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.

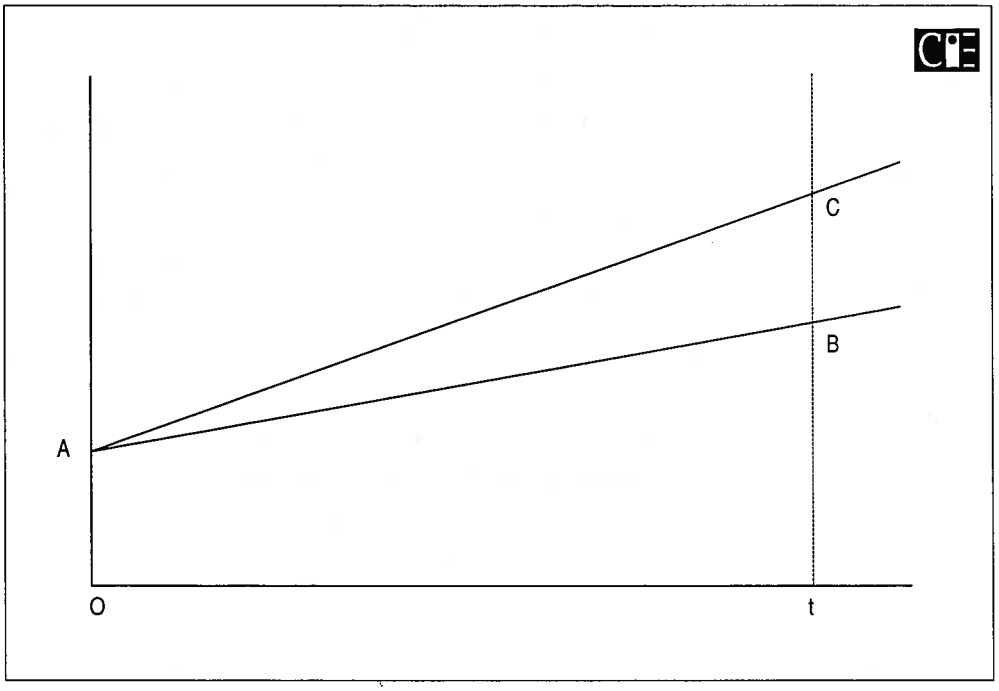
Comparative–statics

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

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



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

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)

```
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.

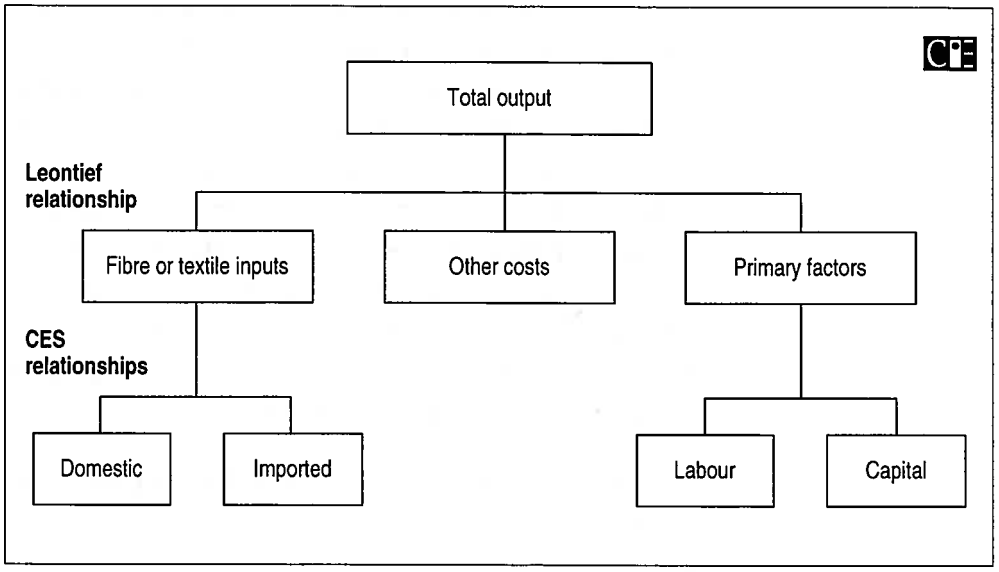
First, a system of variable identifiers is used to specify the dimensions over which the variable ranges. For example, consider the levels variable *INQI(i,j,r)* — which represents the quantity of imported input *i* into production process of industry *j* in region *r*. A typical example of this flow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

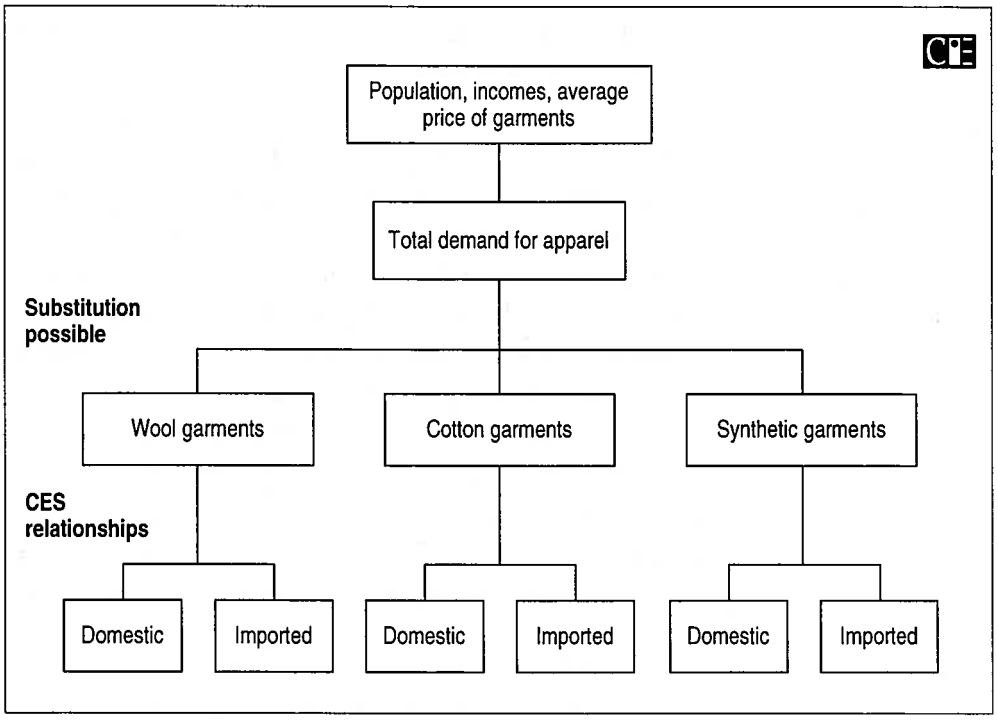
Equation 4 models the demand for 'other inputs' (matrix H of chart C.2), which are those inputs whose price is not explicitly determined by the model. Equation 4 states that, in percentage change terms, changes in the quantity demanded of other inputs will vary in proportion to changes in industry output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

(Continued on next page)

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

(Continued on next page)

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

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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

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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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