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DETERMINANTS OF U.S. TEXTILE AND APPAREL IMPORT TRADE

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Introduction

In 1994 the U.S. textile and apparel industry complex employed about 1.5 million workers, and they have since then produced output worth at least \$50 billion every year (U.S. Department of Labor). The latest figures from the U.S. Department of Labor's Bureau of Labor Statistics show that the U.S. textile industry complex has been losing jobs since 1994 when the North American Free Trade Agreement (NAFTA) was ratified. In particular, the industry complex has lost 441,800 jobs from January 2000 through April 2005. The National Council of Textile Organizations (NCTO) claims that there have been 354 plant closings from 1997 to date, of which more than half (131 and 80, respectively) have occurred in North and South Carolina. Both textiles interest groups and the popular press blame job losses and plant closings on import surges to the U.S. (ATMI, 2001; Patterson, 2004).

Kletzer (2001) analyzed the relationship between rising import shares and job decline and concluded that for the U.S. textile and apparel complex the costs of import-competing job losses are high. Gleaning from Figure 1, U.S. exports of textile and apparel grew from \$12 billion in 1994 to \$15 billion in 2003. At the same time, the U.S. imported \$45 billion worth of textile and apparel in 1994 and \$82.8 billion in 2003; contributing to more than doubling the textile and apparel trade deficit from about \$33 billion in 1994 to \$68 billion in 2003. Figure 2 also shows that the share of imports relative to domestic consumption rose from 37% in 1994 to 66% in 2003. Therefore it appears that growth in U.S. textile exports has been relatively miniscule while imports as a share of domestic demand have continued to spiral.

Trade in textiles has historically been governed by quantitative restrictions. From the 1970s through 1995, the Multifibre Arrangement (MFA) governed the bulk of world textile and apparel trade, with textile and clothing quotas being negotiated bilaterally between trading

partners. The WTO ratified the Agreement on Textiles and Clothing (ATC) in 1995 to phase out quotas established under the MFA by January 1, 2005. Therefore, the world textile market effectively became fully integrated into the WTO when the ATC ended. With it also ended control of the imports of textiles and apparel into the U.S.

MacDonald et al (2001), by using a dynamic computable general equilibrium (CGE) simulation model found that the 2005 trade reforms in textiles and clothing would improve welfare in every region in the world, and would cause world textile, apparel, and cotton production to rise. In particular, U.S. production would decline for cotton as well as for textiles and apparel, although U.S. cotton exports potentially would rise. Therefore, it appears that conditions are ripe for global exporters of textiles and apparel to gain even greater access into the U.S. market. Yet, many developed countries, including the U.S., which are supposed to lift their quotas, are reluctant to do so because developing countries, such as China, have increased their share of the global textile and apparel market.

Moreover, it is a sector where relatively modern technology can be adopted even in poor countries at relatively low investment costs. These technological features of the industry have made it suitable as the first rung on the industrialization ladder in poor countries, some of which have experienced a very high output growth rate in the sector. These characteristics, however, have also made it a footloose industry that is able to adjust to changing market conditions quickly (Nordas, 2004). The latest statistics from the WTO show that developing countries take 55% of the global textile exports, which stood at \$1.369 trillion, in 2003. Developing countries also exported 71% of the apparel around the world in the same year. Despite import restrictions imposed as a result of the ATC of the MFA, relative prices of textiles and apparel tend to be higher in the U.S. than its trading partners (Cotton and Wool Situation and Outlook).

Consequently, U.S. importers of textile and apparel products have increased their imports over time (see Figure 1). The major sources of textile imports for the U.S. are China, Pakistan, India, Mexico, Taiwan, South Korea, Thailand, Indonesia, Japan, Hong Kong, Philippines, Canada, and Sri Lanka (U.S. International Trade Administration).

According to Ikenson (2005), the time has come for the Bush administration to cut the textile industry lobby's cord. For years, the industry has been a thorn in the side of policymakers attempting to do the right thing by liberalizing trade. Trade agreements and other trade liberalizing initiatives have had to be abandoned, curtailed, or saddled with red tape to accommodate the industry's unwillingness to compete. Meanwhile, the industry complex has used threats and extortions to achieve its objective of protectionism, often saddling consumers with stealth taxes, and dragging down market prospects for other industries.

Trade flows are generally determined on the basis of the principle of comparative advantage in a free trade system (Salvatore, 2004; Koo and Karemera, 1991). Since trade flows of cotton and textiles have been distorted by government interventions, determinants of trade flows of textile and apparel and their economic effects are not clearly understood. Accordingly, the objectives of this study are to evaluate factors explaining the pattern of textile and apparel imports into the U.S. from key trading partners and to derive implications from such textile and apparel trade. The rest of the paper is organized as follows: in the first section, we provide a theoretical justification for using the gravity model in determining trade flows of textiles and apparel. In the second section, we derive the reduced form of the gravity model. In the third section, we provide information on data sources and estimation procedure. The fourth section presents the results and the fifth section offers concluding remarks.

Theoretical Justification for Using the Gravity Model

Classical gravity models generally use cross-sectional data to estimate trade effects and trade relationships for a particular time period. However, cross-sectional data observed over several time periods (panel data methodology) result in more useful information than cross-sectional data observed in say a year. The advantages of this method are that panels can capture the relevant relationships among variables over time, and panels can monitor unobservable trading –partner pairs’ individual effects (Rahman, 2003).

Deriving its origins from Newton’s law of gravity in mechanics, gravity models analogously determine trade flows between two or more countries as a function of their respective economic masses, the distance between the economies and a variety of other factors. Therefore, the Newtonian physics notion provides the first justification for using the gravity model. A second justification derives application from the partial equilibrium model of export supply and import demand presented by Lineman (1966). Based on some simplifying assumptions discussed in the model derivation section, the gravity model is derived as a reduced form equation with characteristics similar to the original Newtonian model.

The gravity model has been applied to evaluate bilateral trade flows of aggregate commodities between pairs of countries and across regions (Oguledo and Macphee, 1994). Gravity modeling was originally developed by Tinbergen (1962), but with little in the way of theoretical justification. Recently, it has found empirical application in determining trade flows and policy analysis (Koo and Karemera, 1991), boarder effects inhibiting trade (McCallum, 1995; Helliwell, 1996 and 1998), and impacts of currency arrangements on bilateral trade (Rose, 2000; Frankel and Rose, 2002; Glick and Rose, 2002).

Koo and Karemera (1991) state that research in this area (such as Takayama and Judge,

1964; Bawden, 1966; Koo, 1984; Sharples and Dixit, 1989; Mackinnon, 1976) has used spatial equilibrium models on the basis of a mathematical algorithm. In these studies, trade flows are explained by the prices of commodities in importing and exporting countries and transportation costs between countries. However, Thompson (1981) and Dixit and Roningen (1986) explain that spatial equilibrium models perform poorly in explaining trade flows of commodities that could be distorted by both exporting and importing countries trade programs and policies.

Anderson (1979), Bergstrand (1985, 1989), Thursby and Thursby (1987), and Helpman and Krugman (1985) apply microeconomic foundations in deriving the gravity model which show that price variables, in addition to conventional gravity equation variables, are statistically significant in explaining trade flows among participating countries (Oguledo and Macphee, 1994). Generally, a commodity moves from the country where prices are low to the country where prices are higher. Therefore, trade flows are expected to be positively related to changes in export prices (Karemera et al., 1999).

Eaton and Kortum (1997) also derive the gravity equation from a Ricardian framework, while Deardoff (1997) derives it from a Heckscher-Ohlin (H-O) framework. But the H-O and Ricardian theories of trade contradict with what prevails with trade in the real world. For example, H-O postulates that the larger the differences in factor endowments between two countries, the larger will be the incidence of trade. Deardoff shows further that if trade is impeded and each good is produced by only one country, the H-O framework will result in the same bilateral trade pattern as the model with differentiated products. Additionally, the author states that if transaction costs from trade exist, then distance should be included in the gravity equation.

Model Derivation

In this study, the typical gravity model for aggregate goods is re-specified into a commodity-specific model to analyze trade flows in textiles. We follow the approach used by Koo and Karemera (1991), where they derive a single commodity gravity model for wheat trade. The approach derives its foundation from Linneman (1966) and Bergstrand (1985, 1989), where the gravity model is specified as a reduced form equation from partial equilibrium demand and supply systems. The import demand equation for a specific commodity can be derived by maximizing the constant elasticity of substitution (CES) utility function (U_{ij}) subject to income constraints in the importing country as follows:

$$U_j = \left(\sum_{i=1}^N X_{ij}^{\theta_j} \right)^{1/\theta_j} \quad (1)$$

where

X_{ij} = the quantity of a commodity imported from country i to country j (and N is the number of exporting countries).

It is assumed that a commodity can be differentiated by country of origin such that in the exponent, $\theta_j = (\sigma_j - 1) / \sigma_j$, where σ_j is the CES among imports. Consumption expenditures are limited by the income constraints (Y_j) of importing country j as:

$$Y_j = \sum_{i=1}^N \bar{P}_{ij} X_{ij}; \text{ Where } \bar{P}_{ij} = P_{ij} T_{ij} C_{ij} / E_{ij} \quad (2)$$

where

P_{ij} = the unit price of country i 's commodity sold in country j 's market;
 T_{ij} = $1 + t_{ij}$ where t_{ij} is import tariff rates on j 's imports;
 C_{ij} = the transport cost of shipping i 's commodity to country j ; and
 E_{ij} = the spot exchange rate of country j 's currency in terms of i 's currency.

By using the Lagrangian function to maximize utility (equation 1) subject to income constraint (equation 2), the procedure generates the import demand equation as:

$$X_{ij}^d = Y_j P_{ij}^{-\sigma_j} T_{ij}^{-\sigma_j} C_{ij}^{-\sigma_j} E_{ij}^{-\sigma_j} \left(\sum_{i=1}^N \bar{P}_{ij}^{1-\sigma_j} \right)^{-1} \quad (3)$$

where X_{ij}^d = the quantity of i 's commodity sold in country j ; and all other variables are as previously defined.

The model of trade supply equation is derived from a firm's profit maximization procedure in exporting countries. The total profit function of the producing firms is given as follows:

$$\Pi_i = \sum_{j=1}^N P_{ij} X_{ij} - W_i R_i \quad (4)$$

where:

- P_{ij} = the export price of i 's commodity paid by importing country j ;
- X_{ij} = the amount of i 's commodity imported by country j ;
- W_i = country i 's currency value of a unit of R_i ;
- R_i = the resource input used in the production of the commodity in country i .

R_i is allocated according to the constant elasticity of transformation (CET) production referred to as:

$$R_i = \left[\left(\sum_{i=1}^N X_{ij}^{\phi_i} \right)^{1/\phi_i} \right]^{1/\delta_i} \quad (5)$$

where $\delta_i = (1 + \gamma_i)/\gamma_i$ and γ_i is the CET among exporters.

Furthermore, we assume that income is a limiting factor in producing textile and apparel in the exporting countries. Therefore, $Y_i = W_i R_i$, where Y_i is the allocated income. Substituting equation 5 into equation 4 and maximizing the resulting profit function yields the export supply equation as follows:

$$X_{ij}^s = Y_i P_{ij}^{\gamma_i} \left(\sum_{i=1}^N P_{ij}^{1+\gamma_i} \right)^{-1} \quad (6)$$

General equilibrium conditions require demand to equal supply. Therefore:

$$X_{ij}^d = X_{ij}^s = X_{ij} \quad (7)$$

where X_{ij} is the equilibrium or actual quantity of the commodity traded from country i to country j . By equating equation 3 to equation 6, the commodity specific gravity equation is derived as follows:

$$X_{ij} = Y_i^{\frac{\gamma_j}{\sigma_j + \gamma_i}} Y_j^{\frac{\sigma_j}{\sigma_j + \gamma_i}} T_{ij}^{\frac{\gamma_i \sigma_j}{\sigma_j + \gamma_i}} C_{ij}^{\frac{\gamma_i \sigma_j}{\sigma_j + \gamma_i}} E_{ij}^{\frac{\gamma_i \sigma_j}{\sigma_j + \gamma_i}} \left(\sum_i P_{ij}^{1 + \gamma_i} \right)^{-\frac{\sigma_j}{\sigma_j + \gamma_i}} \left(\sum_j \bar{P}_{ij}^{1 - \sigma_j} \right)^{-\frac{\gamma_i}{\sigma_j + \gamma_i}} \quad (8)$$

The gravity model incorporates three variable components: (1) economic factors affecting trade flows in the origin country; (2) economic factors affecting trade flows in the destination country; and (3) natural or artificial factors enhancing or restricting trade flows. Bergstrand argues that since the reduced form of the generalized gravity equation eliminates all endogenous variables out of the explanatory part of each equation, income and prices can also be used as explanatory variables of bilateral trade. With N countries, one aggregate tradable good, one domestic good and one internationally immobile factor of production in each country, Bergstrand's (1985) model represents a general equilibrium model of world trade.

As previously noted, the major trade policies that have affected textile and apparel trade are the multilateral WTO's MFA and regional/bilateral NAFTA's yarn forward rule. Consistent with MacDonald et al (2001), we distinguish countries by whether or not trade in textiles and apparel was restrained by the MFA. We recognize that the use of a qualitative variable to represent the key trade policies leads to capturing average effects that may not track variations during the phase-out process of the MFA. However, in this case, it provides more coherent results. Therefore, consistent with Koo and Karemera (1991), we use dummy variables to

differentiate countries receiving policy benefits associated with the ATC governed under the MFA. Among the countries whose exports to the U.S. were restrained by the MFA, we include China, India, Pakistan, Taiwan, South Korea, Thailand, Indonesia, Japan, and Hong Kong. However, the Philippines and Sri Lanka (as less developing countries enjoying preferential trade treatment) were free from trade restraint. Canada and Mexico, by virtue of their NAFTA membership, were also free from trade restraint. Additionally, we substitute distance between the exporting country and the U.S. for cost of transportation, since data on the latter is not readily available.

Consistent with MacDonald, et al., this study abstracts from the issue of whether importing or exporting countries capture the rents from MFA quotas, and assumes that these rents are dissipated by rent-seeking behavior and inefficiency. That is to say, the MFA does not create either a price gap per se between domestic and border prices or quota rents for the restraining country (the U.S.). Instead the restraint merely causes difficulty for some countries (especially developing countries that do not benefit from preferential access) to export their textile and apparel products to the restraining country, and hence lower the efficiency of their exports. Also, one limitation of the study is that it does not capture the reduced import protection over time associated with the ATC. Therefore, potential increased export efficiencies attained by some exporting countries with trade reform, such as China following its bilateral trade agreement with the U.S. in 1999, are not adequately captured by this study.

The empirical reduced form gravity model to evaluate factors explaining textile and apparel trade between the U.S. and its key trading partners is specified as follows:

$$TEXIMP_{iust} = \beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{ust} + \beta_3 PCI_{it} + \beta_4 PCI_{ust} + \beta_5 EXRATE_{iust} + \beta_6 PRICED_{ust} \\ \beta_7 PRICED_{it} + \beta_8 DIST_{ius} + \beta_9 DMFA_{it} + \varepsilon_{iust} \quad (9)$$

where:

$TEXIMP_{iust}$	=	value of annual textile/apparel imports (in million dollars) by the United States from the exporting country i ;
GDP_{it}	=	Gross domestic product of the exporting country i ;
GDP_{ust}	=	Gross domestic product of the United States
PCI_{it}	=	Per capita income of the exporting country i ;
PCI_{ust}	=	Per capita income of the United States;
$EXRATE_{iust}$	=	Exchange rate of the currency of country i to the U.S. dollar;
$PRICED_{ust}$	=	Price deflator (proxy for inflation rate) of the U.S.;
$PRICED_{it}$	=	Price deflator of the exporting country i ;
$DIST_{ius}$	=	Distance in kilometers between the exporting country i and the U.S.;
$DMFA_{it}$	=	Dummy variable identifying whether country i was free from trade restraint (1 if country i was free from restraint in year t , and 0 otherwise); and
ε_{iust}	=	error term
t	=	time (1989 – 2003)

Data Sources and Estimation Procedure

The empirical evaluation of equation 9 is based on secondary data obtained from the following sources: (i) GDP, exchange rate, price deflators and population for the calculation of per capita GDP were obtained from the *International Marketing Data and Statistics* (2004); (ii) distance in kilometers between the U.S. and the exporting country was obtained from the research aid website of the Macalester College of Economics at www.macalester.edu/research; and (iii) trade values were obtained from the United States International Trade Commission's trade data website at www.dataweb.usitc.gov. Textile and apparel trade values, classified in SIC code 22 and 23, respectively, were used for years 1989-1996. The new NAIC code, which commenced in 1997, was used for the years 1997-2003. Under this new industrial code, NAIC 313 and 314 are specified as equivalent to the old SIC code 22 (for textile products); and NAIC 315 is equivalent to SIC 23 (for apparel products).

The variables and summary statistics are presented in Table 1 and the explanation of expected signs on independent variables is provided in Table 2. The exporting country's GDP can be interpreted as its production capacity, while importing country's GDP represents its level of effective demand. It is expected that the trade flows are positively related to exporting and importing countries' GDP. Per capita income for the exporting country is also included as a separate independent variable because it serves as a proxy for greater productivity of labor (Deardoff, 1977). Higher output per person indicates potential efficiency in production and greater exports; although a high population may decrease exports if there is a higher domestic demand for the product. Additionally, as a country's market develops and, especially, if the level of development is matched by innovation in the production of a new or higher quality product, then more of that good is demanded as import by other countries. For similar reasons, as a country develops consumers with higher per capita income are able to afford higher quality and more exotic imported goods (Rahman, 2003). We also use the GDP deflator as a proxy for price of goods in each country, since consistent time series data for prices of all categories of textile and apparel products for all the countries were not immediately available.

The gravity model was effectively parameterized through a SAS estimation program by utilizing time series and cross-sectional panel data. Two separate regression runs were conducted for textile and apparel trade, respectively. A major advantage in using panel data is its ability to control for the presence of individual variable effects which are common to the individual agent (or country) across time, but which may vary across agents at any one-time period. In addition, the combination of time series with cross-sectional data can enhance the quality and quantity of data in ways that would be impossible to achieve by using only one of these two dimensions (Gujarati, 2003). However, the presence of individual variable effects can

potentially create correlation problems among individual variables and the covariates. This can be corrected by specifying the model to capture the differences in behavior over time and space. Conceptually, the difference in the nature of individual effects can be classified into the fixed effects which assume each country differs in its intercept term; and the random effects which assume that the individual effects can be captured by the difference in the error term.

The Hausman test was run to check if the fixed or random effects model is more efficient. We use the Hausman's (p. 1261) notation where equation 9 in the time series and cross-section framework is written as:

$$X_{ijt} = Z_{ijt} \beta + \mu_{ij} + \mu_{ijt} \quad (10)$$

where

X_{ijt} = trade observation from country i to j at time t ($t = 1, \dots, T$);
 Z_{ijt} = a corresponding trade determinant vector;
 μ_{ij} = the trade effect associated with a country pair; and
 μ_{ijt} = the error term.

Equation 10 has the main advantage of allowing different effects of Z_{ijt} on X_{ijt} for each country pair to be captured. By assuming individual effects, we proceeded to test if μ_{ij} is fixed or random. Hausman's essential result is that "the covariance of an efficient estimator with its difference from an efficient estimator is zero" (Greene, 1990). Results indicate a Hausman m-statistic of 22.81 and 15.20 for the specified models for textiles and apparel imports, respectively, at a χ^2 value of 15.09 at the 1% level and 5 degrees of freedom. Thus, we reject the assumptions of orthogonality between μ_{ij} and right-hand side variables in favor of the existence of individual country fixed effects, which supports covariance specification of the models. The covariance matrix is estimated by a two-stage procedure leading to the estimation of model regression parameters by General Least Square (GLS) approach. The covariance model

estimates have the advantage of being unbiased and valid under the null hypothesis of no misspecification (Koo and Karemera, 1991). Also, since variables are expressed in the deviation form in the covariance specification of the model, the error term exhibits no serious heteroscedasticity with the cross-section data. In fact, the SAS estimation procedure automatically corrects for potential panel problems by using the Parks (1967) and Kmenta (1986) methods.

Results

Table 3 presents estimated results for the gravity models on textiles and apparel imports, respectively, from the major exporting countries to the U.S. With the exception of the parameter estimate representing U.S. GDP that is insignificant, most other parameters have consistent signs and are statistically significant at the 1% level for the textiles results. For the apparel results, all estimated parameters are of consistent signs and are significant at the 1% level, except for the parameter on per capita income for the exporting countries that is significant at the 10% level. For the textile results, per capita income for the U.S. has consistent sign and is significant at the 5% level. The fit statistics indicates R^2 of 0.86 and 0.94 for textiles and apparel, respectively, indicating that parameters in the models consistently explain trade flows of textiles and apparel.

As explained previously and in Table 2, GDP and per capita income of exporting countries represent their aggregate production capacity and higher productivity per capita of labor in output. Both estimated variables are positive as hypothesized and differ significantly from zero at the 1% level for the textiles results. For the apparel results, per capita income for exporting countries is significant at the 10% level, while the GDP for exporting countries is significant at the 1% level. This implies that a rise in exporting countries' total output or per capita productivity cause increased potential to export textiles and apparel. The magnitudes of

both variables are smaller than 1.0 in both models, potentially indicating that the values of textiles and apparel traded are insensitive to the countries' production capacity or individual productivity of labor. This insensitivity in exporting countries may be attributed to either their excess production capacity or government domestic support of the industry.

The parameter on per capita income of the U.S. was of the right sign and significant for the textiles model, although it was less than 1.0. The GDP parameter for apparel was consistent and significant, and its magnitude is less than 1.0. However, the per capita income parameter for apparel was significant and greater in magnitude than 1.0. The insensitivity in the U.S. of per capita income for textiles imports may be mainly because textiles are a necessity or that because of some other reason (perhaps because of the relative price differences) U.S. firms are willing to import foreign-produced textiles. Indeed, the estimated coefficients on the price deflators in the U.S. and exporting countries were all of consistent signs as hypothesized, and were all significant. Although relative prices were generally highly sensitive to trade (exports and imports) in textiles and apparel, the rates of responsiveness were larger for textiles than for apparel. Therefore, it appears that increasing GDP deflator (signaling potential inflationary trend) in the U.S. caused it to increase imports of textiles and apparel from its trading partners. Likewise, decreasing prices in the exporting countries caused them to export more textiles and apparel to the U.S. These results reflect significant import substitution of textiles and apparel during periods of rising prices for textiles and apparel in the U.S., especially since lower prices in exporting countries made their textiles and apparel more competitive in the U.S. market and increased the values traded. Nevertheless, the significant (at the 1% level) but negative parameters on the dummy variable for MFA in both the textiles and apparel models indicate that generally imports of textiles and apparel were expected to have been constrained by restrictions

imposed on access to the U.S. market by most of the leading exporters as a result of the ATC.

The estimated coefficient for exchange rate shows that a unit decrease in the exchange rate of local currency to the dollar will result in an increase of \$ 40.05 million in value of textile imports and \$2,827.24 million in the value of apparel imports, respectively to the U.S. Indeed, depreciation of an exporting country's currency relative to the dollar makes the exporting country's textiles and apparel products cheaper in the importing country's market, leading to increased trade flows. The variable for distance shows a negative and significant relationship at the 1% level with import values for both textiles and apparel, although the parameters are not sensitive to imports of textiles and apparel. The results explain the possibility that as distance between the U.S. and its trading partners increases, the value of imported textiles and apparel declines.

Implications and Concluding Comments

Although the popular press and textile and apparel interest groups decry the patterns of consistent imports of products from abroad, to date, no empirical study has been conducted to explain the pattern of textiles and apparel trade between the U.S and its trading partners. A major objective of this study is to fill that gap by providing consistent economic measures to explain some of the key underlying factors supporting recent textiles and apparel trade flows into the U.S. Despite some limitations, such as data paucity, this study demonstrates that the traditional gravity model can be parameterized effectively by using time series and cross-section data. It is clear from the gleaned results that modeling trade in textiles and apparel between the U.S. and its major trading partners provides consistent and efficient results.

A nation's aggregate output and its per unit productivity serve as important determinants of textiles and apparel trade with the U.S., indicating that countries that produce more quality

textiles and apparel efficiently are able to stimulate greater trade with the U.S. Consistent with theory, a country's depreciating exchange rate as well as relatively cheaper prices to that of the U.S., also play an important role in determining textiles and apparel trade flows to the U.S. market. Although the aggregate nature of the variables used in the gravity model for this study does not allow a measure of the relative costs of inputs in the textiles and apparel production such as labor, nevertheless, we are able to conclude from the results of relative prices that so long as textile and apparel products are perceived as cheaper abroad, U.S. importers will continue to purchase from abroad and global producers will find it profitable to sell their products in the U.S. market. Certainly, it appears that strong competition among exporting countries makes trade flows more sensitive to price changes, overcoming the existence of trade restraining policies such as the MFA imposed by the GATT and renewed under the ATC with the advent of the WTO in 1995. In fact, the abrogation of the ATC in January 2005 is expected to pave the way for even greater access to the U.S. market of textiles and apparel products from leading global producers, such as China. This must be a source of major concern to U.S. textiles and apparel producers and the communities in which they are located. Additional job losses in the future would threaten the economic viability of many rural communities in the South where textiles firms are mainly located.

References

- American Textile Manufacturers Institute (ATMI). *Crisis in U.S. Textiles*. Prepared by the Office of the Chief Economist and the International Trade Division of the American Textile Manufacturers Institute, August 2001. [Www.atmi.org/](http://www.atmi.org/)
- Amponsah, William A. "Impacts of NAFTA on the U.S. Textile and Apparel Industries." Research Report presented during the International Agricultural Trade Research Consortium General Membership Meeting, Tucson, Arizona, December 14-16, 2001.
- Amponsah, William A. and Xiang Dong Qin. "Impacts of Regional Trade Agreements: The Case of U.S. Textile and Apparel Trade with Mexico." Contributed paper presented during the XXIVth International Conference of Agricultural Economists, Berlin, Germany. August 13-18, 2000.
- Anderson, James. "A Theoretical Foundation of the Gravity Equation." *American Economic Review*, March 1979.
- Dixit, Praveen M. and Vernon O. Roningen. *Modeling Bilateral Trade Flows with Static World Policy Simulation (SWOPSIM) Modeling Framework*. AGES 861124. Washington, D.C.: USDA, ERS, Agriculture and Trade Analysis Division, 1986.
- Bawden, D.L. "A Spatial Equilibrium Model of International Trade." *Journal of Farm Economics* 4(1966):862-74.
- Bergstrand, Jeffrey. "The Gravity Equation in International Trade: Some Microeconomics Foundations and Empirical Evidence." *Review of Economics and Statistics* 67 (1985): 474-81.
- Bergstrand, Jeffrey. "The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportion Theory in International Trade." *Review of Economics and Statistics* 71 (1989): 143-53.
- Cotton and Wool Situation and Outlook Year Books*. U.S. Department of Agriculture, Economic Research Service (selected years).
- Deardorff, A.V. "Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?" In J. Frankel, ed., "The Regionalization of the World Economy," Chicago: University of Chicago Press, 1998.
- Dickerson, Kitty G. *Textiles and Apparel in the Global Economy*. Upper Saddle River, NJ: Prentice-Hall, Inc., 1999.
- Egger, P. "A Note on the Proper Econometric Specification of the Gravity Equation" *Economics Letters* 66(2000):25-31.

- Frankel, J.A. and A. K. Rose. "An Estimate of the Effect of Common Currencies on Trade and Income." Mimeograph, <http://haas.berkeley.edu/~arose>, 2002.
- Glick, R. and A. K. Rose. "Does a Currency Union Affect Trade? The Time Series Evidence." Mimeograph, <http://haas.berkeley.edu/~arose>, 2002.
- Gujarati, D. (2003). *Basic Econometrics*. 4th Ed. New York: McGraw Hill, 2003, p. 638-640.
- Helliwell, J.F. "Do National Borders Matter for Quebec's Trade?" *Canadian Journal of Economics* 29, 3 (1996): 507-22.
- Helliwell, J.F. "How Much Do National Borders Matter?" The Brookings Institution, Washington, D.C., 1998.
- Hicks, A. "Introduction to Pooling." In T. Janoski and A. Hicks (Ed), *The Comparative Political Economy of the Welfare State*, Cambridge, MA: Cambridge University Press, 1994.
- International Marketing Data and Statistics*. London: Euromonitor Publications Ltd., 2004.
- Kmenta, J. *Elements of Econometrics*. New York: Macmillan Press, 2nd edition, 1986.
- Koo, Won W. and David Karemera. "Determinants of World Wheat Trade Flows and Policy Analysis." *Canadian Journal of Agricultural Economics* 39 (1991): 439-55.
- Linemann, H. *An Econometric Study of International Trade Flow*. Amsterdam: North Holland Publishing, 1966.
- Macalester College of Economics (web site). www.macalester.edu/research/economics/trade.
- MacDonald, S., A. Somwaru, L. Meyer, and X. Diao. "The Agreement on Textiles and Clothing: Impact on U.S. Cotton." *Cotton and Wool Situation and Outlook*. USDA, ERS, CWS-2001/November 2001.
- Maddala, G. S. *Introduction to Econometrics*, 3rd ed. New York: J. Wiley & Sons, 2001.
- McCallum, J. "National Borders Matter: Canada-U.S. Regional Trade Patterns." *American Economic Review*, 85, 3 (1995): 615-23.
- Parks, R.W. "Efficient Estimation of a System of Regression Equations When Disturbance are Both Serially and Contemporaneously Correlated." *Journal of the American Statistical Association*, 62 (1966):500-09.
- Patterson, Donald, W. "The Great Unraveling." *The News and Record*, Greensboro, February

22, 2004, p. E1.

Rose, A. K. "One Money, One Market: Estimating the Effect of Common Currencies on Trade." *Economic Policy: A European Forum*, 30 (2000): 7-33.

Tinbergen, J. *Shaping the World Economy: Suggestions for an International Economic Policy*. New York, 1962.

U.S. Department of Agriculture. "Effects of North American Free Trade Agreement on Agriculture and the Rural Economy." Steven Zahniser and John Link (editors), Electronic Outlook Report from the Economic Research Service, WRS-02-1, July 2002. www.ers.usda.gov.

U.S. Department of Commerce web site. [Http://www.doc.gov/](http://www.doc.gov/)

U.S. Department of Commerce. "The U.S. Textile and Apparel Industries: an Industrial Base Assessment." Bureau of Industry and Security, www.bxa.doc.gov/, copied on February 25, 2004.

U.S. Department of Labor, Bureau of Labor Statistics. *Employment and Earnings*, various issues, 1989-2001.

U.S. International Trade Commission. Washington, DC., 2004. [Http://dataweb.usitc.gov/](http://dataweb.usitc.gov/)

Zoellick, Robert B. "Countering Terror with Trade." *Washington Post*, September 20, 2001.

Table 1. Descriptive Analysis

	Mean	Std. Deviation	Minimum	Maximum	Skewness
<i>TEXIMP</i>	496.96	538.74	3	3885	2.51
<i>APPIMP</i>	2412.14	3483.75	61	41146	7.49
<i>GDP_i (Billion)</i>	586.6	1074.70	6.98	5283.05	3.04
<i>PCI_i</i>	8244.73	10488.44	317.08	42071.92	1.31
<i>GDP_{us} (Billion)</i>	8013.06	1771.75	5438.7	11004	0.17
<i>PCI_{us}</i>	30039.12	5409.86	22159.88	39011.87	0.15
<i>EXRATE_{ius}</i>	0.95	0.35	0.22	2.61	1.57
<i>INFRATE_{us}</i>	2.99	1.05	1.55	5.4	0.86
<i>INFRATE_i</i>	6.92	7.13	-3.96	57.64	2.78
<i>DIST_{ius}</i>	11151.84	4265.74	733.89	16370.82	-1.44
<i>DMFA</i>	0.31	0.46	0	1	0.84

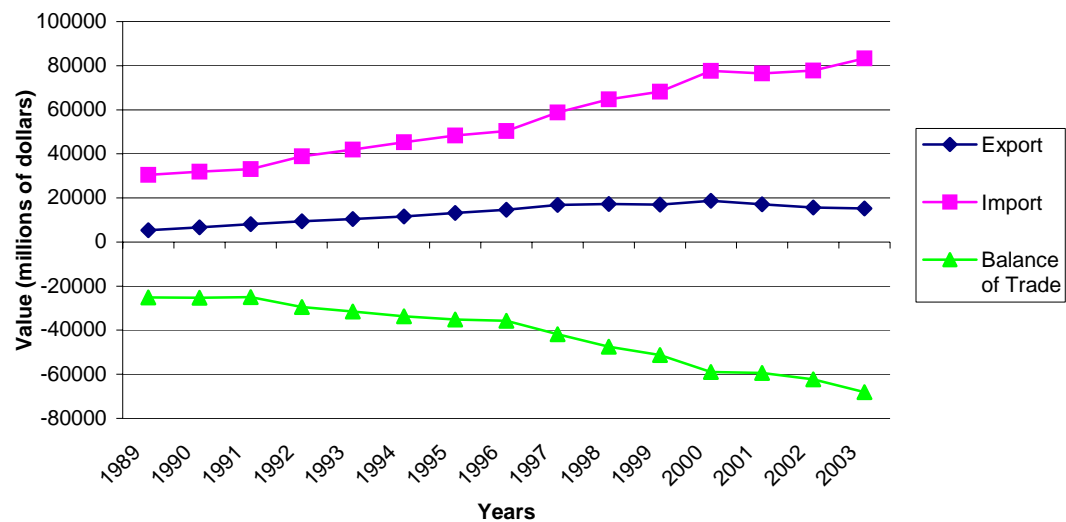
Table 2. Explanation of Expected Signs on Independent Variables

Variable	Expected Sign	Explanation
GDP of importing country	+	As income increases purchases are likely to increase. Thus increased income results in increased imports.
GDP of exporting country	+	Higher GDP indicates potential to export more textiles.
Per capita income of importing country	+	A higher per capita income indicates greater potential to demand higher quality and more exotic imports.
Per capita income of exporting country	+	A higher per capita income indicates higher productivity of labor (skill content) in output and would potentially lead to greater exports.
Distance	-	Proxy for cost of transportation. The further the distance, the less imports of goods from a country.
Exchange rate	-	The lower the exchange rate of the exporting country to the dollar, the cheaper its goods will be on the importing country's market. This results in an increase in imports.
Price Deflator _{us}	+	Importing country with high price deflator (a proxy for inflation rate) would substitute domestically produced goods with foreign imports.
Price Deflator _i	-	An Exporting country with a relatively high price deflator/inflation would be less competitive in the world market.
Effect of Multifiber Arrangement (Agreement on Textiles and Clothing)	-	MFA restricted trade in textiles and clothing until January 2005 for a majority of the countries trading with the U.S (but it allowed bilateral agreement to grant access). Therefore, MFA would lead to less import from trading countries to the U.S.

Table 3. Gravity Model Estimates on the Import of Textiles and Apparel

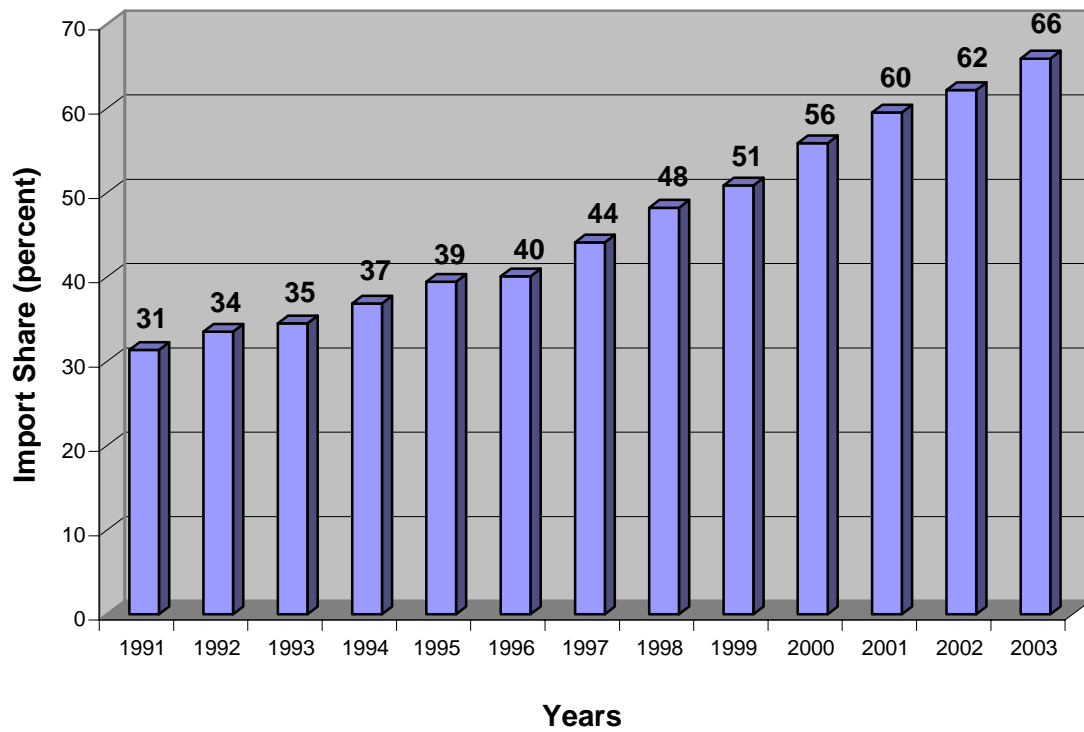
Variable name	Textile		Apparel	
	Point Estimate	P-value	Point Estimate	P-value
<i>Intercept</i>	382.46	0.1773	45627.66	0.0001
<i>GDP_i</i>	0.00026***	0.0001	-0.00022***	0.0192
<i>PCI_i</i>	-0.018***	0.0001	0.0188*	0.0828
<i>GDP_{us}</i>	-0.00021	0.1688	0.0112***	0.0001
<i>PCI_{us}</i>	0.098**	0.0482	-3.823***	0.0001
<i>EXRATE_{ius}</i>	-40.05***	0.0029	-2827.24***	0.0001
<i>INFRATE_{us}</i>	-15.27***	0.0005	292.43***	0.0001
<i>INFRATE_i</i>	-1.436***	0.0001	-47.002***	0.0001
<i>DIST_{ius}</i>	-0.083***	0.0001	-0.8105***	0.0001
<i>DMFA</i>	-492.34***	0.0001	-5979.63***	0.0001
<i>R²</i>	0.86		0.94	
***	Refers to significance at 1% level			
**	Refers to significance at 5% level			
*	Refers to significance at 10% level			

Figure 1. U.S. Trade in Textile and Apparel



Source: On-Line Database of the U.S. International Trade Commission: ITC trade Dataweb, Washington, DC, 2004 <http://dataweb.usitc.gov>

Figure 2. Import Share of Total U.S Textile Domestic Consumption



Sources: Cotton and Wool Situation and Outlook Year Books (1991 - 2004)