The ATC Quota Elimination and the Mexican Cotton Industry: Measuring Potential Impacts on US Cotton Exports

By

Jose Enrique Lopez, and Jaime Malaga
Department of Agricultural and Applied Economics, Texas Tech University
Contact: Jaime.Malaga@ttu.edu

Abstract

The textile and clothing trade agreements signed by the U.S. may bring about important adjustments in the international textile and cotton markets affecting trade flows between the US and Mexico. Mexico is the largest importer of U.S. cotton while the US market is critical for the Mexican textile/clothing sector This paper presents the results of a comprehensive econometric and simulation model that allows for the assessment of some of the implications of the Agreement on Textiles and Clothing's quota eliminations on Mexico's cotton consumption and U.S. cotton exports to that country.

Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Tulsa, Oklahoma, February 18, 2004

Introduction

Recent changes in the textile and clothing trade agreements and the impact of the growing globalization of textile and fiber markets may result in important shifts in trade flows for which both importing an exporting countries need to be prepared. During the past forty years, world textile trade has been in large part governed by the Multi Fiber Agreement (MFA) and its predecessor agreements. However, in 1994, in accordance with the World Trade Organization (WTO) the Agreement on Textiles and Clothing (ATC) was signed by the four largest importers (US, The European Union, Canada, and Norway), and most of the T&C exporters subject to quotas. The ATC agreement mandates that the quantitative restrictions imposed by previous agreements must finally end by 2005 through a gradual process of three stages. The agreement allowed importing countries some flexibility in the implementation of the process resulting in the accumulation of most relevant quotas to be eliminated only during the last stage, the year 2005 (Malaga and Mohanty). Consequently, a large impact of ATC is expected on the US and EU textile and clothing markets by 2005 and beyond. The new global trade rules that WTO members agreed to follow, and specifically, the elimination of quotas in the textile/clothing industry are certainly going to have important implications not only for textiles but also for cotton trade.

In order to have a better understanding of the far-reaching consequences and policy implications of such a change in the textile and clothing industry (i.e., at the aggregate level), individual structural relationships for the main market participants need to be examined and updated. In the late nineties Mexico became the number one supplier of textiles and clothing (T&C) to the U.S. market. In fact, Mexico currently exports around 44% to 50% of its textile and apparel products, and about 95% of them are exported to the United States. Furthermore, in the year 2000, Mexico was ranked as the world's 4th largest exporter of clothing.

As a member of NAFTA, Mexico is now a privileged supplier of clothing to the United States and Canada where most of Mexican shipments are already duty-free. However, with the forthcoming final elimination of theT&C quotas, other big exporters currently bounded by those quotas, such as China or Pakistan, could easily challenge Mexico's privileged position due the NAFTA agreement. Accordingly, Mexico's competitiveness in the cotton T&C industry could be jeopardized by the lower costs of many Asian countries. For example, Chinese textile wage rates are reported to be one tenth of their Mexican counterparts.

The imposition of quotas in the textile industry create price gaps between importing and exporting prices constraining the potential level of trade. Therefore, trade theory suggests that if quotas were the only binding constraint, liberalization of trade, (e.g. elimination of quotas) would cause the importing country (The United States for example) to increase its imports of textiles while the exporting countries formerly limited by those quotas would increase their exports. The other implication of the textile quota elimination would be that the import price of textile products would certainly decline. It has been previously estimated that the average "tariff equivalent" (or import-export price gap) of the U.S. quotas for Chinese T&C imports could be as high as 40%. Since the average U.S. tariff for T&C items is between 12% and 15% (and will remain in place after the quota elimination), it would not be unlikely that US prices for textile and clothing imports from China decline a 20% or 25% as consequence of the 2005 final ATC quota elimination.

On the other hand, Mexico, which currently has a free trade agreement with the United States, is taking advantage of this privileged position of not being subject to quotas and not paying U.S. tariffs. However, as suggested above, the 2005 ATC final elimination of quotas by the United States would likely cause U.S. imports of textiles from China and other Asian countries to increase and imports from Mexico to decline. Therefore, this substitution is expected to bring down not only Mexico's exports of textiles and clothing but also the export-import price of textiles between Mexico and the United States. (FIRA, 1997).

At the same time, and mainly because of NAFTA, Mexico's consumption of cotton has increased considerably during the 90's. Only between the years of 1994 and 1998 national apparent consumption of cotton fiber increased by 74%. This indicates the favorable demand for the product and the expansion experienced by the textile industry during this NAFTA phase. As a consequence, Mexico became in recent years the largest market for U.S. cotton exports. For instance, during, 2000, 25.3% of U.S. total cotton exports went to Mexico (FATUS). Moreover, between 94% to 97% of cotton imports used by the Mexican textile industry come from the United States (INEGI). It should not be difficult to argue then that Mexico's demand for U.S. cotton is highly dependent upon Mexico's ability to export textiles and clothing. Understanding the impact of the ATC quota elimination on Mexico's competitive position in the U.S. market becomes a critical component to forecast future U.S. cotton exports to that key cotton market

Previous Studies

Several previous studies have attempted to estimate the parameters of the Mexican cotton industry with mixed results. These include, Salcedo-Baca (1981), Coleman and Thigpen (1991), Ibañez (1999), and Meyer (2002). In some cases the estimations have been reduced to a single equation cotton demand and/or a general direct estimation of cotton supply. Coleman and Thigpen (1991) attempted a two-stage estimation for the Mexican demand for cotton that includes two behavioral equations and an identity. The first behavioral equation estimates per capita total fiber use, which was estimated generally as a function of current per capita gross domestic product. The second behavioral equation estimates the cotton "share" of total fiber consumption.

Overall, comparisons across the few studies already conducted on the Mexican cotton industry became extremely difficult for several reasons. First of all, there are very few studies addressing the Mexican cotton industry with a comprehensive approach (farm supply, industry demand, stocks, and trade). Furthermore, empirical studies on cotton demand have suggested that modeling cotton demand seems very sensitive to model specifications. Unfortunately, the previous studies conducted on Mexico have generally used very different model specifications and covered dissimilar time periods. In addition, most of them have used international prices instead of Mexican domestic prices. In order to appropriately evaluate the potential impacts of ATC on the Mexican cotton industry and trade, we propose a comprehensive an updated Mexican model to estimate the relevant parameters to simulate alternative but plausible future scenarios.

Methods and Procedures

The Mexican model equations were estimated using Time Series Data and Ordinary Least Squares. The regression period was 1964-2001 (Lopez, 2003). On the supply side, cotton production was isolated into separate behavioral equations for Cotton Area Harvested and Cotton Yields. On the demand side, a two-stage procedure was implemented where the first stage consists of Total Fiber Consumption, and the second stage was delineated by the Cotton Share of Total Fiber Consumed. Subsequently, the estimation of an Ending Stock behavioral equation allowed for the computation of the Change in Cotton Stocks. Finally, the closing of the model was achieved through the calculation of Net Cotton Trade equation. Net cotton trade was determined by the difference between cotton production and cotton consumption plus or minus the change in cotton stocks.

Price transmission relations were additionally built for farm cotton prices, mill cotton prices, and soybean prices in Mexico. These transmission relations are primarily used in the model to forecast domestic prices in Mexico, and to incorporate the international market effect into the model. Linkages between Mexico and the U.S. cotton industries were established based on their trade patterns. The estimation period that was used to estimate Mexican cotton demand, supply, and price equations generally consists of thirty-eight years (1964-2001). The data sources that were used in this study consist of several official Mexican sources, including the Secretaria de Agricultura (SAGAR), INEGI, ASERCA, Concejo Nacional Agropecuario (CNA), as well as ICAC and USDA.

The effects of the ATC textile quota eliminations were incorporated through the Total Fiber Consumption behavioral equation and a textile and apparel price index in the United States. For a more comprehensive description of the model refer to Figure 1. The projections on international commodity prices are borrowed from FAPRI. FAPRI's compilation of variable projections such as income, price indexes, and exchange rates are also utilized. The historical patterns of the series are also considered to compute compound growth rates for the remaining exogenous variables.

Results and Discussions

Results of the model parameter estimation with the respective statistics are presented in Tables 1 to 8. The cotton price elasticity found in this study (i.e., 0.66) is consistent with previous studies such as Coleman and Thigpen (1991), Salcedo-Baca (1981), Collins et all (1979), and Thigpen (1978) which are 0.56, 0.54, 0.38, 0.48 respectively. Ibañez (1999), who did not separate supply into area and yield equations, similarly reported a cotton price elasticity of production of 0.78**.** A successful specification for the total fiber consumption behavioral equation was reached after correcting for autocorrelation by Cochrane-Orcutt procedure. The variables that resulted statistically significant are real income in Mexico, an index for real fiber prices in Mexico, and an index for real textile and apparel prices in the United States. Regarding the real fiber price index, due to the lack of data availability, an index for a selected group of developing countries, including Mexico, was utilized and deflated using the consumer price index in Mexico. A summary of the results for this behavioral equation is provided in Table 3.

Most previous research estimating total fiber consumption in Mexico utilized income as the only variable influencing fiber consumption. None of the previous works included fiber prices or an Index for textile and apparel prices in this equation. In other words, mainly because of lack of price data , incorrect signs or other reasons, previous researchers have estimated fiber demand equations without prices. Another reason why income was becoming the only variable in this equation could have been the convenience of projecting fiber consumption exclusively as a function of income.

This research paper successfully evaluated and included income, and indexes for fiber and textile and apparel prices into the total fiber consumption equation at the 99% significance level. In fact, as illustrated on Table 3, these variables explained 97.63% of the variation in total fiber consumption. Even though the uniqueness of the estimation of this behavioral equation makes comparisons with previous research papers difficult, some relations can be drawn. For instance, most of previous works hypothesized that fiber prices had little influence on total fiber consumption. This paper was able to confirm that there is an elasticity of –0.0011. In other words, fiber prices are significant and correctly signed but they have little influence on fiber consumption.

With respect to textile and apparel prices, the fact that they are correctly signed and significant at the 99% level allows for the assessment of the implications of the 2005 textile quota eliminations on net trade between Mexico and the United States. The model makes possible the simulations of different scenarios (e.g., no change, 20% or 25% declines in textile and apparel prices) and transfers that effect into cotton consumption and ultimately into net trade. An important statistic that might be crucial to recall at this point is that, as stated earlier, about 94% of Mexico's imports of cotton come from the United States. In fact, in the year 2000, 97.1% of Mexico's cotton imports originated in the United States.

Approximately 94.57% of the variation in the cotton share of total fibers consumed was found to be explained by the price of cotton, the price of polyester or synthetic fibers, and the lagged dependent variable. Cotton price was found to be significant at the 97% significance level while polyester price and the lagged dependent variable were significant at the 99%. The estimated coefficients were consistent with economic theory, previous hypotheses, and previous results. A summary of econometric statistics related to this behavioral equation is provided in Table 4.

The results in this study are very compatible with previous research papers that used this estimation technique. Some examples are Coleman and Thigpen (1991), who estimated the elasticities at ± 0.0 9; and Collins et all (1979), whose estimates were ± 0.13 for the cross and own price elasticities respectively. Unlike these previous two research papers which used the ratio of cotton to polyester prices and had to restrict the own and cross price elasticities to be the same, this research paper provides different elasticity estimates for each of the fibers; and therefore, is able to more accurately isolate the two individual effects.

The estimated model was utilized to generate the baseline forecast for cotton production, total fiber consumption, cotton consumption, and net imports of cotton in Mexico. Forecasted values for the years 2003 to 2005 are shown in Table 8. Cotton production is forecasted to remain at low levels of around 100,000 million pounds. Fiber and cotton consumption are estimated to slowly increase from the year 2003 to the year 2005. Increases in fiber and cotton consumption were found to be primarily driven by increases in Mexican income. Furthermore, net imports under baseline conditions were forecasted to follow a slow-growth pattern to the year 2005.

Estimated own and cross price elasticities of supply and demand variables are summarized in Table 9. On the supply side, cotton yield elasticity estimates with respect to fertilizer use and pesticide prices could be utilized to further assess eventual Mexican policy changes directed to encourage cotton production. (e.g., subsidies on fertilizer prices, and subsidies for pest control). On the demand side, it is interesting to notice how income dominates fiber consumption over the other explanatory variables. The textile and apparel price index was the second most important factor affecting total fiber consumption.

Subsequently, two scenarios were simulated based on prior research regarding the effects of the ATC quota elimination on U.S. textile and apparel prices (Malaga and Mohanty, 2003). Specifically, 20% and 25% decreases in U.S. textile and apparel prices were addressed. Textile and apparel prices in the U.S. were found to influence Mexico's fiber consumption primarily because around 50% of fiber used by the Mexican industry is exported to the U.S. in the form of textile and apparel. Given that U.S. textile and apparel prices were found to induce the amount of total fiber consumed, the 2005 forecasted amounts of cotton consumption, and ultimately net cotton imports changed based on these two scenarios as illustrated in Table 10.

Table 10 indicates that the model predicts that the simulation of a 20% decrease in textile and apparel prices in the United States leads to an 8% reduction in total fiber and cotton consumption, respectively. Additionally, this 20% decline in total fiber and cotton consumption translates into a 9% reduction in net imports of cotton in Mexico. Similarly, the simulation of a 25% decrease in textile and apparel prices is estimated to cause an 11% reduction in total fiber and cotton consumption, respectively. Moreover, this 25% decline scenario is estimated to lead to a 12% reduction in net cotton imports. Consequently, considering the fact that 94% to 97% of Mexican cotton imports come from the United States, the former statistics indicate that the United States exports of cotton to Mexico are forecasted to decrease by a similar 9% to 12%, depending on the respective impacts of the textile quota elimination (i.e., 20%, 25%).

References

Coleman, J., and M. E. Thigpen. "An Econometric Model of the World Cotton and Non-Cellulosic Fibers Markets." World Bank Staff Commodity Working Paper No. 24. World Bank, Washington, DC, 1991.

FIRA, "Oportunidades de Desarrollo del Algodón en México." Morelia Michoacán, México. Informative bulletin No. 300. November 1997

Food and Agricultural Policy Research Institute (FAPRI). *U.S. and World Agricultural Outlook*. Staff Report 1-03. Ames, IA, 2003.

Ibañez, J. S. "Modelo Econométrico del Mercado de Algodón en México y Estados Unidos de Norte América." Licenciatura en Economía Agrícola, Universidad Autónoma Chapingo, 1999.

International Cotton Advisory Committee (ICAC). *World Textile Demand*. October 2002.

International Cotton Advisory Committee. Cotton World Statistics. September 2002.

Instituto Nacional de Estadística, Geografía e Informática (INEGI), *La Industria Textil y del Vestido en Mexico*. Boletin No. 15, Mexico, 2002.

Lopez, J. E. 2003. "An Econometric and Simulation Model of the Mexican Cotton Industry." M.S. Thesis, Texas Tech University, Lubbock, Texas.

Malaga J. and S. Mohanty. "Agreement on Textiles and Clothing: Is It a WTO Failure?" *Journal of International Law and Trade Policy*, 4(1, June 2003):75-85.

Meyer, S. D. "A Model of the Textile Fiber Supply and Inter-Fiber Competition with Emphasis on The United States of America. Ph.D. Diss. University of Missouri-Columbia, 2002

Tyndall, Michael R. "The Influence of Trade in the World Cotton Demand." *Journal of Textile and Apparel,Technology and Management* 2 (Fall 2001)

United States Department of Agriculture (USDA), Economic Research Service web site. Foreign Agricultural Trade of the United States (FATUS) Report. Available at: http://www.ers.usda.gov/data/FATUS/. Accessed in October 2003.

Table 1. Summary of Econometric Results of Area Harvested Behavioral Equation.

Variable Name	Coefficient and T-Stat	Elasticities at Mean	R-Squared and Durbin Stat
Cotton Price	0.02127 and (4.036)	0.6630	R-square: 0.8477
Lagged Area	0.84360 and (13.21)	0.8939	Adj. R-square: 0.8343
Soybean Price	-0.06113 and (2.130)	-0.4158	Durbin H: -1.0657

Table 2. Summary of Econometric Results of the Yield Behavioral Equation.

Explanatory Variable Names	Coefficients and T-Values	Elasticities at Mean	R-square and Durbin Stat
Log Pesticide Prices	-0.17890 and (-2.136)	-0.1789	R-square: 0.4124
Log Fertilizer Use	0.20388 and (3.402)	0.20388	Durbin Watson: 1.98

Table 3. Summary of Econometric Results of the Total Fiber Consumption Behavioral Equation.

Explanatory Variable Names	Coefficients and T-Values	Elasticities at Mean	R-square and Durbin Stat
Income in Mexico	0.11155 and (5.02)	1.48	R-square: 0.9763
Reciprocal of Textile Fiber Prices in Mexico	619.88 and (7.35)	-0.0011	Adj. R-square: 0.9743
Log Textile & Apparel Prices in the U.S.	1274.4 and (2.70)	1.2145	Durbin Watson: 1.84

Table 4. Summary of the Econometric Results for the Cotton Share of Total Fibers Consumed Behavioral Equation.

Explanatory Variable Name	Coefficients and T-values	Elasticities at Mean	R-square and Durbin Statistic
Cotton Price	-0.0077013 and (-2.23)	- 0.0967	R-square: 0.9457
Polyester Price	0.0081549 and (4.05)	0.1211	Adj. R-square: 0.9408
Log Lagged share	0.3667000 and (14.18)	0.8198	Durbin H: 0.792

Table 5. Summary of Econometric Results for the Ending Stock Behavioral Relation.

Explanatory Variable Names	Coefficients and T-values	Elasticities at Mean	R-square and Durbin Statistic
Log Cotton Price	-47.508 and (-2.821)	-0.7174	R-square: 0.5696
Domestic Cotton Supply	0.21880 and (2.996)	1.0201	Adj. R-square: 0.5399
			Durbin Watson: 2.06

Table 6. Summary of Econometric Results for the Cotton Price Transmission Relation.

Explanatory Variable Name	Coefficient and T-Value	Elasticity at Mean	R-square and Durbin Statistic
Log Real International Cotton Price	0.76024 and (8.431)	0.76024	R-square: 0.7154
			Adj. R-square: 0.7075
			Durbin Watson: 1.85

Table 7. Summary of Econometric Results for the Mill Cotton Price Transmission Equation.

Explanatory Variable Name	Coefficient and T-value	Elasticity at Mean	R-square and Durbin Statistic
International Cotton price	0.39314 and (26.49)	0.8977	R-square: 0.9727

Table 8. Baseline Model Forecast for the Variables of Interest for the Years 2003 to 2005.

Baseline Quantities in Million Pounds			
Variables of Interest	**2003**	**2004**	**2005**
Cotton Production	85	100	117
Total Fiber Consumption	2638	2813	3005
Cotton Consumption	1214	1284	1358
Net Imports	1111	1186	1247

Table 9. Relevant Supply and Demand Elasticity Estimates at Mean Level Derived from the Model.

	Area Harvested	Cotton Yields	Fiber Consumption	Cotton Share
Farm Cotton Price	0.66			
Soybean Price	-0.42			
Pesticide Price index		-0.18		
Fertilizer Use		0.20		
Fiber Price Index			-0.0011	
U.S. Textile and Apparel Price Index			1.21	
Income in Mexico			1.48	
Mill Cotton Price				-0.10
Mill Polyester Price				0.12

Table 10. Simulation Results for the Impacted Variables by the 2005 ATC Final Quota Elimination.

Quantities for the Year 2005 in Million Pounds				
Variables of Interest	**20% Impact**	**Percentage Decrease**	**25% Impact**	**Percentage Decrease**
Fiber Consumption	2765	8%	2683	11%
Cotton Consumption	1250	8%	1212	11%
Net Imports	1138	9%	1101	12%

Note: The percentage decrease is with respect to the 2005 baseline level.

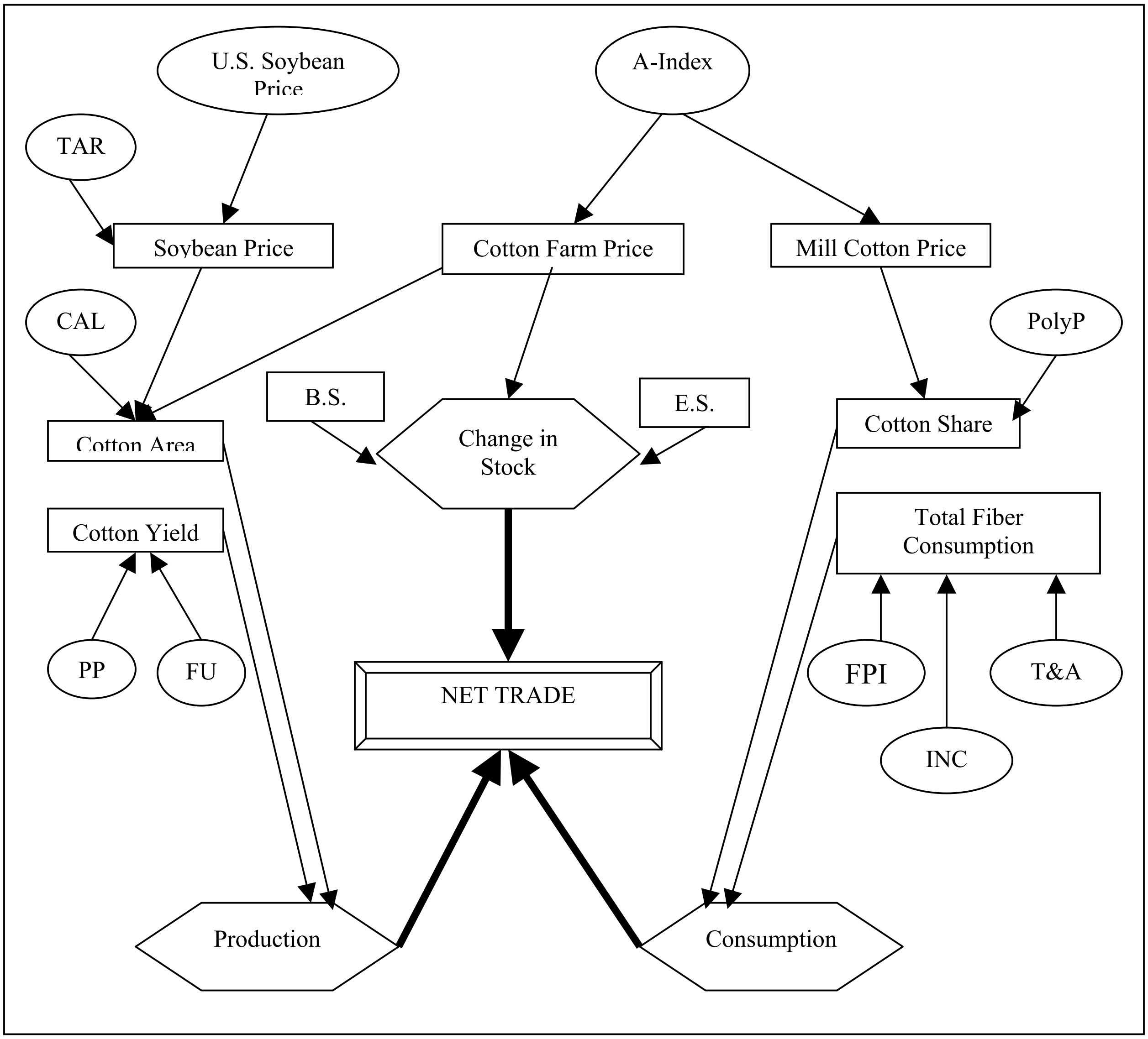

Figure 1. Simplified Representation of the Mexican Cotton Industry Model.

Note: TAR stands for tariffs; CAL stands for cotton area lagged one period; PP stands for weighted average pesticide prices; FU stands for fertilizer use; B.S. and E.S. stand for beginning and ending cotton stocks, respectively; PolyP stands for polyester price; FPI stands for fiber price index; T&A stands for textile and apparel price index; and INC stands for income.