Cotton Trade Liberalizations and Domestic Agricultural Policy Reforms: A Partial Equilibrium Analysis

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Abstract

This paper analyzed the effects of trade liberalizing reforms in the world cotton market using a partial equilibrium model. The simulation results indicated that a removal of domestic subsidies and border tariffs for cotton would increase the amount of world cotton trade by an average of 4% in the next five years and world cotton prices by an average of 12% over the same time horizon. The findings indicated that under the liberalization policy, the United States would lose part of its export share to Brazil, Australia, and Africa. Furthermore, net cotton importing countries with minimum domestic and trade distortions would import less because of higher cotton prices whereas net cotton importing countries that subsidize domestic production and/or impose border tariffs (China, European Union, Pakistan, and Turkey) would significantly increase their imports.

Keywords: Cotton, domestic subsidies, TRQs, tariff rates
JEL code: F17, F42, F47, O2

Introduction

The United States has issued a proposal to the world trading community outlining several steps to jumpstart the stalled World Trade Organization (WTO) negotiations on agriculture. The proposal is intended as a challenge to members of the WTO to improve market access through "ambitious tariff reduction" and to "move aggressively" to cut trade-distorting domestic support (Portman, 2005). Although the major parameters of the proposal are yet to be defined, these steps seem consistent with commitments made by WTO participating countries to move agricultural trade negotiations forward in the framework agreement of July 2004. This proposal therefore is a step forward because there was a general pessimism about the likelihood of any significant reforms of the world trading system to take place, especially after the U.S. adopted the Farm Security and Rural Investment (FSRI) Act of 2002. The enactment of FSRI Act to a larger extent was perceived as a means to expand the generous subsidies to producers and because the policy has the support of the most of the political establishment and producers' organizations in the U.S., could potentially remain in place for an extended time (Sumner, 2003a). The adoption of the FSRI Act of 2002 was found critical and Sumner (2003a) anticipated that it would probably factor in future WTO negotiations, thus, making the prospects for further trade liberalization remote.

The basis of the framework document of the July 2004 agreement advocated a reduction in all trade distorting policies to ensure an open market, an elimination of all forms of export subsidies to increase export competition, and a major overhaul of domestic policies in all countries. The framework document provides some flexibility to developing countries to smooth their transition toward a reduced tariff system without

major adverse impacts in their import-sensitive sectors (WTO, 2004). The July 2004 framework agreement puts a particular attention on cotton in light of a recent WTO ruling against U.S. farm policy and in favor of Brazil. This ruling upheld an earlier decision by the Dispute Settlement Body that the U.S. cotton program and the U.S. export credit program contribute to depress prices in the world cotton market. Thus, the framework recognizes the nexus between trade and development and the vulnerability of least developed countries to downturns in international prices of cotton.

U.S. cotton subsidies have been the focus of attention for many researchers since they were first contested by Brazil in 2002 (ICAC 2002; Sumner 2003b; Goreux 2004; Pan et al. 2004). However, cotton production is also subsidized in other countries, including China, the European Union (EU), India, Egypt, Mexico, and Turkey. The total U.S. support for cotton production and for cotton export in 2004/05 amounted to $2.2 billion and $0.45 billion, respectively (ICAC, 2005). For the rest of the world, production assistance is estimated at $2.3 billion and export assistance at $0.02 billion (ICAC, 2005).

In addition, many importing countries have been using high tariffs to restrict imports. China for example, uses a two-tier tariff structure known as a tariff rate quota (TRQ) on cotton imports as part of its WTO commitments. Currently, the out-of-quota tariff for cotton is 40 percent for any imports above 890,000 metric tons (about 4 million bales). In addition Import tariffs on cotton for India are 10% and tariffs are 9.7% for cotton imports into Mexico (Baffes, 2003). Although these two sets of policies cause considerable trade distortions, studies evaluating their combined effects are limited except the report produced by FAPRI (2002), Fabiosa, et al (2005) and a recent study by

Hertel (2005). These two studies differ considerably in terms of their findings. FAPRI estimated the quantity effects at 11.44% on average for the ten-year period while Hertel estimated these effects at around 25%. While it is often hypothesized that a tariff-free world would benefit cotton producers in West Africa because of their lower cost of production and in Australia which does not have any tariff system or provides support to cotton producers, what would happen in the U.S. and the rest of the world cotton markets if all countries agree to remove the border protection and domestic subsidies is not known.

The purpose of this study, therefore, is to analyze how the U.S. cotton sector would be impacted by a complete elimination of both domestic support mechanisms and market access restrictions in the world cotton market. Will the benefits of free trade compensate U.S. cotton producers for the loss of domestic support provided under the current U.S. farm policy? To answer this question, a partial equilibrium econometric model of the world fiber market, developed by the Cotton Economic Research Institute (CERI) at Texas Tech University, is used. The analysis considers a scenario under which all distortions directly affecting cotton supply and demand (price supports, input subsidies, and border measures such as import tariffs and TRQ) are eliminated for all major market participants.

Policy Review for Major Cotton Players

This study is based on the CERI 2005 baseline, which was subsequently adjusted to include new information related to Chinese cotton imports which are expected to reach 14 million bales in 2005/06. The baseline incorporates most major policies currently in place and policy commitments such as the 2002 U.S. Food Security and Rural Investment

(FSRI) Act and China's accession to the WTO in December 2001. Under its agreement with the WTO, China agreed to implement a TRQ system and committed to raise the in-quota import levels from 818,500 metric tons in 2002 to 894,000 metric tons in 2004 with a tariff of one percent. The out-of-quota tariff, which was 54% above 818,500 metric tons in 2002 dropped to 47% above 856,200 metric tons in 2003 and 40% above 894,000 metric tons in 2004 and thereafter (U.S. Department of Agriculture, 2005). The baseline also included provisions of the 2002 US FSRI Act. Loan rates and target prices were fixed in the baseline at the maximum levels allowed, and the step 2 payments program was included in the model to account for the endogenous effects from world cotton price. At the same time, 25% of the per pound production flexibility contract (PFC) payments and direct payments were added to the expected net returns (Sumner, 2003a). Similarly, counter-cyclical payments (CCP) which were assumed to be 50% coupled for the period 02/03 to 07/08.

Table 1 presents cotton import tariff rates and domestic subsidies of the world's major importers and exporters of cotton. China adopted a TRQ system as we discussed earlier. In general, tariff rates were higher for cotton net exporters than for cotton net importers. As Table 1 indicates, the United States (14%), Uzbekistan (10%), India (10%), Mexico (9.7%), and Brazil (9.2%) have the highest cotton import tariff rates in the world while the European Union under the Common Agricultural Policy provides support payments to cotton ginners who are required to pass the subsidy on to growers in the form of higher prices. The ICAC found the EU has the highest cotton production subsidies with $1.13 per kilogram, followed by the U.S. cotton producers with $0.44 per kilogram in subsidies in 2004/05. As for china, the paucity of data related to subsidies

renders any comparison less reliable. However, it is estimated that Chinese farmers received $0.18 per kilogram in 2004/05. In Turkey, all growers are entitled to a premium payment calculated on the basis of seed cotton deliveries to either cooperatives or private gins. The Turkish government support amounted to $0.12 per kilogram of seed cotton . In 2004/05, Egyptian government total payment in subsidies to cotton producers amounted to $0.28 per kilogram to cotton producers in 2004/05. Mexico applied a support price of $0.67 per pound in 2004/05 marketing year. Finally, in India, the government provided a $0.03 per kilogram price support, which corresponded to a total outlay around $500 million annually (FAPRI, 2002; ICAC, 2005).

Data and Methods

Data

The historic and predicted macroeconomic variables (real GDP, exchange rate, population, and GDP deflator) were obtained from the Food and Agricultural Policy Institute (FAPRI). Cotton production, consumption, ending stocks, imports, and export data were compiled from the US Department of Agriculture Foreign Agriculture Service Production, Supply & Distribution (PSD). Fiber mill consumption and man-made fiber data were from FAO World Fiber Consumption Survey before 1994 and Fiber Organon after 1994. Chinese TRQ data were extracted from US department of Agriculture Economic Research Service web site. Most of the Tariff rates for other countries were from Baffes (2004).

Partial Equilibrium Model

A partial equilibrium world fiber model was utilized to estimate the effects of liberalization on the world cotton market. This model incorporated the regional supply

response of cotton, different competing goods in different producing regions, substitutability between cotton and competing fibers, and linkage between raw fiber and textile sectors. The unique characteristics of this model compared to others included incorporation of regional supply response of cotton, substitutability between cotton and competing fibers, and linkage between raw fiber and textile sectors. The model included 24 major cotton importers and exporters: (1) Asia (China, India, Pakistan, Taiwan, South Korea, Japan and Other Asia); (2) Africa (Egypt, West Africa and Other Africa); (3) North America (Mexico, United States, and Canada); (4) Latin America (Brazil, Argentina, and Other Latin America); (5) Oceania (Australia); (6) Middle East (Turkey and Other Middle East); (6) Former Soviet Union (Uzbekistan, Russia, and Other FSU); (7) Europe (European Union, and Other Europe). In the case of U.S., China, and India, four producing regions were modeled for each country to account for the heterogeneity between producing regions stemming mainly from climate differences. The partial equilibrium model allowed each of these regions to be simulated separately, with different cropping patterns and yield equations.

Representative country model

As shown in figure 1 the representative country model included supply, demand, ending stocks, and market equilibrium for cotton and man-made fibers. 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 were endogenously solved in the models by respectively equalizing world exports and imports.

Cotton mill use was estimated following a two-step process in which total textile fiber mill use was first estimated as a residual of textile fiber consumption and the net

trade of textile fiber, followed by allocations among various fibers such as cotton, wool, and man-made fibers represented by polyester based on their relative prices. Imports and exports were specified as functions of domestic price, international price (A-index), exchange rates, tariff rates, and quota restrictions.

Cotton production was modeled using separate acreage and yield equations. Current cotton production was specified as a function of the previous year cotton net returns and the relative net returns of competing crops. Man-made fiber was modeled using capacity and utilization. The capacity and utilization equations were estimated by the man-made fiber price and petroleum spot price.

Specifications of Behavioral Equations

A stylized model specification for a representative country is presented in Table 2. The model specifies per capita fiber consumption as a function of the fiber price and per capita income (equation 1). In the second stage, total fiber production was allocated among various fibers based on relative prices (equations 2 and 3). In the supply side, cotton acreage generally was specified as a function of own and competing crop expected net returns or prices and cotton yield is dependent on cotton price and time trend to capture technological change (equation 4). Cotton subsidies are included in the acreage equation.

Following Meyer (2002), man-made fibers production was modeled separately as capacity and utilization (equation 5). Capacity equation was specified as function of past five years' man-made fibers and crude oil prices and utilization rate as a function of recent man-made fiber and crude oil prices.

Cotton exports and imports equations were specified as a function of domestic and international prices (equations 6 and 7). For import equations, international prices were calculated by converting world price into domestic currency equivalent after adding appropriate tariffs. Similarly, for export equations, international prices were calculated by converting world representative price into domestic currency equivalent. Finally, ending stock equation (equation 8) was specified as domestic cotton price, cotton production and beginning stock. Domestic and world prices were solved endogenously based on marketing clearing condition (equations 11 and 12).

Elasticities

Table 3 contains income elasticities for the per capita textile consumption equations and own and cross price elasticities for cotton mill demand equations. Income elasticities range from 0.11 to 0.69, the lowest for South Korea and highest for China. Most of the emerging markets such as China, India, Brazil and Mexico have income elasticities higher than 0.5. At the mill level, cotton is very responsive to its own price in most of the Asian and African countries/regions.

Table 4 reports cotton acreage response elasticities for major producing countries. The short run elasticities of cotton acreage response range from 0.10 to 0.54, with Mexico having the highest value. The long-run acreage response elasticities range from 0.21 to 1.15, with highest in Australia. The relatively large elasticities for Mexico, Australia and Brazil reflect greater flexibility and choice in alternative crops production. Price transmission elasticities from the world to domestic prices are also reported in Table 4. Price transmission elasticities ranged between 0.14 to 0.97 with higher values for countries like Argentina, Brazil and Australia and lower values for China and Africa.

The lowest elasticities of price transmission represents that the procurement prices are set by policy and can be treated as being predetermined in these regions at the history.

Both the income and price elasticities reported here are a little higher than the results of Coleman and Thigpen (1991), Meyer (2002), and Clements and Lan (2002). This may be due to the different time period used for estimation. Coleman and Thigpen (1991) found the income elasticity of per capita fiber consumption to be 0.91 and the own- and cross-price elasticities of cotton to be around -0.06 and 0.06. Meyer (2002) estimated the income elasticity of cotton mill use to be 0.49 and the own-price elasticity for cotton to be -0.46. The Rotterdam model of Clements and Lan (2001) showed the income elasticity of cotton to be 0.607 and the own-price elasticity of cotton to be -0.27.

Stochastic Experiment

A stochastic simulation was conducted to gauge the effects of alternative policies, quantify the uncertainties resulting from of the policy shocks, and to generate confidence bands for the response variables. The simulation experiments used a multivariate empirical distribution of the stochastic error components derived from the historical yield data. The empirical distribution is a non-parametric distribution function that uses the observed distributional parameters of the data. It provides the flexibility to circumvent the difficulties that arise with small samples, especially the assumption of a specific error term distribution, while dealing with autocorrelation and Heteroskedasticity problems that are characteristic to yields (Richardson, Klose, and Gray, 2000; Fadiga, Mohanty, and Pan, 2005).

The additive error at the basis of the uncertainty within the world fiber market was assumed to emanate mainly from the stochastic characteristics of yields driven by the

residuals of yield equation for each country or region. These residuals were collected from the estimation of the partial equilibrium model discussed earlier, then normalized, and converted into deviates about their respective means. The deviates were then sorted to generate a correlation matrix for the sorted residuals, a matrix of correlated uniform standard deviates, and the cumulative probabilities of the sorted deviates (Richardson, Schumann, and Feldman, 2002). These three elements are the parameters of the multivariate empirical distribution used to simulate the stochastic components of the simulation experiments. It is important to note that only yields from different geographic regions within a specific country are correlated to each other.

The simulations were conducted over a five-year horizon using SIMETAR© to draw 500 alternatives stochastic output ranges. The 500 alternative stochastic ranges were then applied to the partial equilibrium model to solve for 500 alternative projected endogenous variables, including yields for all twenty-four countries and regions for the period 2006/07 to 2010/11.

Similar experiments were conducted after removing the subsidies, TRQ system, and tariff rates to generate a new set of 500 alternative solutions. These results were compared to those generated under the original scenario to evaluate the stochastic and deterministic effects of policy changes on each endogenous variable. For the purpose of this study, only the effects on A-index, world total cotton trade are presented.

Results

Results are reported as average annual changes over the outlook period (2006/07–2010/11) in terms of deviations from baseline estimates. Table 5 presents the principal

results regarding prices and trade for the full trade liberalization scenario for each year of the outlook period.

The resulting price and traded quantity changes have similar dynamics, increasing by 10.85% and 3.86% relative to their respective baseline in the first year following the removal of all distorting policies then by 10.96% and 4.55% in 2007/08, their highest levels during the simulation period. From 2008/09 onwards, the price and quantity changes follow a relatively slow decay. Thus under a full trade liberalization policy (removal of all distortions), the cotton price (A-index) increases by an average of 10.79%, which corresponds to an average 7.68 cents per pound over the baseline. World cotton net trade increases by an average 1.73 million bales (about 4%) following the removal of all trade distortions. Thus, a free trade environment for the cotton market results in a higher world price and an increase in the quantity traded. These results are more conservative than those of studies such as FAPRI (2002), which finds larger impacts for both price (15.71%) and net exports (5.44%) for the time period of 2003/04-2007/08 and Hertel (2005) which estimates a price of change at 25%.

United States

In the United States, this scenario models the elimination of the cotton loan program, step 2 payments, and other subsidies. From a policy standpoint, this move is offset by increased access to the world's cotton markets through the removal of import tariffs. Figure 2 compares the relative cotton prices facing U.S. cotton producers in this analysis. U.S. cotton producers who choose to participate in government programs receive benefits that assure a target price for cotton of 72 cents per pound. Baseline estimates of the U.S. domestic price of cotton range from about 56 cents in 2006/07 to 61

cents in 2010/11 (Table 6). With free trade, the domestic U.S. price is roughly 7 cents higher than the baseline each year. In the final year of analysis, the U.S. domestic price is expected to reach 68 cents, 4 cents below the current target price.

Currently, U.S. producers respond to a price guarantee of 72 cents. In a free trade environment, U.S. cotton producers will face prices below those possible with present program benefits, but steadily approaching current target prices. This decrease in cotton price received by U.S. farmers is expected to affect U.S. cotton production resulting in reduced export levels. Additionally, the step 2 program benefits provide a price subsidy for the users and exporters of U.S. cotton making U.S. cotton more competitive in world markets. The elimination of step 2 is expected to cause a decrease in exports as well. These anticipated effects are evidenced in the model results (see Table 6). U.S. cotton exports are predicted to decline by 8% (approximately 1 million bales) in the first year following the policy changes with an average decline of about 5% (600,000 bales) over the scenario horizon. In a free trade environment, U.S. cotton producers no longer receive a guaranteed price and cotton mills and exporters do longer no longer get the price subsidy. As a result, the domestic U.S. cotton price increases by 12% and the quantity of cotton exported from the U.S. declines by 5%.

In terms of the average market value of exports, U.S. cotton in the world market totals $4.3 billion under the baseline. With free trade, the value of U.S. cotton increases to $4.6 billion. Even though increases in the U.S. domestic price remain below current target prices, percentage increases in domestic prices in excess of percentage decreases in cotton exports serves to mitigate the welfare changes for the U.S.

China

The removal of all trade distortions has a significant impact on China's cotton trade (Table 7). Under the baseline, China's cotton imports continue to grow in spite of triggering the out-of-quota tariff rate (40%) while most cotton producers receive some form of subsidy. If China removes its TRQ system and ceases subsidizing its farmers, cotton imports are only affected by world price. Even though the A-index increases under the free trade scenario, the removal of tariff barriers also results in lower average prices for China's cotton importers. They are expected to increase their purchases by more than 10% in the first year of free trade and average a 9.33% increase for the entire simulation period. This means that imports to China, already the world's largest importer of cotton, increase by 1.3 million bales per year. This is approximately 75% of the total increase in cotton traded around the world. Over a five year period, cotton imports to China will increase by almost 7 million bales.

Others

For other cotton net importers (Table 7), those with relatively low or no import duties (Japan, South Korea, and Taiwan) slightly decrease their excess demand of cotton as a result of higher world prices. Imports for India, Pakistan, Mexico, Turkey, and the European Union, which have higher levels of border protection and/or domestic support increase under a free trade environment. The results of this study are significantly different from FAPRI (2002) study, which found a decrease in cotton imports by China, India, and Turkey. Although the import tariff rates of the major cotton exporters in the baseline are higher than those of major importers, the effects are relatively small due to the low elasticities of cotton imports in these countries.

As mentioned above, cotton exports from the U.S. are expected to decline while the world trade of cotton is expected to expand, meaning an increase in market share for U.S. competitors. Under the scenario presented here (Table 8), the increase in world price results in increased average exports from Brazil (9.90%), Australia (6.53%), Uzbekistan (3.78%), and West Africa (3.57%).

The results of this study are sensitive to market conditions and are likely to change as market conditions evolve. The stochastic results pertaining to A-index changes are presented in Table 9. For the period between 2006/07 and 2010/11, the average median baseline of A-index is 60 cents per pound less than deterministic average baseline presented earlier. The stochastic average based on the 500 alternative outcomes lies below the deterministic baseline. Comparing scenario case with baseline (Table 9), the average median change for the five years is 8.94%, a little lower than the deterministic results (10.79%).

To further check our results, we did two sensitivity analysis based on the elasticity changes. Results of A-index changes are presented in figure 3. There are two cases in the Figure: case 1 (double), we double increase elasticities of major cotton exporters and importers such as US, Brazil, Australia, China, India, and Pakistan; case 2 (half), we decrease half of the elasticities for these major cotton trade players. The results show that the effects of free trade on cotton A-index decrease as elasticities increase; increase as elasticities decrease. The average A-index for case 1 is around 8.68% and for case 2 is 12.04% (as we shown earlier, average for the deterministic result is 10.79%).

Conclusion

Trade flows are significantly affected if both domestic and trade protection are removed. World price (i.e., A-index) would increase by 11.5% compared to the baseline. The impacts of trade liberalization are lower than those from FAPRI and Hertel studies. Significant export expansions occur in countries that are natural exporters, such as Brazil, Australia, Uzbekistan and West Africa countries competing with the United States on world markets. U.S. exports decrease as the effects of removing the domestic subsidy programs higher than the world price.

Textile industries in low-duty countries (Taiwan, Japan, and South Korea) are worse off because of higher world cotton price while textile industries in the relatively high-protected net-importing countries (e.g., EU, China, India, Mexico and Turkey) are better off following a removal of domestic cotton subsidies, TRQ system, and tariff.

The effects on both cotton exporters and importers are driven by world price increases. For the high domestic subsidy exporters, the effects from world market may not be enough to compensate the loss due to the change of domestic policies, which cause export share loss in the world market. For the low domestic subsidy exporters, the positive effects come from the world market. For importers in high domestic subsidies high tariff rate countries, the effects are driven by domestic production loss and the difference between the world price increase and the tariff rates. For importers in low tariff rate countries, the increase in world price leads to declining imports from them.

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Table 1. Cotton Import Tariff Rates and Subsidies for the Major Importers and Exporters

Countries	Import Tariff Rate		Government Assistance to Cotton Producers	
	Year	%	Year	$/lb
Argentina	2003	7.5	2004/05	0
Australia	2001	0	2004/05	0
Brazil	2003	9.2	2003/04	0.01
Canada	2002	0	2004/05	0
China	2003	TRQ	2004/05	0.08
Egypt	2003	5	2004/05	0.14
EU	2002	0	2004/05	0.97 (Greece)
India	2003	10	2003/04	0.03
Japan	2003	0	2004/05	0
Korea, Rep.	2002	1	2004/05	0
Mexico	2002	9.7	2004/05	0.16
Pakistan	2002	5	2004/05	0
Russia	2002	0	2004/05	0
Taiwan	2002	0	2004/05	0
Turkey	1999	0	2004/05	0.06
United States	2003	14	2004/05	0.20
Uzbekistan	2003	10	2004/05	0

Notes: The data are compiled from various sources, including World Integrated Trade Solution Database (2003), ICAC (2005).

Table 2. Standard Specifications of Behavioral Equations

Equation	Variable	Behavior Equation
1	Per capita fiber consumption	$PC_f = \alpha_0 + \alpha_1 P_f + \alpha_2 I$
2	Share of cotton mill use	$DS_c = \beta_0 + \beta_1 (P_c / P_s)$
3	Share of man-made fiber mill use	$DS_m = \beta_0^m + \beta_0^m (P_c / P_s)$
4	Cotton supply	$S_{c,t} = \kappa_0 + \kappa_1 (P_{c,t-1} / P_{o,t-1})$
5	Man-made fiber supply	$S_{m,t} = \kappa_0^m + \sum_{k=1}^{5} \kappa_1^m (P_{m,t-k}) + \sum_{k=1}^{5} \kappa_2^m (P_{g,t-k})$
6	Cotton imports	$I_c = \phi_0 + \phi_1 (P_c / WP_c (1+T))$
7	Cotton exports	$E_c = \phi_{e0} + \phi_{e1} (P_c / WP_c (1-\tau))$
8	Cotton ending stock	$K_{c,t} = \rho_0 + \rho_1 (S_{c,t}) + \rho_2 (P_c) + \rho_3 K_{c,t-1}$
9	Cotton price linkage	$P_c = \gamma_0 + \gamma_1 WP_c$
10	Polyester price linkage	$P_m = \gamma_0 + \gamma_1 WP_m$
11	Marketing clearing cotton	$\sum_n I_c = \sum_n E_c$
12	Marketing clearing man-made fiber	$\sum_n (S_{m,t}^e + S_{m,t}^i) = \sum_n (DS_m * PC_f * PO)$

Note: The superscript e and i refers to a country which is assumed to export and import cotton and man-made fiber, respectively. The capital letter PC, S, D, DS, P, WP, I ,E, K, and PO represents per capita consumption, supply, share of mill use, domestic price, world price, imports, exports, ending stock, and population respectively. The subscripts *f, c, m, w,* and *o* represent fiber, cotton, man-made fiber, world, competing crops respectively and *t, t-1, t-k* represent current time period, one lag, and *k* lags. T and τ represent tariffs rate and export subsidy rate; n represents number of countries included in the model; and α, β, κ, ϕ, ρ, and γ's are estimated coefficients.

Table 3. Income Elasticities of Textile Consumption and Price Elasticities of Cotton mill Use for Major countries

Countries	Income Elasticities For Textile	Price Elasticities	
		Cotton	Polyester
US	0.15	-0.24	0.07
Australia	0.13	-0.05	0.00
South Korea	0.11	-0.57	0.24
Taiwan	0.11	-0.50	0.35
Japan	0.14	-0.57	0.37
EU-15	0.12	-0.39	0.15
Mexico	0.58	-0.27	0.10
Brazil	0.53	-0.15	0.12
China	0.69	-0.57	0.16
India	0.56	-0.44	0.10
Pakistan	0.52	-0.28	0.18
Africa	0.55	-0.74	0.24
World	0.30	-0.28	0.15

Table 4. Cotton Price Transmission and Supply Elasticities

Countries	Regions	Price Transmission Elasticities	Acreage response	
			Short-Run	Long-run
US				
	Delta		0.18	
	Southeast		0.16	
	Southwest Irrigated		0.31	
	Southwest Dryland		0.37	
	West		0.42	
Australia		0.93	0.52	1.15
Brazil		0.97	0.50	0.74
China		0.14		
	Yellow River		0.11	0.21
	Yantze River		0.10	0.22
	Southwest		0.11	0.30
Africa		0.41	0.11	0.58
India		0.75		
	North		0.12	0.23
	West		0.12	0.23
	South		0.16	0.17
EU-15		0.96	0.44	1.05
Mexico		0.87	0.54	0.91
Pakistan		0.83	0.13	0.26
Argentina		0.76	0.24	0.48
Former Soviet Union		0.79	0.25	0.28

Table 5. Effects of trade liberalization on the world cotton prices and trade

	2006/07	2007/08	2008/09	2009/10	2010/11	Average
A-Index						
			(Cents Per Pound)			
Baseline	63.91	65.08	65.74	66.35	67.06	65.63
Change	6.94	7.13	7.10	7.10	7.15	7.68
% change	10.85%	10.96%	10.80%	10.70%	10.66%	10.79%
Total Trade						
			(Million Bales)			
Baseline	39.33	40.89	42.51	43.78	45.39	42.38
Change	1.52	1.86	1.74	1.76	1.76	1.73
% change	3.86%	4.55%	4.10%	4.03%	3.89%	4.09%

Table 6. Effects of trade liberalization on the U.S. cotton market

	2006/07	2007/08	2008/09	2009/10	2010/11	Average
Domestic Price						
			(Cents Per Pound)			
Baseline	56.29	58.10	59.11	59.18	61.43	58.82
Change	6.85	7.23	7.02	6.57	6.75	6.88
% change	12.17%	12.45%	11.87%	11.10%	10.99%	11.71%
Exports						
			(1000 Bales)			
Baseline	13547.15	13456.27	13676.27	13500.38	13847.45	13605.50
Change	-1084.03	-557.72	-563.77	-554.97	-563.39	-664.78
% change	-8.00%	-4.14%	-4.12%	-4.11%	-4.07%	-4.89%

Table 7. World cotton imports for selected countries

	2006/07	2007/08	2008/09	2009/10	2010/11	Average
			(Thousand Bales)			
China						
Baseline	14468.59	14663.22	14705.78	14807.20	15046.38	14738.23
Change	1464.13	1472.25	1304.32	1312.56	1317.67	1374.19
% chg	10.12%	10.04%	8.87%	8.86%	8.76%	9.33%
European Union						
Baseline	2722.61	2683.08	2573.03	2449.53	2349.25	2555.50
Change	124.02	120.90	110.88	92.32	85.13	106.65
% chg	4.56%	4.51%	4.31%	3.77%	3.62%	4.15%
India						
Baseline	766.21	886.81	931.61	1120.67	1125.50	966.16
Change	50.49	45.17	43.39	50.77	54.16	48.80
% chg	6.19%	5.40%	5.10%	4.99%	4.73%	5.28%
Pakistan						
Baseline	1486.91	1559.46	1595.56	1653.88	1782.13	1615.59
Change	74.14	68.18	53.46	39.28	34.46	53.90
%chg	5.07%	4.84%	3.95%	2.97%	2.55%	3.88%
Japan						
Baseline	642.30	604.35	575.90	554.71	534.10	582.27
Change	-18.63	-15.03	-12.77	-10.53	-8.20	-13.03
% chg	-2.55%	-2.34%	-2.29%	-2.24%	-2.13%	-2.31%
Mexico						
Baseline	1612.95	1575.20	1510.55	1471.09	1401.35	1514.23
Change	18.36	20.30	18.98	15.53	12.22	17.08
% chg	1.24%	1.22%	1.02%	0.79%	0.57%	0.97%
South Korea						
Baseline	1217.21	1203.66	1175.53	1112.32	1074.42	1156.63
Change	-18.39	-15.28	-12.47	-10.33	-8.83	-13.06
% chg	-1.71%	-1.49%	-1.28%	-1.15%	-1.03%	-1.33%
Taiwan						
Baseline	1032.32	1009.21	991.24	975.48	962.66	994.18
Change	-93.03	-43.03	-26.96	-21.54	-18.35	-40.58
% chg	-10.96%	-5.59%	-3.87%	-3.45%	-3.25%	-5.42%
Turkey						
Baseline	3669.37	4020.91	4403.22	4508.17	4720.03	4264.34
Change	248.65	231.52	224.55	220.88	219.09	228.94
% chg	6.78%	5.76%	5.10%	4.90%	4.64%	5.43%

Table 8. World cotton exports for selected countries

	2006/07	2007/08	2008/09	2009/10	2010/11	Average
			(Thousand Bales)			
Australia						
Baseline	3131.05	3329.70	3447.04	3537.48	3626.01	3414.26
Change	276.26	242.95	201.23	199.42	183.15	220.60
% chg	8.82%	7.30%	5.84%	5.64%	5.05%	6.53%
Brazil						
Baseline	2778.10	3437.49	4060.16	4651.10	5285.88	4042.55
Change	311.50	371.98	377.17	430.21	471.68	392.51
% chg	11.21%	10.82%	9.29%	9.25%	8.92%	9.90%
West Africa						
Baseline	3308.43	3226.93	3188.49	3173.21	3158.23	3211.06
Change	133.44	126.93	123.43	101.38	89.15	114.87
% chg	4.03%	3.93%	3.87%	3.19%	2.82%	3.57%
Uzbekistan						
Baseline	3971.37	3929.56	3901.61	3933.79	3978.48	3942.96
Change	190.10	156.45	133.33	132.01	132.89	148.96
% Chg	4.79%	3.98%	3.42%	3.36%	3.34%	3.78%

Table 9. A-index comparison between baseline and scenario

Year	2006/07	20007/08	2008/09	2008/09	2009/2010	Average
Deterministic Baseline	10.85%	10.96%	10.80%	10.70%	10.66%	10.79%
Stochastic Average	7.59%	8.31%	8.19%	9.54%	8.36%	8.40%
Percentiles						
5%	1.20%	3.82%	8.50%	1.99%	21.33%	7.37%
10%	4.70%	5.14%	6.09%	8.75%	19.94%	8.92%
20%	8.76%	8.26%	8.02%	8.15%	9.92%	8.62%
30%	9.81%	11.15%	10.23%	9.70%	11.24%	10.43%
40%	10.00%	8.70%	10.25%	12.38%	9.71%	10.21%
50%	9.31%	9.21%	10.61%	9.15%	6.42%	8.94%
60%	8.45%	9.87%	11.40%	9.64%	6.78%	9.23%
70%	8.65%	9.29%	6.65%	8.43%	5.28%	7.66%
80%	6.21%	9.19%	5.68%	11.24%	9.86%	8.44%
90%	2.95%	7.70%	3.68%	13.08%	10.43%	7.57%
95%	3.84%	0.47%	6.18%	6.94%	5.23%	4.53%

Figure 1. Schematic representation of representative country model

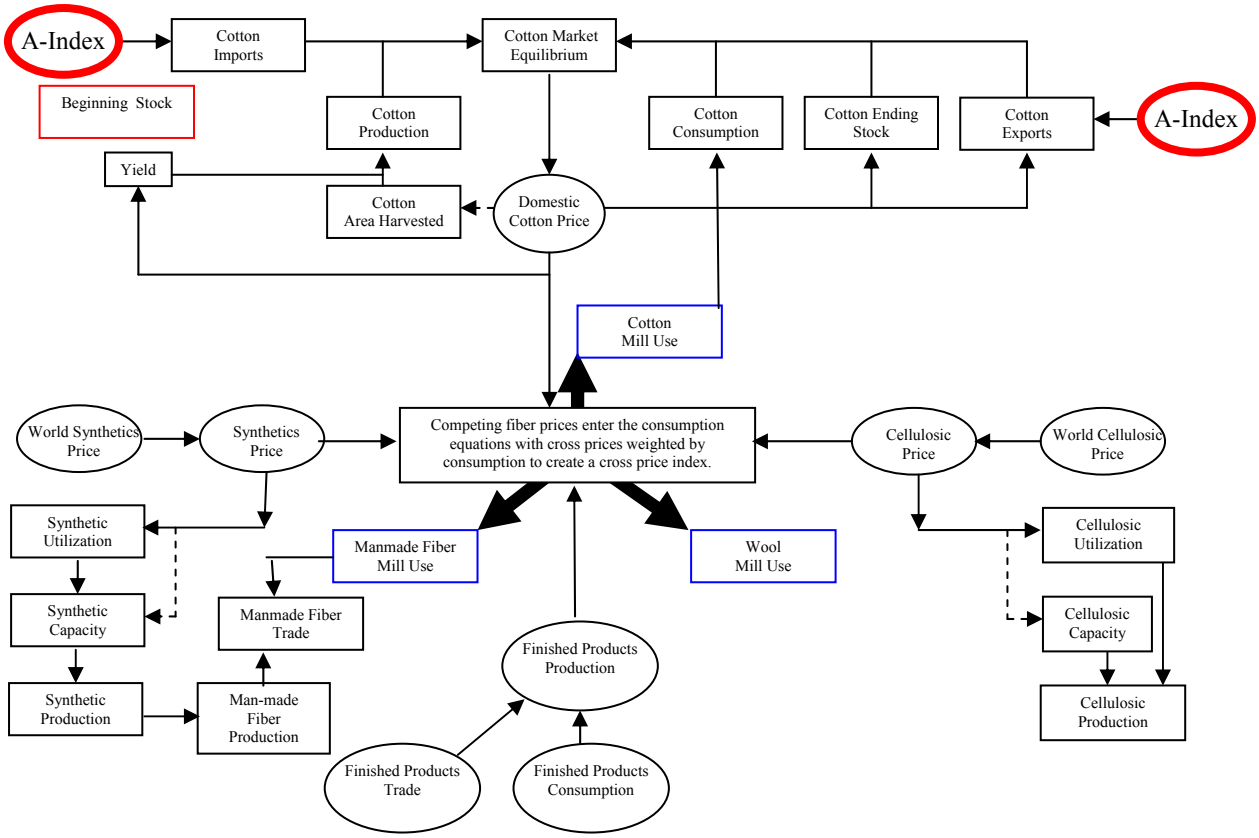

Figure 2. Comparative prices for U.S. cotton

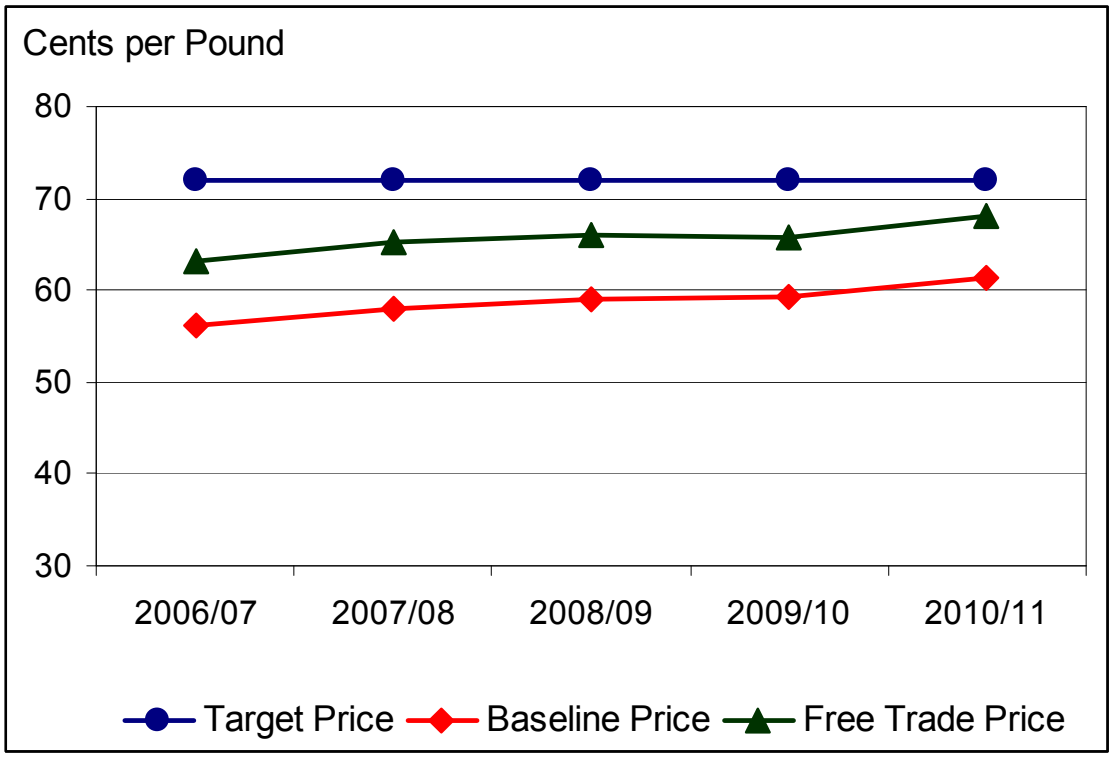

Figure 3. Effects of Elasticities on cotton A-index