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A Global Perspective of Liberalizing World Textile and Apparel Trade

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International trade in textile and apparel has been governed by quantitative restrictions under the Multi-Fiber Arrangement (MFA) and earlier agreements for more than 30 years. One of the major accomplishments of the Uruguay Round was the Agreement on Textiles and Clothing (ATC), which provides for the dismantling of these restrictions. Under the Uruguay Round ATC, the MFA restrictions are to be phased out over a 10-year period and are scheduled to end by the year 2005. This study combines a data description of the trends in world textile and apparel trade flow, an econometric analysis on the linkage between textile trade and growth, and an intertemporal, world CGE model to evaluate the possible impact of liberalizing world textile and apparel trade. As textile and apparel industry is an important source of the growth, our study focuses on the effect on the developing countries.
Key words: Textile trade and growth, ATC, Intertemporal general equilibrium

Trends in world T&A trade flow

In the last four decades, world textile and apparel (T&A) trade increased from less than $6 billion in 1962 to 300 billion (in nominal terms) in 1999. Deflated by the U.S. GDP deflator, world T&A trade increased by 11 times in this period. Of the $300 billion of T&A trade, slightly less than two-thirds is trade in apparel goods and the rest is trade in textile goods. Four decades ago, however, the value of world textile trade was twice that of the world apparel trade (figure 1). As world textile trade has increased by five times and trade in apparel has grown more than 25 times, apparel trade has taken the lion's share of total world T&A trade.

In general, developing countries have a comparative advantage in textile and apparel trade. This advantage allows developing countries to diversify their exports beyond traditional primary commodities, whose production may be restrained by natural resources. As a leading, labor-intensive manufacturing sector, the textile and apparel industry is often thought to represent the first base in a country's economic growth and development. Moreover, unlike the primary agricultural commodities that are often

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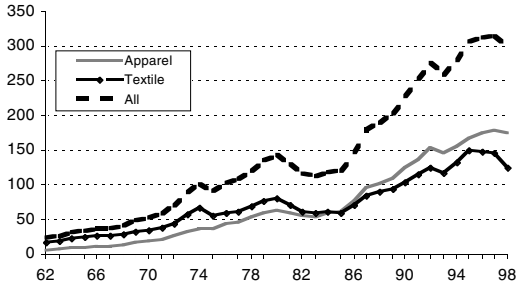
Figure 1.
World Textile and Apparel Exports
(In Billions US Dollars)



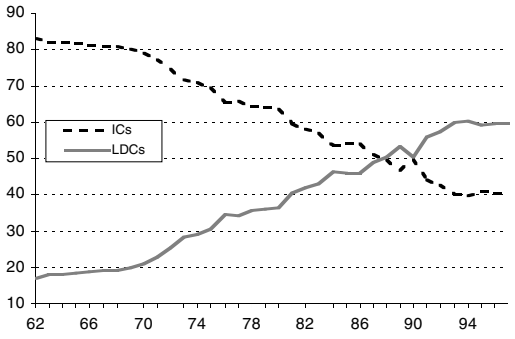
income inelastic, demand for textile and apparel commodities steadily grows in both developed and developing countries as countries become wealthier. This implies that for many developing countries there is room for future expansion of their production and export capacities.

In terms of the contribution to a country's economic development, many countries' experience shows that once export growth begins in the textile and apparel sectors, other steps in economic development follow. This transition has taken place in Korea, Taiwan, and now is happening in China, India, and many other South and Southeast Asian, and Latin American countries. One reason is that there are strong linkages between the textile industry and other economic sectors, both agricultural and non-agricultural. Growth in the textile sector benefits "upstream" agricultural or manufacturing sectors through increased demand for material inputs or machinery and equipment. In addition, the textile and apparel sectors depend on the presence of many modern economic activities. Through developing export-oriented textile and apparel industries, a country acquires other knowledge and skills such as marketing, advertising, transportation, and communication. These advances highlight the importance of the textile and apparel industries to a country's development process.

International trade in textiles and apparel has been governed by quantitative restrictions under the MFA and earlier agreements for more than 30 years. Restrictions in T&A trade can be traced back even further to the late 1950s when Japan imposed "voluntary export restraints" on cotton textiles destined for the United States (Spinanger, 1998). Starting with cotton and selected exporters, the MFA eventually covered textiles of all fibers and regulated exports from virtually all developing countries. It is estimated that the MFA covers about 15 percent of world textile trade and 40 percent of world apparel trade (Cline, 1990). Quantitative restrictions on developing country exports to developed countries were imposed through bilateral arrangements sanctioned under the MFA, while developed countries permitted unrestricted trade among themselves (see Trela and Whalley, 1990, for details on the development of the MFA).

The world trade regime that came to govern textiles was not entirely satisfying to anyone. Chafing under restrictions on export growth, periodic closing of quotas, and investigations of alleged quota circumvention, developing exporting countries railed against interference in one of their most promising sources of export growth. In developed countries, retailers resented the constraints on apparel sourcing, while domestic producers of textiles and apparel faced rapidly rising imports despite the presumably restrictive system of quotas and above average tariffs. Quota-driven constraints on established, efficient exporting countries drove apparel production into lower-income developing countries open to investment as the industry sought to stay ahead of importers' regulatory efforts. For their part, developing countries typically imposed import barriers of their own, barriers that were often even more

Figure 2.
Share in World Textile and Apparel Exports



restrictive than those imposed by developed countries under the MFA, providing yet another set of stumbling blocks to the global expression of comparative advantage. Under these restrictions, industrial countries as a group (ICs) accounted for the largest share of world total T&A exports until 1990, and were overtaken by developing countries (LDCs) only in the post decade (figure 2).

When we consider textile and apparel as two separate categories, the ICs exported more textile goods than that of LDCs until the last decade, while exports of apparel goods from LDCs exceeded the exports of the industrial country group in late 1970s. In the last five years, almost 70 percent of world apparel goods were exported from the developing countries (figure 3). The developing countries have gained market share in world apparel trade mostly due to the relative more rapid growth rate of their exports compared to ICs exports. Industrial countries' apparel exports actually grew quite rapidly and even faster than their textile exports in the last four decades (seven vs. three times). But developing countries' apparel exports increased by more than 88 times, and many developing countries have become major exporters in world apparel markets.

While ICs are the destination of more than 70 percent of world T&A trade (figure 4), the market is not fully open to the developing countries. Even though the developing countries have gained considerable ground and increased their market share in the last two decades, the industrial countries are still trading with other industrial countries to a large extent. This is in particularly true for the European Union, the world's largest textile and apparel importer. While the share of the EU's T&A imports is about 40–50 percent of world T&A trade, intra-EU's trade accounts for more than 50 percent of total EU's T&A imports, even in recent years. That is, roughly

Figure 3.
Share in World Textile and Apparel Exports for Developing Countries

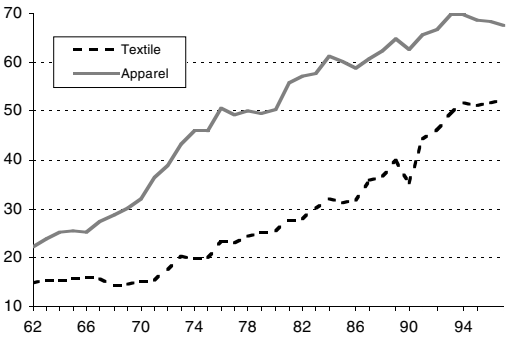


Figure 4.
Shares in World Textile and Apparel Imports

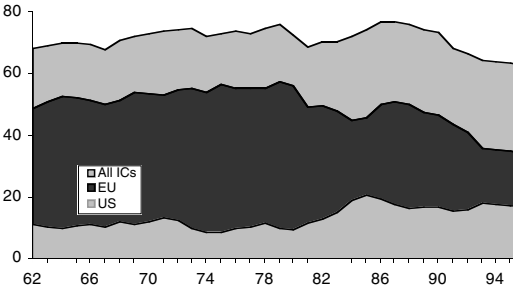
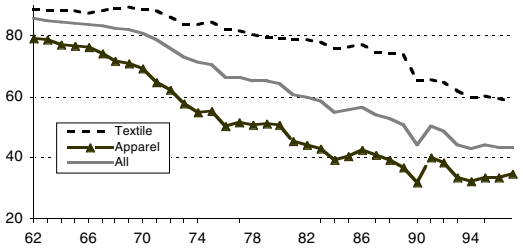


Figure 5.
Share of Industrial Countries' Imports Coming from Other Industrial Countries



20 percent of world T&A exports are actually traded among the EU's member countries. If we further take into account trade between the U.S. and EU, and between the U.S. and Canada, intra-industrial country trade accounts for 50 percent of T&A market share in the industrial countries (figure 5).

Economic growth and T&A trade

The purpose of this study is to evaluate the possible gains to developing countries if the MFA is dismantled. Before we proceed with the analysis, we first empirically investigate the impact of trade in textile and apparel products on standards of living. Many studies have empirically examined the correlation between trade and income. However, most of these studies look at trade in general, i.e., the relationship between total trade (exports plus imports for all commodities) and income level. While these studies provide some insights, we want to specifically investigate the linkage between trade in textiles and apparel and income.

We employ the UN COMTRAD database to develop a data set of textile and apparel trade for 91 countries over 37 years (1962–98). Using GDP and population data for these countries, we conduct a time-series and cross-sectional estimation to analyze the relationship between textile and apparel trade and income growth. In order to compare our results with those of other studies, we also include in the estimation total trade, agricultural trade, and total non-agricultural trade of the 91 countries over a 37-year period. The estimated equation is adopted from Frankel and Romer (1999). We do not include the country geographic area in the equation, as this type of effect is already captured by the constant term in the estimated panel model. Moreover, due to data constraints, we are not able to develop the constructed trade shares that Frankel and Romer have estimated in their study, and hence we use the actual trade shares.

The scale effects may distort the magnitude of estimated coefficients, because, e.g., shares for total trade are much larger than the shares for the textile and apparel trade. To avoid the scale effects, we normalize the data before we conduct the estimation. Specifically, we use U.S. 1962's data (including U.S. per capita GDP and all different trade shares for this year) as a reference, and divide all 91 countries over 37 years data by the reference.

The endogeneity is another problem that we have to deal with, as the independent variables are the trade shares which are the ratios of imports plus exports over real GDP, while the depend variable is the GDP per capita. To avoid this problem, we use a two-step procedure in the estimation. In the first step, each country's trade shares are specified as functions of time (the instrument) and consequently the estimated trade shares ($\hat{T}_{it}$) over time are derived. We then estimate the following equation using a time-series and cross-section (TSCSREG) procedure:

$$\ln Y_{it} = \alpha + \beta \hat{T}_{ti} + \gamma \ln A_{it} + \varepsilon_{it}$$

where Y_{it} is the real income (GDP) per person of country $i = 1, 2, \ldots, 91$, and time $t = 1962, \ldots, 98$, $\hat{T}_{it}$ (estimated) trade share, A_{it} population for country at time t, and ε_{it} the error term.

Table 1.
Trade and income

	Parameter estimate (standard error in parentheses)					
Variable/Statistic	Total trade (1)	Agricultural trade (2)	Nonagricultural trade (3)	Textile trade (4)	Apparel trade (5)	Textile & Apparel trade (6)
Intercept	-4.923	-0751	-6.197	-4.909	-4.243	-7.260
	(0.164)	(0.040)	(0.264)	(0.229)	(0.185)	(0.156)
Trade share	1.209	-1.540	1.967	0.702	3.281	1.272
	(0.016)	(0.028)	(0.085)	(0.030)	(0.065)	(0.020)
Ln population	-0.155	-0.439	1.900	-0.904	-1.141	-0.443
	(0.009)	(0.017)	(0.108)	(0.047)	(0.008)	(0.010)
R-squared	0.72	0.72	0.85	0.71	0.87	0.84

Results are all statistically significant at the 1-percent level

The TSCSREG procedure is included in the SAS software and it addresses both error-correction and fixed effect problems (SAS Institute, 1979). These methods are consistent with the Generalized Method of Moments (GMM) (see Arellano and Bond, 1991).

The estimation results indicate statistically significant positive relationships between total trade and income, total nonagricultural trade and income, as well as textile and apparel trade and income. However, the estimated parameter for the share of agricultural trade is negative. The estimated parameter for the share of total trade is 1.209 (table 1, column 1) and this result is consistent with the estimation in Frankel and Romer (1999, table 3). The parameter estimate implies that an increase in the share of total trade in GDP by one percentage point is associated with an increase of 1.2 percent in income per person. When we distinguish total trade into two aggregate categories: agricultural and non-agricultural trade, the estimated coefficients vary considerably and the coefficient for agricultural trade share is negative (–1.54) and positive for the non-agricultural trade (1.967, table 1, columns 2 and 3). As we mentioned above, world agricultural trade grew much more slowly than world non-agricultural trade in the last four decades (15 vs. 55 times). This causes the share of agricultural trade in GDP to decline in the world (figure 6). A negative coefficient on the share of agricultural trade is consistent with this fact, which implies that, in general, a decline in the share of agricultural trade in GDP is associated with an increase in income. This result also implies that to increasing non-agricultural trade is more crucial for developing countries to raise their living standards than depending mainly on agricultural trade.

The positive coefficients are obtained for the shares of textile and apparel trade. Moreover, the coefficient for the share of apparel trade is significantly larger than that for the shares of textile trade and total nonagricultural trade. The results indicate that one percentage increase in apparel trade shares is associated with a 3.3 percent increase in income per person (table 1, columns 6), which implies the importance of apparel trade in economic growth. Also, the data show that growth in T&A trade, especially in apparel trade, is much more rapid than the growth in

Figure 6.
Share of Agricultural and Nonagricultural Trade in GDP in the World

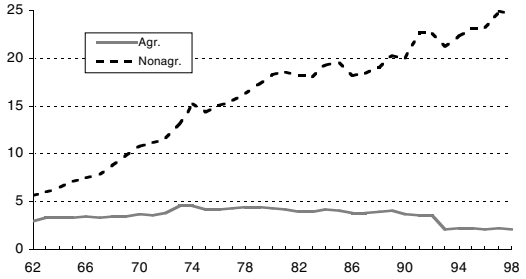
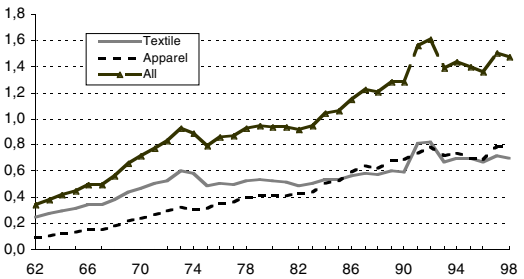


Figure 7.
Share of Textile and Apparel Trade in GDP in the World



GDP. World GDP per capita rose by more than 2 times in the 37 years while T&A trade has grown more than 50 times, mainly due the growth in apparel trade. Thus, the share of T&A trade in world GDP rises to 1.5 percent in 1998, from 0.35 percent in 1962. (figure 7)

In sum, the regression results suggest that T&A trade has a quantitatively large, robust, positive, and statistically significant effect on income. Although we do not specifically incorporate policy effects, the results suggest that promoting trade will benefit economic growth. In the following sections, we analyze quantitatively how the MFA and other trade restriction policies affect the economy. The regression results are used for the simulation analysis later.

MFA phase-out process

The Uruguay Round's ATC mandates the end of the quotas established under the MFA and also the reciprocal termination of the restrictions imposed by developing countries on their imports of textiles and clothing. By 2005, restrictions that do not meet GATT standards are supposed to be phased out, and the strengthened dispute-settlement mechanism the Uruguay Round introduced to the World Trade Organization increases the likelihood that the agreed liberalization will in fact occur.

The MFA phase-out is comprised of two parts: a four-stage process eliminating export restraints contained in bilateral agreements previously negotiated on products covered under the MFA, and an increase in quota growth rates for products still under restriction during the transition period. The ATC also deals with other non-MFA restraint measures relating to textiles and clothing.

The integration of the textile and clothing sector into the GATT is expressed as a percentage of the total volume of imports in 1990 of "covered" products. The four stages are defined in the ATC as follows:

Stage 1 – On January 1, 1995, members shall integrate products that account for at least 16 percent of their total 1990 import volume;

Stage 2 – On January 1, 1998, they shall integrate products that account for at least an additional 17 percent of the total 1990 import volume;

Stage 3 – On January 1, 2002, they shall integrate products that account for at least an additional 18 percent of the total 1990 import volume;

Stage 4 – On January 1, 2005, all remaining ATC restrictions are eliminated and the textile and clothing sector is integrated into the GATT.

In addition to these minimum percentages, products from each of the four groups – tops and yarns, fabrics, made-up textiles, and clothing – must be included in each stage. However, the selection of products to integrate is determined by the importing country. Also, products not liberalized but under quota or other restraint will have their quota growth rates increase during the first three stages of the phase-out period by 16, 25, and 27 percent, respectively.

As successful as the countries were in achieving an agreement on T&A products, they did not succeed in bringing T&A products under the jurisdiction of the GATT framework throughout the phase-out period. However, the selection of products to integrate is determined by the importing country, and the products integrated into the GATT are not necessarily those whose imports are restricted. Importing countries have largely chosen to postpone integration of the most heavily protected products until 2005. United Nation estimates in Thomas and Whalley (1998) suggest that the major restraining countries fulfilled their obligations under the ATC in the first two stages without significantly eliminating any MFA quota in place. As a result, modest trade opportunities for developing countries may be available only after the third stage is in place in 2002. Even then, about half of the 1990 import volume will remain restricted until 2005 as specified in the ATC. Moreover, the ATC specifies nothing about what might or might not happen beyond the year 2005 when the MFA is absent. The language of the agreement speaks of textiles and apparel as a sector simply returning to normal GATT/WTO disciplines. However, this need not, and probably will not, mean that free trade will prevail in T&A trade. There are fears of new developed country dumping actions in this sector partially substituting for existing restraints; there are also doubts openly expressed by developing countries as to whether the developed countries will have the political will to actually implement their commitment. These doubts focus more heavily on the North American than the European importers, but both are the subject of questions (Whalley, 1999).

Perspectives of a post MFA world

Given the fact that much of the trade liberalization due to the MFA phase-out will happen after 2004, this study does not take into account commitments that will be implemented in the first three stages. That is, we do not attempt to analyze specifically what will happen in each stage in which the phase-out commitments are implemented. Instead, we focus on the potential outcome in a post MFA world.

Several facts make the study difficult and distinguish it from a standard trade liberalization case. First, regional trade in textile and apparel goods has grown rapidly in the two world's largest industrial (importing) regions – the North America and the EU. In the last 5 – 8 years, the U.S. has increased apparel imports from Mexico under NAFTA and from Jamaica and Dominican Republic under the Caribbean Basin Initiative, while the EU has increased imports from the Central European countries. Most of this trade is free of quota restraints and hence is growing rapidly. This regional trade growth has built a constituency among a subset of exporting countries who now may find themselves more favorable to the MFA, since these countries now have export markets partly protected through MFA quotas from other suppliers.

Second, Korea, Taiwan, and Hong Kong, which were the largest apparel exporters among developing countries 15–20 years ago, are now left with unused and unfilled MFA quotas for their apparel exports, while countries like China, India, and Pakistan are facing tight quota restraints due to the fast growth in their apparel exports. As the current quotas may be not binding for some countries, it seems improper to use established quota levels to quantitatively measure the restrictions that the exporting countries face due to the MFA.

Third, unlike most other non-tariff barriers which allow importing countries to capture the rent generated from restricted imports, the MFA allows exporters to capture some of these rents (Spinanger, 1998). Under the MFA, importing countries (industrial countries) "sell" to the exporting countries the right to continue to export given amounts of T&A products. The exporting countries have the opportunity to capture the rents ensuing from restricting supplies[2]. Thus, the domestic prices of imported T&A products in the restraining countries are not necessary higher than the border prices in international markets, and hence, it is not proper to assume that the gap between the domestic prices and the border prices in the importing countries (i.e., the so called tariff equivalent rate) can represent a restraining country's protection level under the MFA. Modeling the MFA restriction as an export tax in the exporting countries is also questionable, as in many of these countries, such as China and India, exports of T&A products are actually encouraged by domestic policies.

To take into account these facts, we aggregate the world into 13 open economies, 9 developing economies and 4 industrial economies. (1) China, (2) India, (3) other South and Southeast Asian countries, (4) Middle-east countries, (5) former Soviet Union countries, and (6) Latin American countries (excluding Mexico and the Caribbean countries) represent the exporting countries restrained by the MFA quotas in the model, (7) North African and East European countries, and (8) other African countries represent the developing countries free from restraint in the EU market, and (9) Mexico and Caribbean countries, represent the countries free from restraint in the North American markets. The industrial economies are included in the model as both major importers and exporters. Among them, two represent the restraining regions: (10) the North America (U.S. and Canada), and (11) the EU. The rest of the two industrial economies represent the non-restraining regions: (12) Australia and New Zealand, and (13) Japan, Taiwan, Hong Kong, and Korea. As Taiwan, Hong Kong and Korea currently have unused quotas in their apparel exports, we treat them as developed countries in the model. Second, we try to model the MFA quotas as the impact on some developing countries' export efficiency. That is, the MFA does not create either a price gap between domestic and border prices or quota rents for the restraining countries; instead, the restraints cause difficulty for some developing countries to export their textile and apparel products to the restraining countries (North America and the EU in the model), and hence lower the efficiency of their exports. In a post MFA world, exports of textile and apparel products become relatively easy for the developing countries [included in (1) – (6)], and hence exports grow.

1. However, Krishna and Tan (1998) point out that market power by importers in industrial countries may mean that quota rent is actually shared with the industrial country retailer.

The model and data

The model used for the study belongs to the family of global general equilibrium models with multi-sector and multi-region setup and intertemporal feature. Such models have been used widely to analyze the impact of regional or global trade liberalization and structural adjustment programs. The model developed for this study draws in many ways upon the recent contributions by McKibbin (1993), Mercenier and Sampaio de Souza (1994), Mercenier and Yeldan (1997), and Diao and Somwaru (2000, 2001). The model focuses on the real side of economic activities, such as production, consumption, physical investment, trade flows as well as real terms of international borrowing and lending. It incorporates considerable detail in these activities – both at sectoral levels and across regions.

In the model, a representative producer for each sector of a region makes production and investment decisions to maximize an intertemporal profit function or the value of the firm. In making production decisions, the firms choose the levels of labor and intermediate inputs to produce a single sectoral output for each time period, taking into account the price of outputs, the wage rate, the prices of intermediate inputs, and the stock of capital at each time period. Outputs are either sold in the domestic market or exported to foreign markets.

In making investment decisions, the firms have to compare the costs of investment with the expected future returns to capital, taking into account the price of investment goods and the interest rate in each time period. Firms are owned by households/consumers and investment is financed by undistributed profits. In each time period, the firm's profits, $div_{n,i,t}$ which is equivalent to the gross revenue, $PX_{n,i,t}$ minus labor costs, $w_{n,t}L_{n,i,t}$, intermediate input costs, $\sum_j PC_{n,j,t}ITD_{n,j,i,t}$, and investment costs, $PI_{n,i,t} \cdot I_{n,i,t}(1+\phi_{n,i}) \cdot {}^{I_{n,i,t}}/_{K_{n,i,t}}$ distributed to households. Investment raises the stock of capital with waste caused by capital adjustment costs. Formally, the firm's problem can be described as follows:

$$\max_{\{I_{n,i,t}, L_{n,i,t}, ITD_{n,j_1,i,t}, \ldots, ITD_{n,j_J,i,t}\}} V_{n,i,1} = \sum_{t=1}^{T} R_{n,i,t} div_{n,i,t} + div_{n,i,T} \frac{(1 + r_T)^{1-T}}{r_T}$$

$$div_{n,i,t} \equiv P_{n,i,t}X_{n,i,t} - \sum_{j}^{J} PC_{n,j,t}ITD_{n,j,i,t} - w_{n,t}L_{n,i,t} - PI_{n,i,t}I_{n,i,t}\left(1+\phi_{n,i}\frac{I_{n,i,t}}{K_{n,i,t}}\right)$$

$$s.t. \quad X_{n,i,t} = f(L_{n,i,t}K_{n,i,t}, ITD_{n,j_1,i,t}, \ldots, ITD_{n,j_J,i,t})$$

$$K_{n,i,t+1} = (1 - \delta_{n,i})K_{n,i,t} + I_{n,i,t}$$

In the equation, $V_{n,i,1}$ represents the value of firm i in region n at the first time period;

$R_{n,i,t} = \prod_{s=1}^{t} \frac{1}{1 + r_{n,s}}$ is the discount factor for the future returns; $L_{n,i,t}$, $K_{n,i,t}$, and $ITD_{n,j,i,t}$ are, respectively, labor, capital and intermediate inputs in the production of $X_{n,i,t}$; $I_{n,i,t}$ is quantity of new capital equipment built through investments at time t; $\delta_{n,i}$ is a positive capital depreciation rate; and $\phi_{n,i}I_{n,i,t}/K_{n,i,t}$ is adjustment cost per unit of capital investment. The model assumes full employment of labor and capital, and both factors are mobile within a region but cannot move across regions. While labor supply is fixed along the entire time path, capital accumulates over time along the transition and becomes constant at the steady state where the investment only covers the depreciation and adjustment costs.

In each region the representative household owns labor, the equity in domestic firms, and foreign bonds, and allocates income to consumption and savings to maximize an

intertemporal utility function over an infinite horizon:

$$\text{Max} \sum_{t=1}^{\infty} \left(\frac{1}{1+\rho}\right)^{t} U(TC_{n,t})$$

subject to the following current budget constraint:

$$SAV_{n,t} = w_{n,t}\bar{L}_{n,t} + \sum_{i} div_{n,i,t} + r_{n,t}B_{n,t-1} - P^{TC}_{n,t}TC_{n,t}.$$

where ρ is the positive rate of time preference; $TC_{n,t}$ is aggregate consumption at time t; $SAV_{n,t}$ is household savings, $B_{n,t-1}$ is the stock of foreign assets, and $r_{n,t}B_{n,t-1}$ is interest earned from ownership of foreign bonds. $P^{TC}_{n,t}$ is the consumer price index, and $TI_{n,,t}$ is lump sum transfer of government revenues from excise taxes and tariffs. We assume no government saving-investment behavior. "Government" spends all its tax revenues on consumption or as transfers to the households, and hence, public sector borrowing requirement is not explicitly modeled. $TC_{n,t}$, the instantaneous consumption, is generated from the consumption of final goods by maximizing a Cobb-Douglas function:

$$TC_{n,t} = \prod_{i} C_{n,i,t}^{b_{n,i}}$$

subject to

$$\sum PC_{n,i,t}C_{n,i,t} = P^{TC}_{n,t}TC_{n,t}$$

where $C_{n,i,t}$ is the final consumption for good i, and the consumer shares, $b_{n,i}$ satisfy

$0 < b_{n,i} < 1$, and $\sum b_{n,i} = 1$.

International trade flows are tracked by region of origin and destination. The variable $M_{n,s,i,t}$ represents the trade flow of commodity i from region n to s at time t and is an endogenous variable in the model. As the sectors are quite aggregate, a region can export and import a same aggregate commodity, i.e., there exists imperfect substitution relationship between the good domestically produced and imported.

International borrowing and lending occur in the model. When a country's current consumption plus its investments are above its current domestic income, the country experiences a trade deficit. If the reverse is true, the country experiences a trade surplus. If the country does not own net foreign assets that can generate income from abroad, the trade deficit has to be financed by international borrowing (i.e., $SAV_{n,t}$ is negative). Once international borrowing occurs, we observe foreign capital flowing into the country. The current period's foreign borrowing becomes a net debt burden and either increases the country's total outstanding debt or reduces its foreign assets, i.e.,

$$FBOR_{n,t} = \sum_{i}^{J}\sum_{s}^{N}(PW_{s,n,i,t}M_{s,n,i,t} - PW_{n,s,i,t}M_{s,n,i,t})$$

$$SAV_{n,t} = B_{n,t} - B_{n,t-1} = r_{n,t}B_{n,t-1} + FBOR_{n,t}$$

where a positive $FBOR$ implies a surplus in the region's foreign trade.

The model is solved for the entire time path simultaneously and the terminate period of the model is assumed to be a steady state equilibrium. The data are from the *GTAP database* version 5, pre-release 3 (GTAP, 2001), including data about trade flows in the world and production and consumption in each country/region in 1997. The original data set includes 66 countries/regions and 57 aggregate sectors. For the purpose of this study, we aggregate the data into 13 countries/regions (listed in the previous section) and 7 sectors, including cotton, other crops, livestock, processed food, textile, apparel, and an aggregated manufacturing and services sector.

T&A vs. the rest of economy – an illustration of input-output linkages

The study focuses solely on the impact of the MFA phase-out and removal of other related trade restrictions in world T&A trade. Historical trends discussed in the previous sections suggest that world T&A trade can be expected to grow, and hence change in the world market structure may continue regardless of possible policy changes. The method used in our study does not allow us to predict future trends, or the pace of structural change in the future. The method we use in the following analysis is sometimes called a 'counter-factual' analysis, i.e., we ask questions such as given the trend in the growth and the change in the market structure, how the MFA phase-out will add additional growth to world T&A trade or will cause further change in the world market structure.

The MFA phase-out and other changes in trade policy can be expected to affect T&A trade directly. Change in a country's textile and apparel exports can also affect the country's domestic economy as well as the world economy through input-output, supply-demand, and price linkages. This study tries to capture such linkages among economic activities and hence to evaluate the general equilibrium impact of the MFA phase-out on the world economy. We first present a static example to illustrate how such linkages, e.g., the input-output linkages, work when a country's exports of textiles and apparel rise. We start by assuming that the developing countries and regions in (1) – (6) increase their textile and apparel exports by 5 percent. We further assume that prices in the world and in each country/region remain unchanged, and no change in total world T&A trade. Hence, textile and apparel exports from the regions of North America and the EU are assumed to decline. With fixed domestic demand, an increase in exports needs to be supplied by an increase in production, which requires more intermediate inputs, labor, and capital. Increased use of intermediate inputs may promote production in the intermediate producing sectors, such as cotton and manufacturing goods. In addition, textile products are inputs of apparel production and hence apparel exports stimulate textile production. The intermediate inputs may be imported from abroad and hence exports can stimulate imports, which allows intermediate exporting countries to expand production. Putting all these linkages together, increase in the exports of T&A products results in rises in GDP, total labor demand, and hence household income. Similarly, a decrease in the textile and apparel exports in North America and the EU causes GDP and income to fall in these regions (table 2).

It is observed in table 2 that a 5 percent increase in exports of T&A generates differential effects among the countries. These effects are static and mainly reflect the difference in production and trade structures across countries. In general, the more export-oriented a country's textile and apparel industry, the larger the T&A share in a country's GDP, or the more available labor supply, the stronger the response of the rest economy to the exports of T&A. If we further take into account some dynamic factors, such as investment and capital accumulation, the higher a country's saving rate, or greater a country's access to foreign investment, the larger the effect of trade on the economy.

The above illustration only considers the static input-output linkage while the possible effects of change in the structure of world T&A trade on prices, consumer demand, and firms' investment behavior are ignored. In the following analysis, we will take into account these factors in an intertemporal general equilibrium framework.

Table 2.
An illustration of input-output linkages between textile and apparel exports and the rest of economy
(% change from the base after a 5% increase in textile and apparel exports from developing countries)

	China	India	Mid-east	USA	Other L.A.	EU
Demand for labor						
Textile	2.11	1.28	2.63	-0.95	0.16	-1.97
Apparel	2.49	2.25	2.13	-0.95	0.11	-1.78
Demand for intermediates						
Cotton	2.05	0.22	1.59	-0.80	0.13	-1.62
Textile	1.61	1.20	1.65	-0.62	0.11	-1.29
Apparel	0.38	1.32	0.67	-0.80	0.02	-1.04
Manufacturing & services	0.13	0.13	0.07	-0.02	0.01	-0.04
Output						
Cotton	1.96	0.10	1.04	-0.57	0.11	-0.68
Textile	2.11	1.28	2.63	-0.95	0.16	-1.97
Apparel	2.49	2.25	2.13	-0.95	0.11	-1.78
Manufacturing & services	0.08	0.06	0.03	-0.01	0.00	-0.02
Imports						
Cotton	1.96	0.11	1.23	-0.80	0.11	-1.58
Textile	1.49	0.51	1.21	-0.46	0.08	-0.83
Manufacturing & services	0.09	0.07	0.03	-0.01	0.00	-0.02
Macroeconomic effects						
Total labor demand	0.21	0.12	0.07	-0.02	0.01	-0.05
Income	0.15	0.09	0.05	-0.02	0.01	-0.03
GDP	0.19	0.10	0.06	-0.02	0.01	-0.04

General equilibrium perspective of MFA phase-out

We simulate the possible effect of MFA phase-out by improving the efficiency of textile and apparel exports from the countries/regions restrained by MFA (countries/regions included in (1) – (6)). In the model, we employ a CES function to capture the imperfect substitution between exports and sales in the domestic markets. Due to the MFA constraint, firms in textile sector are actually forced to produce more for the domestic markets and less for the foreign markets. Thus, we assume that in the base run the firms in the MFA restrained countries cannot reach an efficient allocation between production for exports and production for the domestic markets. With MFA phase-out, we exogenously increase the efficiency allocation coefficient. Moreover, we assume other trade barriers (represented by tariff equivalent rates) on textile and apparel imports are reduced by 30–40 percent in *all* countries (including developing countries restrained by MFA), and the reduced tariff equivalent rates are close to each country's average tariff rate for other manufacturing imports. Integrating trade barrier reductions in the developing countries into the simulation is based on the ATC requirement, and also on the fact that while

many developing countries face the restraints in their textile and apparel exports under the MFA, there exist high barriers on imports of T&A goods in some of these countries, such as China and India. Hence, there are also conflicts over textile and apparel trade among the developing countries. For this reason, we assume when the MFA is finally dismantled, other trade barriers (represented by tariff equivalents here) have to be also reduced in the world. The econometric results discussed in the previous section concerning linkage between the share of T&A trade in GDP and growth in GDP are also incorporated into the model as a function linking the total factor productivity (TFP) with the trade share in GDP for each region.

1. More textile and apparel trade in the world

World T&A trade increases in the model due to the MFA phase-out and tariff reductions. Comparing with the base, world T&A trade increases by 5–16 percent annually in the simulated time period of 25 years. That is, if world T&A trade were expected to grow 8 percent annually in the next 25 years after 2005, then due to the MFA phase-out, the new annual growth rate in the model is about 8.5 percent average. With this higher growth rate, trade level (not growth rate) would be 5–16 percent higher annually than in the base year as indicate by the trend (figure 8). The gains in world T&A trade are about $20 billion in the early periods of the post-MFA and could increase to $200 billion in the long run (figure 9). Consistent with the trend in the historical data, the model results show that world apparel trade will increase twice as fast as textile trade in the post MFA world (figure 10).

It is obvious that the increase in world trade is mainly due to more apparel exports from developing countries, as their exports become more efficient in the model. However, the model results also show that as a group, exports of T&A by the industrial countries, especially their textile exports, do not fall, but instead rise by about 4–6 percent from the base (figure 11). As we discussed in the above example, textile and apparel sectors have

Figure 8.
World T&A Trade – Data/Trend and Model Results
(Billion US dollar)

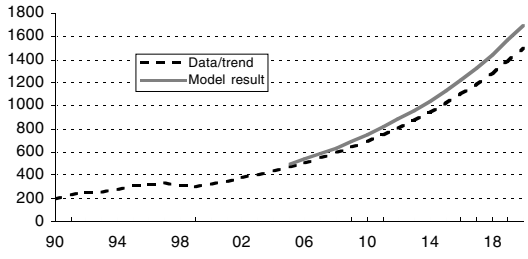


Figure 9.
Change in World T&A Trade – Difference between Trend and Model Results
(Billion US dollar)

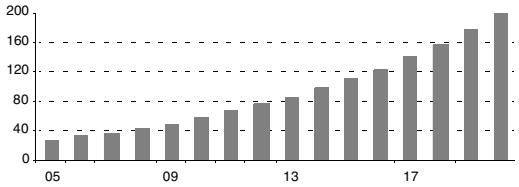


Figure 10.
Increase in World Textile and Apparel Trade
(Simulation results, % change from the base)

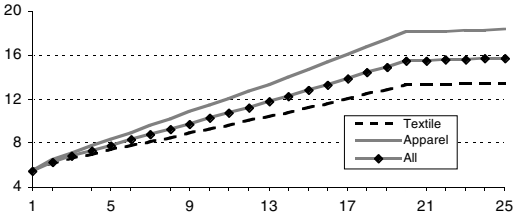


Figure 11.
Increase in Textile and Apparel Exports
(Simulation results, % change from the base)

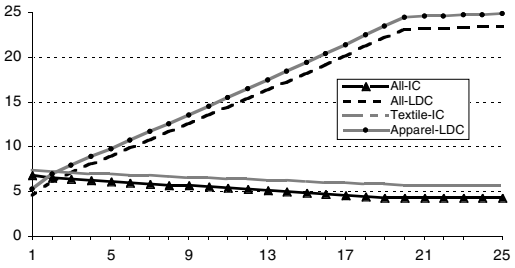
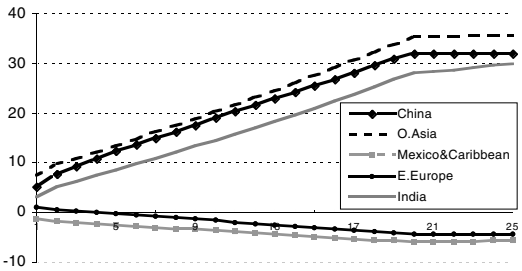


Figure 12.
Increase in Textile and Apparel Exports in Selected Regions
(Simulation results % change from the base)



strong inter-linkages. When developing countries increase their apparel exports, which are mainly labor-intensive products, their demand for industrial countries' textile products, which are often capital intensive, rises and hence industrial countries' exports also increase. This result indicates that protective policies in the world T&A trade not only restrain exports of developing countries, but also limit the possible exports of industrial countries and hence reduce overall world trade flow. While liberalization may cause competition between rich and poor countries in world T&A markets, it can also induce interdependency among countries and hence enlarge world trade.

2. Countries' market shares change

The simulation results show that world market shares for some countries or regions change in the post MFA period. In total, developing countries gain 4 percentage points of the world T&A market from the industrial countries in the base year. As the largest exporter among the developing countries, China is observed to have the most rapid growth in textile and apparel exports. This allows China to gain almost 3 percentage points of the world T&A market (figure 12). Following is the region of the other Asian countries, capturing more than 2 percent more world market share (table 3). Exports in some developing countries/regions that are free from quota restraints under the MFA decline and in total, they lose about 20 percent of their T&A markets (equivalent to 2.3 percentage points of world total T&A markets) to those countries restrained by the MFA.

Changes in market shares may be underestimated due to the regional aggregation in the model. The aggregation causes trade among the countries that are aggregated into a region to be ignored. In some regions, especially in the EU, intra-regional trade is likely to be replaced by imports from countries outside the EU. For example, total EU exports of T&A goods accounted for 30 percent of the world T&A trade in the last decade, on average. As about half of the exports are intra-EU trade, which are not taken into account in the model, the model only captures the exports of the EU to the rest of the world, which is about 14.4 percent of world total textile and apparel exports in the base. This share falls to 12.7 percent in the simulation, which implies that as an exporter, EU loses about 13 percent of

Table 3.
Market shares for selected countries/regions in world total textile and apparel exports

		Simulation results			
	Base	Year 5	Year 10	Year 15	Year 20
Developing countries	**59.57**	**60.20**	**61.32**	**62.41**	**63.49**
(1) China	19.69	20.50	21.24	21.91	22.52
(2) India	4.40	4.43	4.57	4.72	4.88
(3) Other Asia	13.00	13.68	14.18	14.70	15.22
(4) Middle East	5.03	5.22	5.39	5.57	5.76
(7) E. Europe	6.50	6.02	5.80	5.59	5.38
(9) Mexico and Caribbean	6.09	5.51	5.32	5.14	4.96
Industrial countries	**40.43**	**39.80**	**38.68**	**37.59**	**36.51**
(10) N. America	6.61	6.31	6.13	5.95	5.77
(11) EU	14.39	13.91	13.48	13.06	12.65

its markets outside the EU. However, if the intra-EU trade were included in the model, then the developing countries would not only gain markets in the rest of the world, but also within the EU.

Second, while the econometric results on the linkage between T&A trade share in GDP and growth in GDP are incorporated in the simulation, the model does not take into account for the growth trend in T&A trade due to population growth or technological change. The historical data show that growth is a major reason for the structural change in the world T&A market. In the early stage of development, a country tends to export more T&A products, especially high labor-intensive apparel products. When the country becomes wealthy and its labor cost increases it starts to lose its comparative advantage in producing and exporting labor-intensive apparel goods and shifts to other products which are more capital or human-capital intensive. Dynamics of shifts in comparative advantage are observed in the process of economic development in countries such as Japan, Korea, Taiwan, and Hong Kong, all of which were large textile and apparel exporters in the past. While the model fails to capture such dynamics in a country's comparative advantage, the model results seem to tell us that only when the MFA phase-out strongly affects the growth patterns and growth rates of developing countries do such trade reforms have a significant impact on the market structure of world T&A trade.

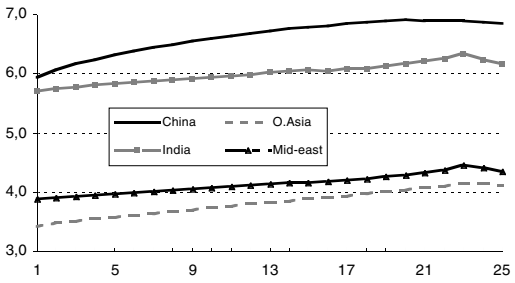
3. Positive welfare effects among the countries

From the world's perspective, a more liberalized textile and apparel sector implies more efficient allocation of resources and hence higher global welfare. Moreover, in the intertemporal model with a linkage between TFP and trade-GDP share, a more liberalized textile and apparel sector also stimulates investment, while a higher trade-GDP share causes TFP level to be higher. Thus, all countries, not only those restrained by the MFA, but also the other ones, gain from the liberalization. We use the well-accepted equivalent variation (often referred to as the willingness to pay) to measure the social welfare gains or losses in the post MFA world. In a static analysis, the welfare effects are often measured by using the status-quo (pre-reform) prices as the base, and addresses the question: what income would be equivalent to the change brought

about by liberalizing world T&A trade (Varian, 1984)? We borrow this concept in our dynamic analysis by evaluating the welfare effects within each time period and the entire time path by summing the discounted value of this measure over time.

As expected, most countries whose textile and apparel exports are restrained by the MFA gain more post-MFA (table 4). However, as we discussed in the previous section, due to the difference in production and trade structure among countries, the same level of change in textile and apparel exports can affect the rest of the economy differentially across countries. For this reason, the welfare gains can be different among countries that benefit directly from the MFA phase-out. For example, textile and apparel exports increase more in the region of other Asian countries than that in India (figure 12). However, from a welfare point of view, India gains more than the gain of the region of other Asian countries. One reason is that the T&A sector contributed more to GDP in terms of the value added (table 5). For this reason, exports of T&A create more employment opportunities and hence GDP rises more in India than that in the region of other Asian countries (figure 13).

Figure 13.
Increase in GDP in Selected Regions
(Simulation results % change from the base)



For the developing countries free from quota restraints under the MFA and industrial (importing) countries, the welfare effect of MFA phase-out is ambiguous analytically.

Table 4.
Welfare effect in the simulation

	Year -5		Year -10		Year -15		Year -20	
	Billion $	%	Billion $	%	Billion $	%	Billion $	%
Developing countries								
(1) China	19.50	3.76	21.96	4.24	22.95	4.43	23.67	4.57
(2) India	7.30	2.39	8.39	2.75	9.30	3.05	10.79	3.53
(3) Other Asia	7.53	1.34	8.43	1.50	9.13	1.62	10.22	1.81
(4) Middle East	9.24	1.65	10.52	1.88	11.62	2.08	13.43	2.40
(5) Formal Soviet Union	15.33	3.32	17.48	3.79	19.01	4.12	20.88	4.52
(6) O. Latin America	17.71	1.44	20.47	1.66	22.93	1.86	26.88	2.18
(7) E. Europe	4.45	1.06	5.34	1.27	6.02	1.43	6.93	1.65
(8) Africa	9.01	1.69	10.06	1.89	10.96	2.06	12.39	2.33
(9) Mexico and Caribbean	1.93	0.50	2.33	0.60	2.70	0.69	3.29	0.84
Industrial countries								
(10) N. America	0.86	0.01	4.24	0.06	7.22	0.10	11.53	0.16
(11) EU	5.60	0.08	9.98	0.14	13.87	0.20	19.39	0.28
(12) Australia and New Zealand	0.33	0.09	0.56	0.16	0.77	0.21	1.08	0.30
(13) Japan, Korea and Taiwan	4.33	0.12	7.11	0.20	9.56	0.27	13.11	0.37

Table 5.
Share of textile and apparel in GDP, 1997

	T&A value-added[1]	Exports of T&A[2]
Developing countries		
China	5.26	5.38
India	3.25	2.64
Other Asia	3.02	3.89
Middle East	1.36	1.68
Former Soviet Union	1.32	0.43
Other Latin America	3.29	0.16
East Europe	2.86	3.10
Other Africa	2.14	1.08
Mexico and Caribbean	3.29	3.00
Industrial countries		
North America	1.22	0.18
European Union	1.06	0.40
Australia and New Zealand	0.87	0.47
Japan, Korea and Taiwan	1.20	0.86

[1] GDP at factor cost
[2] GDP at expenditure
Data source: GTAP database version 5.

The direct effect of MFA phase-out may be negative for these countries' welfare, as their textile and apparel exports and hence production may fall due to competition from previously restrained countries. However, consumers in these countries may benefit from lowered prices for T&A imports. The output of the other sectors may rise by employing resources released from the protected T&A sector. Even within T&A sector, the indirect effect may be positive as the apparel exporting countries may increase demand for imported textile products.

We observe a positive welfare effect of MFA phase-out in the regions free from quota restraints as well as in industrial importing countries (table 4). Even though the competition from other suppliers who used to be restrained by the quota in the EU and North American markets causes the quota-free regions' exports to fall (figure 12), as world apparel prices decline by about 5 percent post MFA, consumers in these countries are better off by consuming cheaper commodities.

In total, the world aggregate welfare increases by $88 billion in the short-run and more than $203 billion in the long run post MFA in the model, which are equivalent to 0.38 and 0.88 percent of world total consumption in the short- and long-run, respectively. The developing countries as a group benefit more from a more liberalized world T&A market, and total welfare gains for them are about $85.5 billion (equivalent to 1.7 percent of total consumption) in the short-run and $145.5 billion (2.9 percent of total consumption) in long-run. The developed countries as a group also gain $2.6–$58 billion in the short- and long-run, equivalent to 0.01 to 0.32 percent of total consumption in all the developed countries in the short and long run, respectively.

Conclusions

This study focuses on the possible impact of MFA phase-out on the world economy. The study starts by analyzing trends in world textile and apparel trade. The developing countries were a growing factor in world T&A trade in recent decades. As 70 percent of world T&A products are imported by the industrial countries, a more open and freer market in the industrial countries is an important condition for developing countries to maintain their growth momentum. However, about 50 percent of industrial countries' markets are not available for developing countries and intra-EU trade still accounts for half of total EU imports of T&A products. The restraints of MFA on the developing countries' T&A trade may partially explain this situation.

The relationship between trade in textile and apparel and the standard of living is empirically investigated in the study. Using trade data from 91 countries over 37 years, the regression results indicate a strong positive linkage between trade in T&A and income per person. This contrasts with the negative linkage between agricultural trade and income estimated by the study.

The prospect of a post MFA world is analyzed by using an intertemporal general equilibrium model. As the model framework does not allow us to predict the trend in world T&A trade, the study focuses solely on the possible impacts of the MFA phase-out on world T&A trade and the world economy. The study finds that MFA phase-out would enlarge world trade of T&A and developing countries will further gain market share in world total exports. However, without evaluating the possible and differential impact of MFA phase-out on the economic growth pattern and growth rate among countries, the model fails to capture a significant change in world T&A market structure.

Almost all countries, including both the developing countries restrained by the MFA quotas and free from the MFA quotas, and the industrial countries, gain in term of social welfare post-MFA in the model. Even though the developing countries currently free from MFA quota restrains may lose their market shares, as world T&A prices are lowered by improving the efficiency of world T&A trade post-MFA, consumers are better off by consuming cheap commodities.

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