Volume 6 Number 2, 2005/p. 267-273 esteyjournal.com

The Estey Centre Journal of
International Law and Trade Policy

Technical Annex

Assessing the Impacts of the Chinese TRQ System and U.S. Subsidies on the World Cotton Market

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This document is the technical annex to the full paper "Assessing the Impacts of the Chinese TRQ System and U.S. Subsidies on the World Cotton Market" which is available separately.

Economic Analysis of Domestic Price Supports

The model of domestic price support presented here follows that of familiar three-panel diagrams of two-region, partial-equilibrium, static world trade models. The three panels of figure A1 depict price-quantity graphs based on supply and demand interactions in the domestic markets of the exporting country (figure A1a), the rest of the world (figure A1c), as well as the world market as a whole (figure A1b). Lines S_X^1 and D_X^1 represent initial supply and demand functions in the exporting country, and lines S_M^1 and D_M^1 represent initial supply and demand functions in the rest of the world. The intersection of the excess supply (ES^1) and excess demand (ED^1) functions derived from the two regions indicates the equilibrium world market price (P_W^1) in the

absence of trade interventions. The domestic prices in the two countries are equal to the world price, and the quantity of world trade, Q_T^1, is equal to exports (X_S^1-X_D^1) in panel (a) and imports (M_D^1-M_S^1) in panel (c).

In the example presented here, the exporting nation implements a minimum domestic price support of P_L (i.e., the U.S. loan rate for cotton). This policy results in an increase in the supply (X_S^2) of the affected commodity by creating a perfectly inelastic supply function up to the established minimum price. This increase in domestic supply in (a) kinks the excess supply curve in the world market to ES^2. The new world market price declines to P_W^2. The effects of the policy are a lower domestic price in the exporting country, a lower world market price, and an increase in world trade (from Q_T^1 to Q_T^2) due to increased exports from (a) (X_S^2-X_D^2> X_S^1-X_D^1) and increased imports in (c) (M_D^2-M_S^2> M_D^1-M_S^1) due to lower supply in the rest of the world.

Though not depicted here, an additional impact of this policy is felt by other exporting countries that do not interfere in their domestic markets for the commodity in question. The lower world price lowers their production and exports. The net effect of the policy is to increase the market share of the exporting country with the policy of domestic price support at the expense of non-subsidizing competitors.

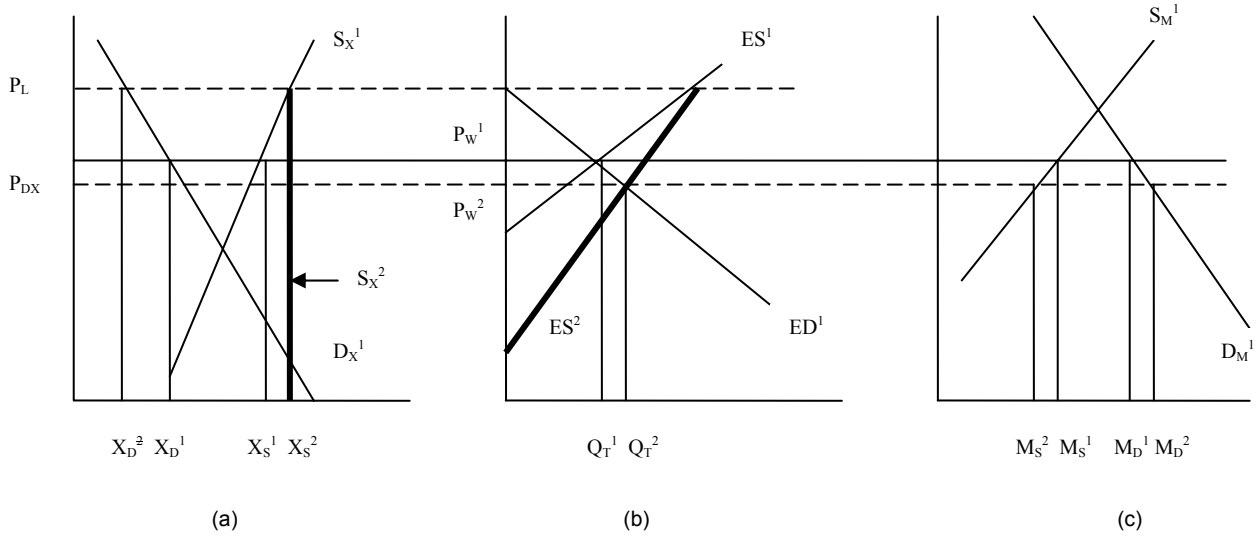

Figure A1 The effects of a minimum price support subsidy by the exporting country.

Economic Analysis of Tariff-rate Quotas

The basic economic concept of a TRQ is to allow a specified quantity of imports to enter a country at a minimal tariff ("within-quota tariff"), while charging a much higher tariff on any additional imports ("above-quota tariff"). Gaisford and Kerr (2001) refer to TRQs as a hybrid of import quotas and tariffs. Import quantities are not limited or restricted as with conventional quota systems, but the allowance for an above-quota tariff may effectively serve to limit import volume to the same levels as would a traditional quota.

Following the same format as figure A1, figure A2 demonstrates the effects of imposition of a TRQ by a large importing country on the world market. The supply/demand interactions of the domestic importing country are shown in panel (c) of figure A2, and those of the rest-of-the-world market are shown in panel (a). The world market interchange is shown in panel (b). Again, initial equilibrium conditions of supply, demand, quantities, and prices are given by superscript 1. The imposition of a TRQ by the importing country is shown by the inelastic portion of the excess demand curve in the world market. A TRQ makes the import demand curve discontinuous at the quota level in panel (b) (Q^{TRQ}). At this import quantity and above, the TRQ serves as a pure tariff that increases the import price of the commodity (P_{DM}) and decreases demand. At import levels below the specified quantity (Q^{TRQ}), the TRQ is not binding and normal supply and demand interactions hold. Under a TRQ policy, the effective excess demand function becomes ED^2. The vertical line segment on demand function ED^2 represents the level of the TRQ, below and beyond which there is a supply and demand response by domestic producers and commodity users in both the importing country and the exporting nations.

With lower demand in the world market due to the TRQ, the rest-of-the-world market will be affected. The TRQ in the importing country lessens demand in panel (b), as shown by the kinked excess demand curve (ED^2). This results in a lower world price (P_W^2) and a higher price in the importing country, P_{DM}. The lower world price causes an increase in the quantity demanded in the exporting country (X_D^2), a decrease in the quantity supplied (X_S^2), and a net decrease in the amount of exports (X_S^2-X_D^2<X_S^1-X_D^1). In the importing country, the higher domestic price causes an increase in domestic production (M_S^2) and a decrease in import demand (M_D^2). The effect on net imports is negative to match decreased exports from the rest of the world (M_D^2-M_S^2<M_D^1-M_S^1). This effect is additionally shown by the decrease in world trade from Q_T^1 to Q_T^2.

As this model demonstrates, the degree to which a TRQ restricts market access is dependent on several factors: (1) the level of demand, (2) the within-quota tariff, (3) the above-quota tariff, and (4) the quota or import level (which defines the volume of imports to which the within-quota tariff applies). The establishment and administration of a TRQ may allow for the accomplishment of open market access as per the goals and purposes of the WTO or may continue to inhibit trade much as would traditional import-restricting quotas.

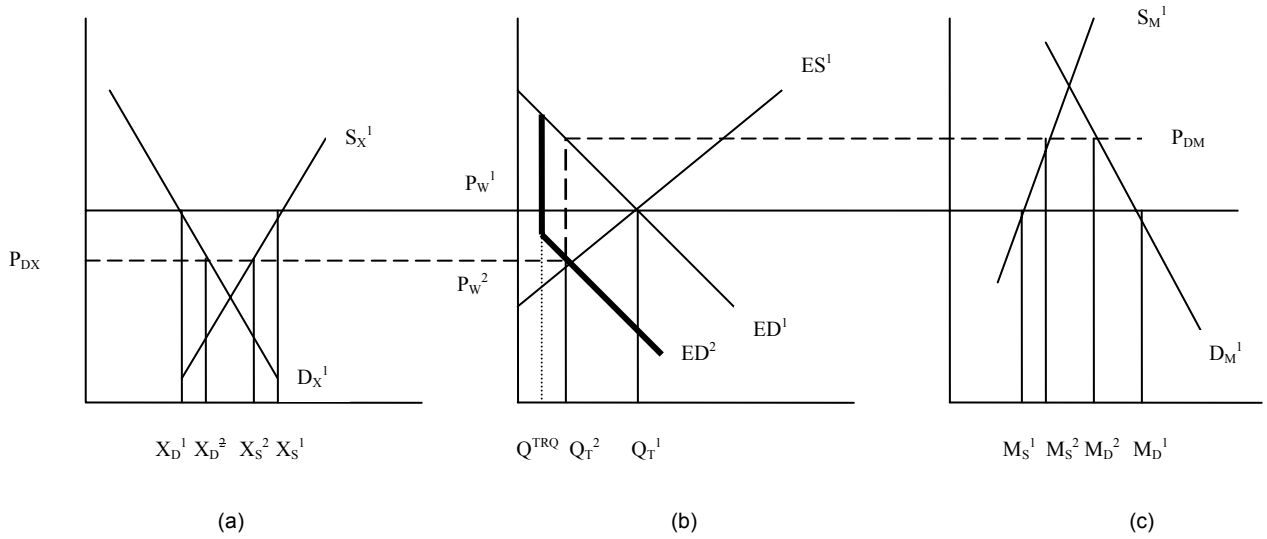

Figure A2 The effects of a tariff-rate quota by the importing country.

Basic Model Structure

A partial-equilibrium world fibre model is utilized to estimate the effects of both U.S. cotton subsidy programs and China's TRQ on the world market. This model incorporates the regional supply response of cotton, different competing goods in different producing regions, substitutability between cotton and competing fibres, and linkage between raw fibre and textile sectors. As shown in figures A3 and A4, the China and U.S. textile models include supply, demand, ending stocks, and market equilibrium for cotton and man-made fibres. Cotton A-index, Chinese domestic cotton price, U.S. cotton textile price index, U.S. non-cotton price index, U.S. farm price, and polyester prices are endogenously solved in the models by respectively equalizing

world exports and imports, Chinese domestic cotton supply and demand, U.S. cotton and non-cotton textile supply and demand, U.S. domestic cotton supply and demand, and man-made fibre supply and demand.

Chinese cotton mill use (see figure A3) is estimated following a two-step process in which total textile fibre mill use is first estimated as a residual of textile fibre consumption and the net trade of textile fibre, followed by allocations among various fibres such as cotton, wool, and man-made fibres (represented by polyester) based on their relative prices. U.S. cotton and non-cotton textile mill use (see figure A4) is solved endogenously with the domestic textile demand and textile net trade (net imports).

U.S. cotton production (see figure A4) is modeled using separate acreage and yield equations. Cotton production is a function of last year's cotton net returns and the relative net return(s) of competing crops. As part of the total U.S. cotton supply, imports and exports are functions of domestic price, international price (A-index), exchange rates, tariff rates, and quota restrictions. Similarly, the U.S. man-made fibre model is modeled using capacity and utilization. The capacity and utilization equations are estimated by the man-made fibre price and petroleum spot price.

Model Estimation and Validation

A complete list and definitions of all data sources, variables in the model, parameter estimates, and calculated supply, demand, and price transmission elasticities for the major countries/regions are available from the authors. For more information on parameter estimates and diagnostic statistics, refer to documentation of the world fibre model found in Pan et al. (2004b).

The Mean Square Error, its components, and Theil inequality coefficients for the variables included in the U.S. and Chinese models were calculated. Based on the results, most of the bias and regression components' values are close to zero, indicating that the simulated values do not tend to be higher or lower than their actual values. The disturbance components for most variables are close to one, which indicates that most of the errors in the simulated values are associated with randomness in the actual data series. Most of the Theil inequality coefficients are close to zero, which indicates the model performs well.

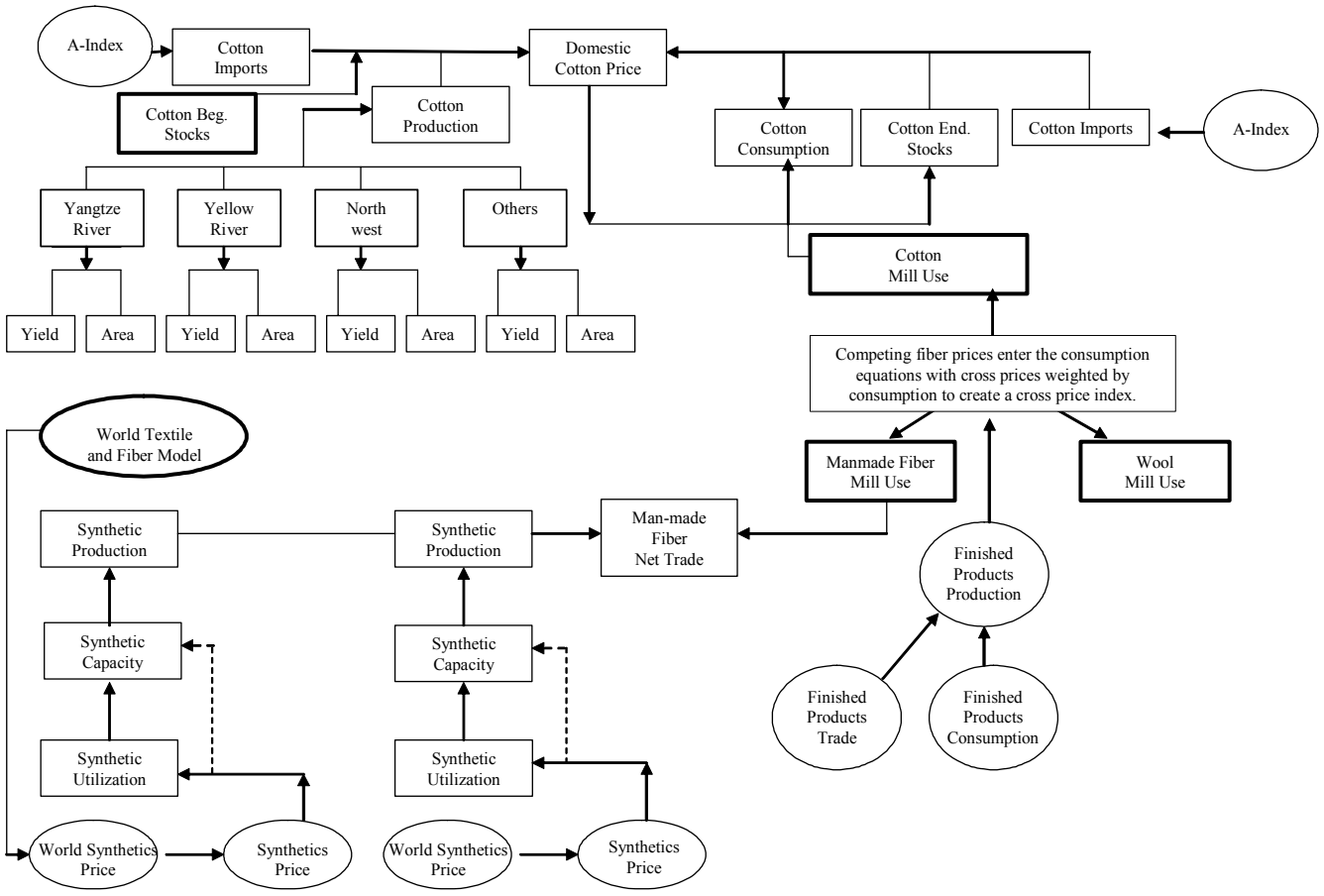

Figure A3 Schematic representation of the Chinese fibre model.

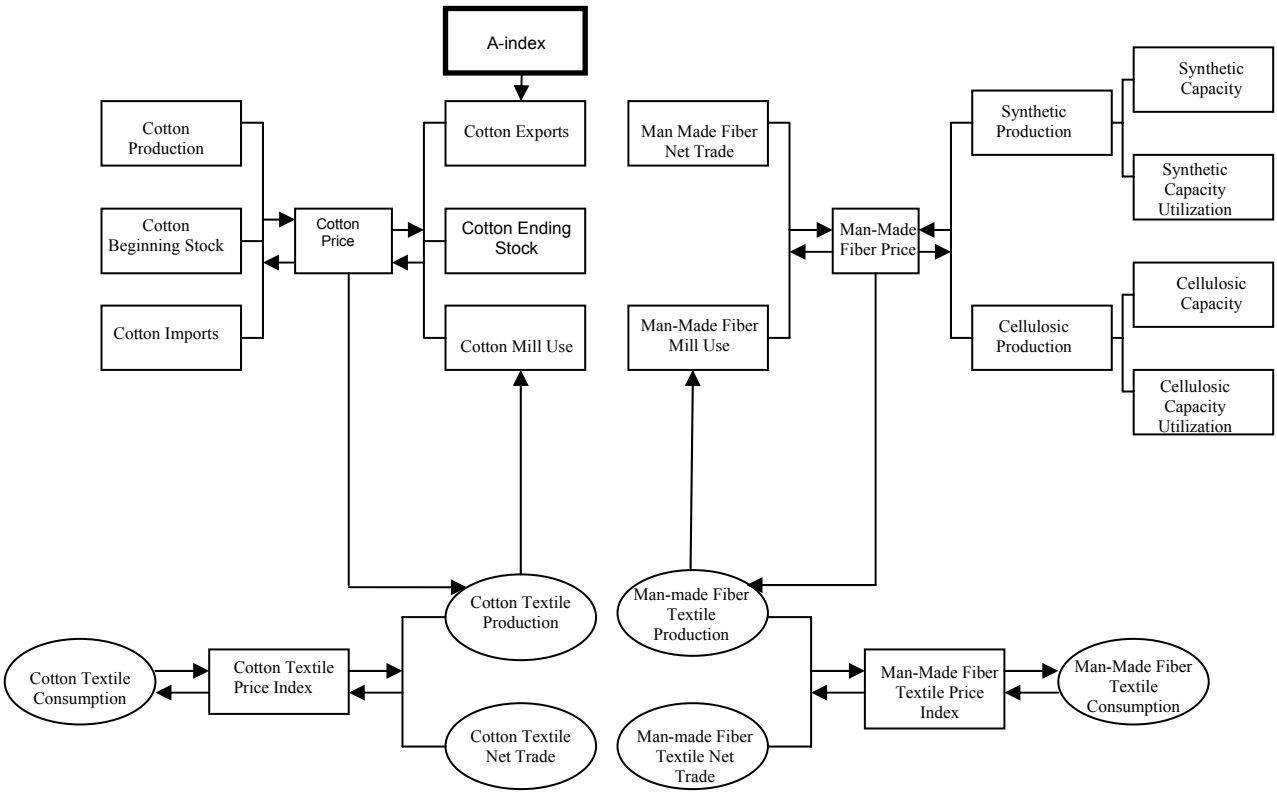

Figure A4 Schematic representation of the U.S. fibre model.