetable textile fibres; paper yarn and woven fa brics of paper yarn		
530110	Flax, raw or retted	AMN
530121	Flax, broken, scutched, hackled other proc n spun	AMN
530129	Flax, hackled etc., not spun	AMN
530130	Flax tow and waste yarn waste and garnetted stock	AMN
530210	True hemp raw/process nt spun; tow & wste raw/rett	AMN
530290	True hemp processed not spun, tow & yarn waste	AMN
530310	Jute other textile bast fib ex flx hem raw retted	AMN
530390	Jute other tex bast fib tow wast proc nt sp other	AMN
530410	Sisal other textile fibers of the genus agave raw	AMN
530490	Sisal oth text fib gen agave tow waste nt sp other	AMN
530511	Coconut textile fibers, raw	AMN
530519	Coconut, tow, noils and yarn waste garnt stk other	AMN
530521	Abaca textile fibers, raw	AMN
530529	Abaca, tow, noils and yarn waste garnett stk other	AMN
530591	Ramie & other vegetable textile fibers nesoi, raw	AMN
530599	Ramie oth veg fib tow yn wast ex coco abaca, other	AMN
530610	Flax yarn, single	YMN
530620	Flax yarn, multiple (folded) or cabled	YMN
530710	Yarn of jute oth tex bast fib ex fl hp ram single	YMN
530720	Yarn of jute oth tex bast fibr multiple or cabled	YMN
530810	Yarn of other vegetable textile fibers; coir yarn	YMN
530820	Yarn of true hemp	YMN
530830	Yarn of other textile fibers; paper yarn	YMN
530890	Yarn of vegetable textile fibers nesoi	YMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
530911	Wov fab >=85% flax unbleached or bleached	FMN
530919	Woven fabrics >=85% by weight of flax other	FMN
530921	Woven fabrics <85% by weight of flax unbl/bleached	FMN
530929	Woven fabrics <85% by weight of flax other	FMN
531010	Wov fb jute/o tx bast f ex flx tr hmp & r rw/pns u	FMN
531090	Wov fab jute oth textile bast fiber exc ubl nesoi	FMN
531100	Wov fab of ot veg textile fib wov fab of ppr yarn	FMN
Chapter 54: Manmade filaments, including yarns and woven fabrics		
540110	Sewing thread synthetic filaments, for retail sale	YCM
540120	Sewing thread artificial filaments, retail or not	YCM
540210	Syn fil yarn ex sewing no retail, nylon etc	YMN
540220	Syn fil yarn ex sewing no retail, polyester	YMN
540231	Syn fil yn exsew no rt tx nylon yn nov 500 decitex	YMN
540232	Syn fil yn exsew no rt tx nylon yn ov 500 decitex	YMN
540233	Syn fil yn exsew no rt tx polyester	YMN
540239	Syn fil yn exsew no rt text nesoi	YMN
540241	Syn fil yn, nosew noret oth sing nov50t nylon etc	YMN
540242	Polyester part orient untwst/twst yn nt>50 turns/m	YMN
540243	Syn fil yn, nosew noret othsing nov50t polyest etc	YMN
540249	Syn fil yn, nosew noret othsing nov50t yarn nesoi	YMN
540251	Nylon filament yn twist >50 turns/m nt retail sale	YMN
540252	Polyester fila yn twist >50 turns/m nt retail sale	YMN
540259	Syn fila yarn exc nylon/polyester twst >50 turns/m	YMN
540261	Nylon filament yarn multiple/cabled nt retail sale	YMN
540262	Polyesters filmt yn multiple/cabled nt retail sale	YMN
540269	Syn fila yn exc nylon/polyesters multiple/cabled	YMN
540310	Art fil yn ex sew no ret hi ten visc rayon	YMN
540320	Art fil yarn exc sew no retail, text yarn	YMN
540331	Art fil yarn exc sew no retail sing visc rayon	YMN
540332	Viscose rayon twist >120 turns/m yn nt retail sale	YMN
540333	Art fil yarn exc sew no retail sing cell acetate	YMN
540339	Art fil yn exc sew no ret single yn nesoi	YMN
540341	Viscose rayon multiple/cabled not for retail sale	YMN
540342	Cellulose acetate multiple/cabled not retail sale	YMN
540349	Art fila exp viscose rayon/acetate multiple/cabled	YMN
540410	Syn monofil, nun 67 dec cr sect nov 1 mm	AMN
540490	Synthetic strip width not > 5mm	AMN
540500	Art monof, nun67dec crsnov1mm, strip etc nov5mm wd	AMN
540610	Syn fil yn, exc sew thread, for retail sale	YCM
540620	Artificial filament yarn put up for retail sale	YCM
540710	Wov fab syn fil hi ten nylon etc and polyester	FMN
540720	Synthetic filament yarn fabric from the strip	FMN
540730	Wov fab syn fil yn spec bonded in layers	FMN

(Continued on next page)

E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
540741	Wov fab syn fil yn nesoi 85% nylon unbl and bleach	FMN
540742	Wov fab syn fil yn nesoi 85% nylon etc dyed	FMN
540743	Wov fab syn fil yn nesoi 85% nylon etc yarn dyed	FMN
540744	Wov fab syn fil yn nesoi 85% nylon etc printed	FMN
540751	Wov fab syn fil yn nesoi 85% tex polyest bl unbl	FMN
540752	Wov fab syn fil yn nesoi 85% tex polyester dyed	FMN
540753	Wov fab syn fil yn nesoi 85% tex polyster yn dyed	FMN
540754	Wov fab syn fil yn nesoi 85% tex polyster printed	FMN
540760	Wov fab syn fil yn nesoi 85% nontex polyester	FMN
540771	Wov fab syn fil yn nesoi 85% syn fil nesoi unbl bl	FMN
540772	Wov fab syn fil yn nesoi 85% syn fil nesoi dyed	FMN
540773	Wov fab syn fil yn nesoi 85% syn fil nesoi yn dyed	FMN
540774	Wov fab syn fil yn nesoi 85% syn fil nesoi printed	FMN
540781	Wov fab syn fil yn nesoi un85% syn fil cot unbl bl	FMN
540782	Wov fab syn fil yn nesoi un85% syn fil cot dyed	FMN
540783	Wov fab syn fil yn nesoi un85% syn fil cot yn dyed	FMN
540784	Wov fab syn fil yn nesoi un85% syn fil cot printed	FMN
540791	Wov fabric synth filament yarn nesoi unbl bleached	FMN
540792	Wov fabric synth filament yarn nesoi dyed	FMN
540793	Wov fabric synth filament yarn nesoi yarn dyed	FMN
540794	Wov fabric synth filament yarn nesoi printed	FMN
540810	Woven fab of viscose rayon, high tenacity yarn	FMN
540821	Wov fab art fil ex ra 85% art fil unbl bl	FMN
540822	Wov fab art fil ex ra 85% art fil dyed	FMN
540823	Wov fab art fil ex ra 85% art fil yn dyed	FMN
540824	Wov fab art fil ex ra 85% art fil printed	FMN
540831	Wov fab art fil ex ra 85% art fil nesoi unbl bl	FMN
540832	Wov fab art fil ex ra nesoi, dyed	FMN
540833	Wov fab art fil ex ra 85% art fil nesoi yn dyed	FMN
540834	Wov fab art fil ex ra nesoi, printed	FMN
Chapter 55: Manmade staple fibres, including yarms and woven fabrics		
550110	Synthetic filament tow of nylon or other polyamide	AMN
550120	Synthetic filament tow of polyesters	AMN
550130	Synthetic filament tow acrylic or modacrylic	AMN
550190	Synthetic filament tow, nesoi	AMN
550200	Artificial filament tow	AMN
550310	Syn stp fib nt crd, cmb or prsd spng, nyl/ ot plym	AMN
550320	Syn stp fib nt crd, cmb or prsd spng: of polyester	AMN
550330	Syn stp fib nt crd, cmb or prsd spng, acry/modacry	AMN
550340	Syn stp fib nt crd, cmb or prsd spng: polyproplene	AMN
550390	Syn stp fib not card, cmb or prsd spng, nesoi	AMN
550410	Artif stp fib nt crd, cmb or prsd spng, vis rayon	AMN
550490	Art stp fib not crd, cmb or prsd spng: oth vis ryn	AMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
550510	Waste of synthetic fibers	AMN
550520	Waste of artificial fibers	AMN
550610	Syn stp fib crd cmb or prs spng nyl or oth plyamd	AMN
550620	Syn stpl fib crd cmb or prcd spng of polyester	AMN
550630	Syn stp fib crd cmb or prcd spng acrylic/mdacrylc	AMN
550690	Synt stp fib card comb or otrws prsd spng nesoi	AMN
550700	Artific stpl fiber crd cmb or othws prcd for spng	AMN
550810	Sew thd mmf stpl fib wth nt retail sale syn stp fb	YCM
550820	Sew thd art stpl fiber, retail or not	YCM
550911	Yrn n swg td sy st fb n rtl sl >=85% st f n/p sg y	YMN
550912	Yrn n swg td sy st fb n rtl sl>=85% st f n/p m/c y	YMN
550921	Yrn syn s fib nt for r s >85% wgt poly s fib s yrn	YMN
550922	Yrn n swg td sy st fb n rtl sl >=85% p st f m/c yr	YMN
550931	Yrn n swg td sy st fb n rtl sl >=85% ac/mac sfsy	YMN
550932	Yrn n swg td sy st fb n rtl sl >=85% a/mc s f m/c	YMN
550941	Yrn n swg td sy st fb n rtl sl >=85% o yr sy sf sy	YMN
550942	Yrn n swg td sy st fb n rt sl >=85% ot sy sf m/c y	YMN
550951	Yr n sw thd syn st fb n rt sl ply s f mix m/s art	YMN
550952	Yrn n swg thd syn st fb mx mnly/sly wl or fn an hr	YMN
550953	Yrn n sw th syn st fb n rt sl ply s f mix m/s cotn	YMN
550959	Yrn n sw td sy st f n rtl sl ot yr poly st f nesoi	YMN
550961	Yr n swg th syn st fb n rt sl o y ac/mac m w/fah	YMN
550962	Yr n swg th syn st fb n rt sl o y ac/mac mx cotton	YMN
550969	Yrn n sw th syn stp fib n rt sl ac/ma stp fib othr	YMN
550991	Yrn n swg th syn stp fb n rtl sl oth yrn mx wl/fah	YMN
550992	Yrn n swg th syn stp fb n rtl sl oth yrn mx cotton	YMN
550999	Yrn n sw th syn stp fib n rt sl ot yrns oth-nesoi	YMN
551011	Yrn n swg th art st fb n rt sl >=85% art s fb sn y	YMN
551012	Yrn n swg th art st f n rt sl >=85% art s f m/c yr	YMN
551020	Yrn n swg th art st f n rt sl ot yr m/s wool or fa	YMN
551030	Yrn n swg thd art stp fb n rt sl ot yrn m/s cotton	YMN
551090	Yrn nt swg thd art stp fib nt rtl sl ot yrn nesoi	YMN
551110	Yrn n sw th mm st fib rt sl syn stp fib >=85% s fb	YCM
551120	Yrn n swg th mmf st fb rt sl syn s f <85% wgt fib	YCM
551130	Yrn nt swg th mmf__stp fib pt up rt sl art stp fib	YCM
551211	Wv fb syn s f >=85% syn st fb >=85% ply sf ubl/blc	FMN
551219	Wov fab >=85% synth st fb poly stp fiber other	FMN
551221	Wov fab >=85% syn st fb >=85% acr/macr s f ubl/blc	FMN
551229	Wov fab >=85% syn st fib >=85% acr/mac s f other	FMN
551291	Wov fab >=85% syn st fib other unbleach/bleached	FMN
551299	Wov fab >=85% synthetic stp fib oth nesoi	FMN
551311	Wov fab pol st fb <85% sf m m/s c wt<170g/m2 u/b p	FMN
551312	Wov fb syn s f <85% mx ct <=170g/m2 ub/bl 3-4 t tw	FMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
551313	Wv fb pol s f <85% sf m cot wt<170g/m2 u/b owfpsf	FMN
551319	Wv fb syn sf <85% s f m cot wt<170g/m2 u/b ot wv f	FMN
551321	Wv fb pol sf <85% s f m cot wt<170g/m2 dy py sf pw	FMN
551322	Wov fb syn f <85% mx ct <=170g/m2 dyed__3-4 t tw	FMN
551323	Wv fb pol sf <85% s f m cot wt<170g/m2 dy owf p sf	FMN
551329	Wv fb syn sf <85% s f m cot wt<170g/m2 dy ot wv fb	FMN
551331	Wv fb pol s f <85% mx ct <=170g/m2 ydf py st fb pw	FCM
551332	Wv fb syn s f <85% mx ct <=170g/m2 3-4twl ply st f	FCM
551333	Wv f pol sf <85% s f m m/s cot <=170g/m2 ydc owfps	FCM
551339	Wv fb syn sf <85% s f m m/s cot <=170g/m2 ydc ow f	FCM
551341	Wv fb pol sf <85% s f m m/s cot <=170g/m2 prt psfp	FMN
551342	Wov fb syn s f <85% mx ct <=170g/m2 prntd 3-4 t tw	FMN
551343	Wv f pol sf <85% s f m m/s ct <=170g/m2 pr owfpsf	FMN
551349	Wv fb syn sf <85% s f m m/s ct <=170g/m2 prt ot wf	FMN
551411	Wov fab syn st fb <85% sf m m/s c wt>170g/m2 u/b p	FMN
551412	Wv fb pl sf <85% m ct >170g/m2 ub/bl 3-4td tl psf	FMN
551413	Wv fb syn s f <85% sf m cot wt>170g/m2 u/b owfpsf	FMN
551419	Wv fb syn sf <85% s f m cot wt>170g/m2 u/b ot wv f	FMN
551421	Wv fb syn sf <85% s f m cot wt>170g/m2 dy py sf pw	FMN
551422	Wv fb pl sf <85% m ct >170g/m2 dyed 3-4td tl psf	FMN
551423	Wv fb syn sf <85% s f m cot wt>170g/m2 dy owf p sf	FMN
551429	Wv fb syn sf <85% s f m cot wt>170g/m2 dy ot wv fb	FMN
551431	Wv fb syn sf <85% mx ct >170g/m2 ydc py sf pln wv	FCM
551432	Wv fb pol sf <85% s f m/ms ct >170g/m2 ydf 3-4t ps	FCM
551433	Wv f syn sf <85% s f m m/s cot > 170g/m2 ydc owfps	FCM
551439	Wv fb syn sf <85% s f m m/s cot > 170g/m2 ydc ow f	FCM
551441	Wv fb syn sf <85% s f m m/s cot > 170g/m2 prt psfp	FMN
551442	Wv fb pl sf <85% m ct >170g/m2 prntd 3-4td tl psf	FMN
551443	Wv f syn sf <85% s f m m/s ct > 170g/m2 pr owfpsf	FMN
551449	Wv fb syn sf <85% s f m m/s ct > 170g/m2 prt ot wf	FMN
551511	Oth wv fab syn ply st fb mx m/s vis ray staple fib	FMN
551512	Oth wov fab syn poly st fb mix m/s mnm filaments	FMN
551513	Oth wov fab syn poly stp fib mix m/s wl/fn anml hr	FMN
551519	Oth wov fab of syn poly stpl fibr other nesoi	FMN
551521	Oth wov fab syn acr/macr st fb mixed m/s mnm filmt	FMN
551522	Oth wov fab syn acr/macr st fb mix m/s wl/fn an hr	FMN
551529	Oth wov fab syn acr/macr staple fibers othr-nesoi	FMN
551591	Oth wov fab syn staple fib oth mix m/s mnm filmnts	FMN
551592	Oth wov fab syn stpl fib oth mix m/s wl or fn an h	FMN
551599	Other wov fab of synthetic stpl fibers other-nesoi	FMN
551611	Unblch/blch wov fabrc, artifcl stpl fbr>85% by wght	FMN
551612	Dyed wovn fabric, artificial stple fibr>85% by wght	FMN
551613	Wov fabrc, artfcl stapl fbr, yrn dif colr>85% by wgt	FMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
551614	Printed wovn fabric artifcial stpl fibr>85% by wgt	FMN
551621	Unbl/blch wv fab, artf stpl fbr<85%a-s-f;mx wth mmf	FMN
551622	Dyed wov fabrc, artf stpl fbr<85%a-s-f;mix with mmf	FMN
551623	Wv fab, art stpl fbr, yrn dif colr;<85%asf;mix w/mmf	FMN
551624	Prntd wv fabrc, artf stpl fbr<85%a-s-f;mix with mmf	FMN
551631	Unbl/blch wv fab, artf stpl fb<85%asf;wool/f-a hair	FMN
551632	Dyed wov fab, art stpl fbr<85%asf;mix wool/f-a hair	FMN
551633	Wv fab, art stpl fbr, yrn df colr;<85%asf;mix w/wool	FMN
551634	Prnt wov fab, art stpl fbr<85%asf;mix wool/f-a hair	FMN
551641	Unbl/blch wv fab, artf stpl fbr<85%asf;mix w/cotton	FMN
551642	Dyed wov fabrc, artf stpl fbr <85% asf;mix w/cotton	FMN
551643	Wv fab, art stpl fbr, yrn dif colr;<85%asf;mix w/cot	FMN
551644	Prntd wov fabrc, artf stpl fbr<85%asf;mixd w/cotton	FMN
551691	Other unblch/blch wov fabrc, artf staple fibr, nesoi	FMN
551692	Other dyed woven fabrics, artifcl staple fibr, nesoi	FMN
551693	Othr wov fabrc, artf stpl fibr, yrns diff colr, nesoi	FMN
551694	Other prntd wovn fabrics, artifcl staple fibr, nesoi	FMN
Chapter 56: Wadding, felt and nonwovens; special yarns, twine, cordage ropes and cables		
560110	Sanitary nap & tamp, diap & liner & simi arti wad	TC
560121	Wadding; other articles of wadding of cotton	TC
560122	Wadding; other articles of wadding of manmade fib	TMN
560129	Wadding; other articles of wadding, nesoi	TMN
560130	Wad of tex mat & art thereof:tex flo dust mill nep	TMN
560210	Needleloom felt and stitch-bonded fiber fabrics	FCM
560221	Oth felt nt impreg, coat, cov/lam wool/f anim hair	FW
560229	Oth felt nt impreg coated cov o lam o oth tex mat	FCM
560290	Felt, whether or not impregnated, coated etc nesoi	FCM
560300	Nonwovens, whether or not impregnated, coated etc	FCM
560410	Rub thread and cord tex covered	YCM
560420	Rub thr & crd, hgh ten yrn poly nyln etc impreg	YCM
560490	Rub thr & crd, nesoi	YCM
560500	Metal yrn whet o nt gimp tex yrn o strip w/metal	YCM
560600	Gimp yrn & strip, 5404/5405 chen yrn loop wale-yrn	YCM
560710	Twine cord rope & cable of jute or other tex bast	TMN
560721	Twine cord rope cable o sisal binder o baler twine	TMN
560729	Twine, cord, rope & cable, of sisal fibers, nesoi	TMN
560730	Twine whet/nt plait/impreg w/rub abaca/oth hrd fib	TMN
560741	Twine whet/nt plait/impreg w/rub polyeth bndr twne	YCM
560749	Twine whet/nt plait/impreg w/rub polyethylen nesoi	YCM
560750	Twine, cord whet/nt plait impreg w/rub oth syn fib	YCM
560790	Twine, cord whet/nt plait impreg w/rub/plast nesoi	YCM
560811	Knotted nett of twine, made up fish net, m-mde mat	FCM

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
560819	Knot net of twne mde-up fish net tex mat mmf nesoi	FCM
560890	Knot net of twine made-up fish net tex mat nesoi	FCM
560900	Art o yrn like of head 5404/5405 twine o cable nes	TMN
Chapter 57: Carpets and other textile florro coverings		
570110	Carpets&oth tex floor covr, wool/fine anml hr, knotd	TW
570190	Carpets&oth tex floor covr, oth tex materials, knotd	TMN
570210	Kelem, schumacks, karamanie, &similar hand-woven rugs	TMN
570220	Floor coverings of coconut fibers (coir), woven	TMN
570231	Carpets, etc of wool/fine animal hr, pile, nt made-up	TW
570232	Carpets, etc of mmf textl material, pile, not made-up	TMN
570239	Carpets, etc of other textl materl, pile, not made-up	TC
570241	Carpets, etc of wool/fine animal hair, pile, made-up	TW
570242	Carpets, etc of mmf textile materialss, pile, made-u	TMN
570249	Carpets, etc othr tex matrl, pile, made-up, not tufted	TC
570251	Carpets, etc wool/fine anml hr, wovn, not pile/mde-up	TW
570252	Textile carpets, wov no pile, mmf, not made up	TMN
570259	Carpets, etc othr tex mat, wov, not pile/made-up/tuft	TC
570291	Carpets, etc wool/fine anml hr, wovn, made-up, nt pile	TW
570292	Textile carpets, wov no pile, mmf, made up	TMN
570299	Carpets, etc othr tex mat, wov, made-up, notpile/tuft	TC
570310	Textile carpets, tufted, of wool	TW
570320	Carpets, etc, nylon/othr polyamides, tuftd, w/n mde-up	TMN
570330	Textile carpets, tufted, mmf except nylon etc	TMN
570390	Textile carpets, tufted, textile materials nesoi	TMN
570410	Textile carpets, felt, no tuft, tiles sur nov .3m2	TW
570490	Textile carpets, felt, not tufted etc. nesoi	TW
570500	Othr carpets&othr tex floor cov, whethr/not made-up	TC
Chapter 58: Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings and embroidery		
580110	Wov pile & chenille fabrics of wool/fine anim hair	FW
580121	Wov fabric of cot uncut weft pile	FCM
580122	Woven pile & chenille fabric of cut corduroy	FCM
580123	Wov fabric of cot, cut other weft pile	FCM
580124	Wov pile & chenille fab of cut warp epingle uncut	FCM
580125	Wov fab cot warp pile fab, cut	FCM
580126	Wov pile fab & chenille fab cot chenille fabrics	FCM
580131	Wov fab of m-made fiber uncut pile	FCM
580132	Wov pile & chenille fab of m-made fib cut corduroy	FCM
580133	Woven fab of m-made fibers, other weft pile	FCM
580134	Wov pile & chenille warp pile fab epingle (uncut)	FCM
580135	Wov fab of m-made faber, cut warp pile	FCM
580136	Wov pile fab & chenille fab mmf chenille fabrics	FCM
580190	Wov pile fab & chenille fab other textile material	FMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
580211	Terry towel & similar wov fab nt narrow cot unblch	FCM
580219	Terry towel & similar wov fab nt narrow cot, other	FCM
580220	Terry towel & sim wov terry fab oth tex ov 30 cm	FCM
580230	Tufted textile fab, oth than products of head 5703	FCM
580310	Gauze, nt narrow fabrics of heading 5806: of cot	FCM
580390	Gauze, over 30 cm wide, textile materials nesoi	FCM
580410	Tulles & oth net fab nt inc wov, knt or crohet fab	FCM
580421	Lace in pce, strip, motif mechanical made mmf	FCM
580429	Lace in piece, strips/motifs mech mde oth tex mat	FCM
580430	Lace in the piece, in strips/motifs handmade lace	FCM
580500	Hand-wov tapestries wall hang use only>$251/sq mtr	FW
580610	Wov pile fab (inc terry towel & sim) & chenile fab	FCM
580620	Nar wov fab nesoi >5% elastomeric yrn/rubber thrd	FCM
580631	Narrow woven fabrics, nesoi, of cotton	FCM
580632	Narrow woven fabrics, nesoi, of manmade fibers	FCM
580639	Other woven fabrics of nesoi textile materials	FCM
580640	Nar fab warp w/o weft assembled with an adhesive	FCM
580710	Textile labels, badges etc, not embroidered, woven	TC
580790	Textile labels, badges etc, not embroid, not woven	TC
580810	Braid in piece w/o embroid oth than knit/crocheted	FCM
580890	Orn trim pc w/o embroid n/kt croc, tasel, pom, etc	FCM
580900	Woven fabrics of metal thread & metalized yarn nec	FCM
581010	Embroidery without visible ground	FCM
581091	Embroid in pe, strip or motifs: oth embroid of cot	FC
581092	Embroid in pc, strip or motifs of mmf	TMN
581099	Embroid pe, strp/motif: oth embroid nesoi tex mat	FW
581100	Quilt tex prod pe 1> layr w/pad stch n/embr h 5810	FCM
Chapter 59: Impregnated, coated, covered or laminated textile fabrics		
590110	Textl fabrc, coatd w-gum/amylc, outer cover of books	FCM
590190	Tracing cloth;preprd paintg canvas;buckram-hat fnd	FCM
590210	Tire cord fabric of high tenacity yarn, nylon etc	FCM
590220	Tire cord fabric of high tenacity yarn, polyesters	FCM
590290	Tire cord fabric of high tenacity yarn, visc rayon	FCM
590310	Textile fabrics, impregnated etc nesoi with pvc	FCM
590320	Textile fabrics, impregn etc nesoi, polyurethane	FCM
590390	Textile fabrics, impregn etc nesoi, plastics nesoi	FCM
590410	Linoleum, whether or not cut to shape	NA
590491	Floor coverings coated etc on a non woven base	NA
590492	Floor covering coated etc on a nonwoven base nesoi	NA
590500	Textile wall coverings	NA
590610	Adhesive tape not over 20 cm wide	NA
590691	Rubberized textile fabrics nesoi, knit or crochet	FCM
590699	Rubberized text fabric nesoi, not knit or crochet	FCM

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
590700	Textl fabrc, coatd, etc, theatrcl scenery, back-cloths	FCM
590800	Textile wicks for lamps etc and gas mantles etc	NA
590900	Textile hosepiping and similar textile tubing	NA
591000	Transmsn/convyr belts, tex matrl, whthr/not reinfrcd	NA
591110	Text fabric for card clothing & other tech uses	NA
591120	Bolting cloth, whether or not made-up	FCM
591131	Textile fabrics etc, papermaking, under 650 g/m2	NA
591132	Textile fabrics etc, papermaking, 650 g/m2 or more	NA
591140	Textile straining cloth used in oil presses etc	NA
591190	Textile products etc for technical uses nesoi	NA
Chapter 60: Knitted or crocheted fabrics		
600110	Long pile fabrics, knitted or crocheted	FCM
600121	Looped pile fabrics of cotton, knitted or crocheted	FCM
600122	Looped pile fabrics man-made fiber, knit or crochet	FCM
600129	Looped pile fabrics other tex mat, knit or crochet	FW
600191	Other pile fabrics of cotton, knitted or crocheted	FCM
600192	Oth pile fabrics, man-made fibers, knitted/crocheted	FCM
600199	Other pile fabric other textile matrl knit/crochet	FW
600210	Knit or croch fab, nov30cm nun5% elast yn etc	FCM
600220	Knit or crochet fabric nesoi, not over 30 cm wide	FCM
600230	Othr knit/crchet fabrc >5% elastomrc yrn/rubr thrd	FCM
600241	Other warp knit fabric of wool or fine animal hair	FW
600242	Other warp knit fabrics(includng galloon)of cotton	FCM
600243	Other warp knit fabric(incl galloon)man-made fiber	FCM
600249	Other warp knit fabrics (including galloon); other	TMN
600291	Oth knit/crochet fabrc, wool/fine animal hair nesoi	FW
600292	Other knitted or crocheted fabrics of cotton, nesoi	FCM
600293	Oth knit/croch fabric nesoi, manmade fibers	FCM
600299	Oth knt/crochet fabric oth textile materials, nesoi	TMN
Chapter 61: Apparel articles and accessories, knitted or crocheted		
610110	M/b overcoats, carcoats, etc of wool, knit	GW
610120	M/b overcoats carcoats & similar art cotton, knit	GC
610130	M/b overcoats carcoats & similar art mmf, knit	GMN
610190	M/b overcoats carcoats & smlr art ot tex mat, knit	GMN
610210	W/g overcoats, carcoats, etc of wool, knit	GW
610220	W/g overcoat carcoat & similar art cotton, knit	GC
610230	W/g overcoats carcoats & similar art mmf, knit	GMN
610290	W/g overcoats carcoats & smlr art ot tex mtrl, knit	GMN
610311	Men's or boys' suits of wool, knit	GW
610312	Men's or boys' suits of synthetic fibers, knitted	GMN
610319	Men's or boys' suits, knit etc, textile mat nesoi	GMN
610321	M/b ensembles of wool, knit	GW
610322	Men's or boys' ensembles of cotton, knitted or cro	GC

(Continued on next page)

E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
610323	Men's or boys' ensembles of synthetic fibers, knit	GMN
610329	Men's or boys' ensembles, knit etc, textiles nesoi	GMN
610331	M/b suit-type jackets and blazers of wool, knit	GW
610332	M/b suit-type jackets and blazers of cotton, knit	GC
610333	M/b suit-type jacket & blazer synthetic fiber, knit	GMN
610339	Men's or boys' suit-ty jac, knit etc, text nesoi	GMN
610341	M/b trouser__overalls shorts etc wool, knit	GW
610342	M/b trousers overalls shorts etc cotton, knit	GC
610343	M/b trousers overalls shorts etc syn fibers, knit	GMN
610349	Men's or boys' trousers etc, knit etc, text nesoi	GMN
610411	W/g suits of wool, knit	GW
610412	Women's or girls' suits of cotton, knitted or croc	GC
610413	Women's or girls' suits of synthetic fibers, knitt	GMN
610419	Women's or girls' suits, knit etc, text mat nesoi	GMN
610421	W/g ensembles of wool, knit	GW
610422	Women's or girls' ensembles of cotton, knitted or	GC
610423	W/g ensembles of synthetic fibers, knit	GMN
610429	Women's or girls' ensembles, knit etc, text nesoi	GMN
610431	W/g suit-type jackets and blazers of wool, knit	GW
610432	W/g suit-type jackets and blazers of cotton, knit	GC
610433	W/g suit-type jackets/blazers synthetic fiber, knit	GMN
610439	Women's or girls' su-ty jac, knit etc, text nesoi	GMN
610441	W/g dresses of wool, knit	GW
610442	Women's or girls' dresses of cotton, knitted or cr	GC
610443	Women's or girls' dresses synthetic fibers, knit	GMN
610444	Women's or girls' dresses artificial fibers, knit	GMN
610449	Women's or girls' dresses of text mtrl nesoi, knit	GMN
610451	W/g skirts and divided skirts of wool, knit	GW
610452	W/g skirts and divided skirts of cotton, knit	GC
610453	W/g skirts & divided skirts of synthetic fib, knit	GMN
610459	Women's or girls' skirts etc knit etc, text nesoi	GMN
610461	W/g trousers overalls breeches shorts of wool, knit	GW
610462	W/g trousers overalls breeches shorts cotton, knit	GC
610463	W/g trouser overall breeches shorts syn fib, knit	GMN
610469	Women's or girls' trousers etc knit etc, tex nesoi	GMN
610510	Men's or boys' shirts of cotton, knitted or croche	GC
610520	Men's or boys' shirts of manmade fibers, knitted o	GMN
610590	Men's/boys' shirts of textile material nesoi, knit	GMN
610610	Women's or girls' blouses and shirts cotton, knit	GCM
610620	Women's or girls' blouses/shirts manmade fib, knit	GMN
610690	W/g blouses and shirts textile material nesoi, knit	GMN
610711	Men's or boys' underpants and briefs cotton, knit	GC
610712	Men's/boys' underpants & briefs manmade fiber, knit	GMN

(Continued on next page)

E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
610719	Men's/boys' underpant, & briefs, text matl nesoi, kt	GMN
610721	Men's or boys' nightshirt and pajamas cotton, knit	GC
610722	Men's/boys' nightshirt and pajamas manmade fib, kt	GMN
610729	M/b nightshirts & pajamas ot textile materials, kt	GMN
610791	Men's or boys' bathrobes and similar art cotton, kt	GC
610792	M/b bathrobes and similar article manmade fib, kt	GMN
610799	M/b bathrobes & similar art of text matl nesoi, kt	GMN
610811	Women's/girls' slips & petticoats manmade fib, kt	GMN
610819	W/g slips and petticoats ot textile materials, kt	GMN
610821	Women's or girls' briefs and panties cotton, knit	GC
610822	Women's/girls' briefs & panties manmade fiber, kt	GMN
610829	W/g briefs & panties of textile mat nesoi, knit	GMN
610831	W/g nightdresses & pajamas of cotton, knit	GC
610832	W/g nightdresses & pajamas manmade fibers, knit	GMN
610839	W/g nightdresses & pajamas ot textile material, kt	GMN
610891	W/g negligees bathrobes & similar art cotton, knit	GC
610892	W/g negligees bathrobes & similar art mmf, knit	GMN
610899	W/g negligees & similar art text matl nesoi, knit	GMN
610910	T-shirts, singlets, tank tops etc, knit etc cotton	GC
610990	T-shirts, singlets etc, knit etc, textiles nesoi	GMN
611010	Sweaters, pullovers etc, knit etc, wool	GW
611020	Sweaters, pullovers etc, knit etc, cotton	GC
611030	Sweaters, pullovers etc, knit etc, manmade fibers	GMN
611090	Sweaters, pullovers etc, knit etc, textiles nesoi	GMN
611110	Babies' garments & clthng access of wool, knit	GW
611120	Babies' garments & clthng access of cotton, knit	GC
611130	Babies' garments & clthng access syn fibers, knit	GMN
611190	Babies' garments etc, knit etc, textiles nesoi	GMN
611211	Track & warm-up suits etc, knit etc, cotton	GC
611212	Track & warm-up suits etc, knit etc, synth fibers	GMN
611219	Track & warm-up suits etc, knit etc, textile nesoi	GMN
611220	Ski suits, knitted or crocheted	GMN
611231	Men's or boys' swimwear of synthetic fibers, knitt	GMN
611239	M/b swimwear of other textile materials, knit	GMN
611241	Women's or girls' swimwear synthetic fibers, knit	GMN
611249	W/g swimwear of other textile materials, knit	GMN
611300	Garments, knit etc, coated etc rubber, plastic etc	GMN
611410	Other garments of wool or fine animal hair, knitte	GW
611420	Other garments of cotton, knitted or crocheted	GC
611430	Other garments of manmade fibers, knitted or croch	GMN
611490	Other garments of other textile materials, knitted	GMN
611511	Panty hose & tght syn fib meas <67 dctx/syn, knit	GMN
611512	Panty hose & tght syn fib 67 dctx or more/syn, knit	GMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
611519	Pantyhose & tights tex material ex synthetic, knit	GMN
611520	Women's hosiery < 67 dctx/single yarn, knit	GMN
611591	Socks & ot hosry & ftwr w/out appld sls wool, knit	GW
611592	Socks & other hosiery nesoi of cotton, knit	GC
611593	Socks & other hosiery nesoi of syn fibers, knit	GMN
611599	Socks & other hosiery textile materials nesoi, kt	GMN
611610	Gloves impreg ctd or cov w plas/rubber, knit	GMN
611691	Mittens and mitts of wool, knitted	GW
611692	Gloves, mittens and mitts of cotton, knitted or cr	GC
611693	Gloves, mittens and mitts synthetic fibers, knit	GMN
611699	Gloves, mittens & mitts other textile mtrl, knit	GMN
611710	Shawls, scarves, mufflers, veils & the like, knit	GMN
611720	Ties, bow ties and cravats, knitted or crocheted	GMN
611780	Other made-up clothing accessories, knitted or cro	GMN
611790	Parts of garments or of clothing accessories, knit	GMN
Chapter 62: Apparel articles and accessories, not knitted or crocheted		
620111	M/b overcoats carcoats similar art wool, not knit	GW
620112	Men's or boys' overcoats etc, not knit, cotton	GC
620113	Men's or boys' overcoats etc, not knit, mnmd fiber	GMN
620119	M/b overcoats carcoats smlr art ot tex mtrl, nt kt	GMN
620191	M/b anoraks, ski jackets & smlr art wool, not knit	GW
620192	M/b anoraks, ski jackets & smlr art cotton, nt kt	GC
620193	M/b anoraks ski jackets & smlr art manmade fib, nkt	GMN
620199	M/b anorak ski jacket & smlr art ot tex mtrl, n kt	GMN
620211	W/g overcoats raincoats & smlr article wool, n kt	GW
620212	Women's or girls' overcoats etc, not knit, cotton	GC
620213	Women's or girls' overcoats etc, not knit, mm fib	GMN
620219	W/g overcoats & similar coats ot tex mtrl, n knit	GMN
620291	W/g anoraks ski jackets & smlr articles wool, n kt	GW
620292	W/g anoraks ski jackets & smlr article cotton, n kt	GC
620293	W/g anoraks ski jackets & smlr articles mmf, n kt	GMN
620299	W/g anoraks ski jacket & smlr art ot tex mtrl, n kt	GMN
620311	Men's or boys' suits of wool, not knit	GW
620312	Men's or boys' suits of synthetic fibers, not knit	GMN
620319	Men's or boys' suits of textile mat nesoi, n knit	GMN
620321	Men's or boys' ensembles of wool, not knitted	GW
620322	Men's or boys' ensembles of cotton, not knitted or	GC
620323	Men's or boys' ensembles synthetic fibers, nt knit	GMN
620329	Men's or boys' ensembles, not knit, textiles nesoi	GMN
620331	M/b suit-type jackets and blazers of wool, nt knit	GW
620332	Men's/boys' suit-type jackets & blazers cot, n kt	GC
620333	M/b suit-type jackets & blazers synthetic fib, n kt	GMN
620339	Men's or boys' suit-ty jac, not knit, text nesoi	GMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
620341	M/b trouser overalls breeches shorts wool, nt knit	GW
620342	Men's or boys' trousers etc, not knit, cotton	GC
620343	Men's or boys' trousers etc, not knit, synth fiber	GMN
620349	Men's or boys' trousers etc, not knit, text nesoi	GMN
620411	W/g suits of wool, not knit	GW
620412	Women's or girls' suits of cotton, not knitted or	GC
620413	Women's or girls' suits synthetic fibers, not knit	GMN
620419	Women's or girls' suits, not knit, textiles nesoi	GMN
620421	Women's or girls' ensembles of wool, not knit	GW
620422	Women's or girls' ensembles of cotton, not knitted	GC
620423	Women's or girls' ensembles synthetic fibers, n kt	GMN
620429	Women's or girls' ensembles, not knit, text nesoi	GMN
620431	W/g suit-type jackets and blazers wool, not knit	GW
620432	W/g suit-type jackets and blazers cotton, not knit	GC
620433	W/g suit-type jackets & blazers syn fibers, n knit	GMN
620439	Women's or girls' suit-ty jac, not knit, tex nesoi	GMN
620441	Women's or girls' dresses of wool, not knitted	GW
620442	Women's or girls' dresses of cotton, not knitted o	GC
620443	Women's or girls' dresses synthetic fibers, nt kt	GMN
620444	Women's or girls' dresses artificial fibers, n kt	GMN
620449	Women's or girls' dresses ot textile mtrl, nt knit	GMN
620451	Women's/girls' skirts & divided skirts wool, nt kt	GW
620452	Women's/girls' skirts & divided skirts cotton, n kt	GC
620453	Women's/girls' skirts synthetic fibers, not knit	GMN
620459	Women's or girls' skirts etc, not knit, text nesoi	GMN
620461	W/g trousers overalls breeches shorts wool, nt knit	GW
620462	Women's or girls' trousers etc not knit, cotton	GC
620463	Women's or girls' trousers etc not knit, syn fiber	GMN
620469	Women's or girls' trousers etc not knit, tex nesoi	GMN
620510	Men's or boys' shirts of wool, not knit	GW
620520	Men's or boys' shirts, not knit, of cotton	GC
620530	Men's or boys' shirts, not knit, manmade fibers	GMN
620590	Men's or boys shirts ot textile materials, nt knit	GMN
620610	W/g blouses, shirts and shirt blouses silk, nt kt	GMN
620620	W/g blouses, shirts and shirt blouses wool, nt kt	GW
620630	W/g blouses shirts & shirt blouses cotton, not knit	GC
620640	W/g blouses, shirts & shirt blouses mmf, not knit	GMN
620690	W/g blouses shirts etc ot textile materials, nt kt	GMN
620711	M/b underpants and briefs of cotton, not knit	GC
620719	M/b underpants and briefs ot textile mtrl, not knit	GMN
620721	M/b nightshirts and pajamas of cotton, not knit	GC
620722	M/b nightshirts & pajamas manmade fibers, not knit	GMN
620729	M/b nightshirts & pajamas ot textile mtrl, nt knit	GMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
620791	Men's or boys' singlets etc, not knit, of cotton	GC
620792	Men's or boys' singlets etc, not knit, mnmd fibers	GMN
620799	Men's or boys' singlets etc, not knit, text nesoi	GMN
620811	W/g slips and petticoats manmade fibers, not knit	GMN
620819	W/g slips & petticoats ot textile materials, n kt	GMN
620821	W/g nightdresses and pajamas cotton, not knit	GC
620822	W/g nightdresses & pajamas manmade fibers, not kt	GMN
620829	W/g nghtdress & pajamas ot tetile material, n knit	GMN
620891	Women's or girls' undshirts etc, not knit, cotton	GC
620892	Women's or girls' undshirts etc, not knit, mm fibr	GMN
620899	Women's or girls' undshirt etc, no knit, tex nesoi	GMN
620910	Babies' grmnt & clthng accessories wool, not knit	GW
620920	Babies' garments & clthng access cotton, not knit	GC
620930	Babies' garments/clthng access syn fibers, not knit	GMN
620990	Babies' garments/clthng access ot tex mtrl, not kni	GMN
621010	Garments of fabric of felts/nonwoven	GMN
621020	M/b overcoats etc felts nonwoven impreg tex f, n kt	GMN
621030	W/g overcoat etc impregnated, rubberized etc. n kt	GMN
621040	Men's or boys' garments, not knit, coated etc	GMN
621050	Women's or girls' garments, not knit, coated etc	GMN
621111	Men's or boys' swimwear, not knitted or crocheted	GMN
621112	Women's or girls' swimwear, not knitted or crochet	GMN
621120	Ski-suits, not knitted or crocheted	GMN
621131	Men's or boys' other garments of wool, not knit	GW
621132	Men's or boys' other garments of cotton, not knitt	GC
621133	Men's or boys' other garments manmade fibers, n kt	GMN
621139	Men's or boys' ot garments ot textile mtrl, n knit	GMN
621141	Oth gar wom grls wol anml hr ex trk ski-suit smwr	GW
621142	Oth gar wom grls cotton ex track ski-suits swmwer	GC
621143	Oth gar wom grls mm fib ex track ski-suits swmwer	GMN
621149	Oth gar wom grls oth tex mtrls ex wl aml hr ct mm	GMN
621210	Brassieres, knit or crocheted or not	GMN
621220	Girdles & panty girdles, knit or crocheted or not	GMN
621230	Corsets, knitted or crocheted or not	GMN
621290	Braces suspenders garters art parts kt o ct nesoi	GMN
621310	Handkerchiefs, of silk or silk waste	GMN
621320	Handkerchiefs, of cotton	GC
621390	Handkerchiefs, of other textile materials	GMN
621410	Shawls scarves mufflers mantillas silk silk waste	GMN
621420	Shawls scarves and the like of wool, not knit	GW
621430	Shawls scarves and the like of synthetic fib, n kt	GMN
621440	Shawls scarves and the like artificial fiber, n kt	GMN
621490	Shawls scarves and the like textile mtrl nesoi, nkt	GMN

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E.1 **Concordance between six digit HS codes and model categories** (Continued)

HS6	*Description*	*Code*[a]
621510	Ties, bow ties and cravats, of silk or silk waste	GMN
621520	Ties bow ties and cravats manmade fibers, nt knit	GMN
621590	Ties, bow ties and cravats, of oth textile materl	GMN
621600	Gloves, mittens and mitts, not knit or crocheted	GMN
621710	Oth made-up clothing access part gar access nesoi	GMN
621790	Parts of garments and clothing accessories, nesoi	GMN
Chapter 63: Other textile articles; needlecraft sets; worn clothing and textile articles		
630110	Blankets and traveling rugs: electric blankets	TMN
630120	Blankets (nt elec) & traveling rugs of wool hair	TW
630130	Blankets (nt elec) & traveling rugs of cotton	TC
630140	Blanket (nt elec) & traveling rugs of synthetic fib	TMN
630190	Other blankets and traveling rugs	TMN
630210	Bed linen, knitted or crocheted	TC
630221	Bed linen, printed, of cotton, not knit or crochet	TC
630222	Bed linen, printed, of manmade fib, not knit etc	TMN
630229	Oth bed linen, printed, of textile materials nesoi	TMN
630231	Bed linen nesoi, of cotton, not knit or crocheted	TC
630232	Bed linen nesoi, of manmade fibers, not knit etc	TMN
630239	Other bed linen: of nesoi textile materials	TW
630240	Table linen, knitted or crocheted	TMN
630251	Table linen of cotton, not knitted or crocheted	TC
630252	Table linen of flax, not knitted or crocheted	TMN
630253	Table linen of manmade fibers, not knit etc	TMN
630259	Other table linen of textile materials nesoi	TMN
630260	Toilet & kitchen linen of cotton terry fabrics	TC
630291	Toilet & kitchen linen of cotton fabric exc terry	TC
630292	Nesoi bed, table, toliet & kitchen linen of flax	TMN
630293	Toilet & kitchen linen of manmade fibers	TMN
630299	Nesoi bed, tble, tolet & kit lin of nesoi tex mat	TMN
630311	Curtain (drapes) & int blnds/bd val kt/crochet cot	TC
630312	Curtain (drape) & inter blnd/bd val kt/cro syn fib	TMN
630319	Curt & intr blnd curt/bd val kt/croc nesoi tex mat	TMN
630391	Curtain & interior blinds/bed valances, nesoi, cot	TC
630392	Curtain & inter blinds/bed valances, nesoi syn fib	TMN
630399	Curt & int blnd curt/bd val nesoi tex mat nt kt/cr	TMN
630411	Bedspreads, knitted or crocheted textiles	TC
630419	Oth furnishing arti exc heading 9404 bedsprd nesoi	TC

[a] See appendix table E.2 for description of codes.

Source: CIE.

E.2 **Description of model codes**

Code	***Description***
AW	Wool fibre
AC	Cotton fibre
AMN	Man-made and other natural fibres
YW	Wool yarn
YC	Cotton yarn
YMN	Man-made and other natural fibre yarns
FW	Wool fabric
FC	Cotton fabric
FMN	Man-made and other natural fibre fabrics
GW	Wool garments
GC	Cotton garments
GMN	Man-made and other natural fibre garments
TW	Wool textiles
TC	Cotton textiles
TMN	Man-made and other natural fibre textiles

Source: CIE.

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